

Evaluating Cooperative Research Centers: Developing Impact Assessment Strategies for Different Stakeholder Groups (Panel Session)

Panel Session Organized by: Author; Session will include four separate papers described below

Theme: Universities as interactive partners

Strand: Academic

Key words: cooperative research centers; evaluation; triple helix; collaboration; industry-university

Abstract of the Panel Session

In the view of many observers (e.g., Berman, 2012), no single development has changed the landscape of research funding and operations in the U.S. and globally than the rise of cooperative research center (CRCs). CRCs are a class of Triple Helix R&D organization that perform research with an explicit or implicit mission to promote cross-sector collaboration, knowledge and technology transfer and innovation (Author et al., 2013). The popularity and wide spread deployment of CRCs is attributable to a number of factors. Perhaps the most important factor leading to their deployment is the fact that CRCs embody three of the most significant social and organizational drivers of contemporary innovation-related activity: collectivization of research (e.g., team science); multi-sector cooperative paradigm (Triple Helix); and open innovation (Author et al., 2013).

However, because CRCs are so complex and multifaceted in both their structure and objectives, they pose some unique evaluation challenges (Author, 2008). Perhaps the most difficult evaluation challenge relates to understanding the impact of CRCs on the large and diverse

collection of stakeholder groups and individuals CRCs can affect. Specifically, CRCs have the potential to simultaneously impact a variety of different stakeholder sectors (industry, university government), organizations (including small and large established firms; start-ups and spin outs; government mission agencies; non-governmental agencies (NGAs), local and national research agencies) and individuals (including firm scientists; university faculty; university students). The proposed session will include four papers that highlight attempts to assess the impact of the National Science Foundation's Industry/University Cooperative Research Centers on different stakeholder groups.

A detailed description of the IUCRC model can be found elsewhere (Author, 1998). In brief, IUCRCs are university-based, industrial research consortia. The research performed in the centers tends to be strategic or preproprietary fundamental research and is carried out primarily by faculty and graduate students. Like other CRCs, the program's most primary goal is to develop and transfer new knowledge and technology to industry. However, IUCRCs also attempt to achieve other goals including: enhance graduate education and scientific social and human capital; enhance U.S. innovation capacity; and ultimately address national societal and economic problems. The IUCRC program currently involves over 60 centers, with 1000 faculty, 1200 graduate students. It is supported by 1200 industry members which yields a highly leveraged total annual budget of \$134 million.

Building on the experience developed through the long-standing evaluation of the National Science Foundation's Industry/University Cooperative Research Centers (IUCRC) Program (Author, 2008), four papers will highlight the varying methodologies used and the results obtained from assessing the impact of the IUCRC program on different stakeholders. Individual papers will examine the impact of the IUCRC program on: industrial sponsors (Authors); the

faculty intrapreneurs who plan and launch IUCRCs (Authors); government sponsors (Authors); and societal beneficiaries (Authors).

Evaluating CRC Impact on Industry: Developing a Compendium of Breakthrough Case Studies
Authors

The National Science Foundation (NSF) is constantly striving to better understand and document the extent to which its Industry/University Cooperative Research Centers (IUCRCs) produce noteworthy technological breakthroughs (TBs). It is essential that the NSF inform its various constituencies and stakeholders about the quality, scope and impacts of the cutting-edge collaborative research that the IUCRC centers have produced over the past several decades.

A unique feature of IUCRCs is that they do not conduct industry's research. Rather, in these centers, industry joins and supports centers that have research areas and missions in which they are interested. Each center's research is guided by an Industrial Advisory Board. Centers only come into being if industry is interested enough in the proposed area of research to commit to paying annual memberships fees ranging from 25 to 50k. These fees are then pooled to provide the resources needed for the centers' research programs.

Because it goes without saying that each center produces high quality research, otherwise industry would not continue to support the center, it is critically important that the process for identifying technology breakthroughs and advances is based on industry nominations solicited by a 3rd party; not on self-nominations by center faculty or administrators. This presentation will characterize the rationale for and the protocol used to develop the TBs contained in the Compendia of Industry-Nominated Technology Breakthroughs of Industry/University

Cooperative Research Centers (<http://faculty.washington.edu/scottcs/NSF/2012/nsf2012.html>). It will then characterize the nature, scope and impacts of the technology breakthroughs contained therein.

TECHNOLOGY BREAKTHROUGH DEFINITION: A technological breakthrough or advance may include: significant process improvements, new processes or techniques and new or improved products or services that resulted either directly from, or was indirectly stimulated by the center's research program.

The compendia contain illustrated TB summary case studies written to enable policymakers, university and industry scientists, and members of the public, to grasp the significance of work in practical, scientific and economic terms. This presentation should enable conference attendees to better understand how to document significant TBs and “game-changing” advances that have been produced by relatively small investments by the government and pooled industry support.

**Impacts for Social-Value Stakeholders in Industry-University-Government Cooperation:
Case Study of CChIPS’ Impact on Child Injury Prevention**

Authors

While many of I/UCRCs sponsored by the NSF serve stakeholders in specific industries, a few address societal values of interest to diverse stakeholders. Assessing impacts for social-value stakeholders calls for identifying and examining impacts and benefits extending well beyond those typical for triple helix (government-industry-university) cooperative research.

We offer a case-study to illustrate impact analysis for one NSF I/UCRC that serves a social-value constituency: Center for Child Injury Prevention Studies – **CChIPS**, founded 2005 at

Children's Hospital of Philadelphia (CHOP) and University of Pennsylvania, "a national platform for cooperative industry-university research on child injury prevention science and engineering."

CChIPS research addresses a broad, philanthropic, social cause – reducing children's injuries (#1 source, automobile crashes) – via a broad, pre-competitive R&D agenda: injury epidemiology and biomechanics; safety technology design, development & testing; human interaction with safety technology; safety promotion and education; evaluation of safety devices and programs.

Founding industry stakeholders - 3 automakers 2 safety equipment companies and an insurer - expressed interest in cooperative research toward understanding and preventing child injuries, evaluated against national children's safety outcomes as much as internal company profits. Now CChIPS has 2 university sites, 20 members including non-profits, and international visibility.

Primary stakeholders' focus on outcomes to external constituencies (interested in child safety science, application & outcomes) and beneficiaries (children, adolescents, parents, etc.) calls for an impact analysis extending the Primary Stakeholder X Impacts matrix beyond beneficial R&D impacts usually of interest in industry-focused I/UCRCs. Extensions include impacts related to: 1) secondary stakeholders: R&D scientists, students, suppliers & customers; 2) beneficiary groups; and 3) center innovations in R&D strategy, organization, partnering, and outreach. Our 8-year case study develops and analyzes the impact matrix for CChIPS with 3 extensions to illustrate a far-ranging impact analysis for social-value stakeholders in cooperative R&D.

Assessing Government Capacity Building Impacts: Can Government Create Self-Sustaining CRCs

Authors

Governments spend millions of dollars annually to seed partnered Triple Helix approaches to research with the implicit or often explicit goal that those partnerships will be able to continue once the initial grant funding has expired. If these partnerships are able to succeed in the long-term, they represent a significant capacity building impact for government stakeholders.

However, there is little evidence about the extent to which government funded programs are able to make this transition.

I/UCRCs) are expected to achieve self-sufficiency after a fixed term (ten years). The current study builds on prior research on CRC sustainability (Author, 2010) by taking a longitudinal approach to examining changes in program sustainability over time, and investigating the impact of measures of stakeholder support and leadership transitions in addition to the environmental, organizational, program, and individual domain variables previously identified. Archival and survey data were used to explore program sustainability of I/UCRCs post-graduation from initial grant support.

Results indicate that the majority of formerly funded I/UCRCs are still operating, despite a small decrease in sustainability over time. When comparing sustained Centers to actively funded I/UCRCs, the sustained Centers appear to have less adherence to I/UCRC model activities but they have been able to replace the resources and structural capacity associated with the end of their I/UCRC grants and are actually achieving greater outcomes than are actively funded Centers; an indication that only the strong survive. When combining the impact of graduated centers with their actively funded counterparts to get a complete picture of the impact of these centers, it is clear that sustained centers nearly double the impact of government investment on a variety of critical outcomes, including funding leveraging, stakeholder support, and human capital outcomes.

Predictive analyses were able to identify environmental, organizational, program, and individual domain variables that were associated with Center status and change in status over time. Results can be used to inform the policy makers and cooperative research center stakeholders about the transition process to program sustainability. While these results are informative, additional research is needed to understand cooperative research center sustainability and to develop a more robust theoretical model of program sustainability in general.

Assessing Human Capital Outcomes: Impact of CRC Leadership Role on Faculty Scientist Careers and Other Outcomes

Authors

A limited body of research has begun to examine the impact of the Industry/University Cooperative Research Centers (I/UCRC) on the creation and enhancement of scientific and technological human capital. However, the impact of the program on a critical participant group, center directors, has yet to be investigated. The overarching goal of this study was to determine the professional trajectory and achievements of I/UCRC directors and the extent to which these outcomes can be attributed to their I/UCRC experience and training. Building on the emergent literature on the effects of center participation on faculty, we applied mixed methods of data collection including a focus group, web survey, curriculum vitae (CV) analysis, and telephone interviews. We found the experience of serving as an I/UCRC director can have significant and positive impacts on the human and social capital of faculty members and through them on other center participants. However, some directors also reported negative impacts including excessive workload and expectations given the funding provided by NSF.

Through regression analysis we explored factors that predict the extent to which the I/UCRC program influences career outcomes and overall work satisfaction. We examine different career opportunities in both academic and industry leadership positions reported by former and current directors, and summarize the career trajectories of I/UCRC directors along three lines: administrative, technical, and technical leadership.

In our conclusions, we highlight the spillover benefits of I/UCRCs to their host universities and offer programmatic and policy recommendations for enhancing the positive impacts of assuming a leadership position in an IUCRC.

References

Berman, Elizabeth Popp (2012). *Creating the Market University: How Academic Science Became an Economic Engine*. Princeton, NJ: Princeton University Press.

Authors (2013). Cooperative research centers as government policies, industry strategies and organizations: Emerging theory and practice for technological innovation. In Authors (2013). *Cooperative Research Centers and Technical Innovation: Government Policies, Industry Strategies and Organizational Dynamics*. Springer Publishing (Business & Economics Group).

Author (2008). Making team science better: Applying improvement-oriented evaluation principles to the evaluation of cooperative research centers. *New Directions for Evaluation*, 118, 73-87.

Author (1998). Expanding and diversifying the center resource base (pp. 262-304). In Author (Eds.), *Managing the industry-university cooperative research center: A guide for directors and other stakeholders*. Columbus, OH: Battelle Press.

Author (2010). *Predictors of cooperative research center post-graduation survival and success*. Thesis submitted to North Carolina State University, Psychology Department, Raleigh NC.