

*Developing Scientific and Technological
Leadership and Human Capital:
Impact of NSF Industry/University Cooperative
Research Center (IUCRC) Directorship on Career
Paths and Achievement*

Drew Rivers, Ph.D.

Denis O. Gray, Ph.D.

Psychology in the Public Interest Program

North Carolina State University

Symposium on Transatlantic EU-US Cooperation, March 22nd 2011, Vienna

Open Innovation and the Human Capital Perspective

Overview



- Faculty and research centers
- The IUCRC and the center director
- Study goals and methods
- Study findings (to-date) on S&T Human Capital outcomes
- Center director role as a career path
- Conclusions with reference to human capital and open innovation
- Next steps and cautionary notes

Faculty & Research Centers



- Studies with implications for human capital, social capital, and open innovation:

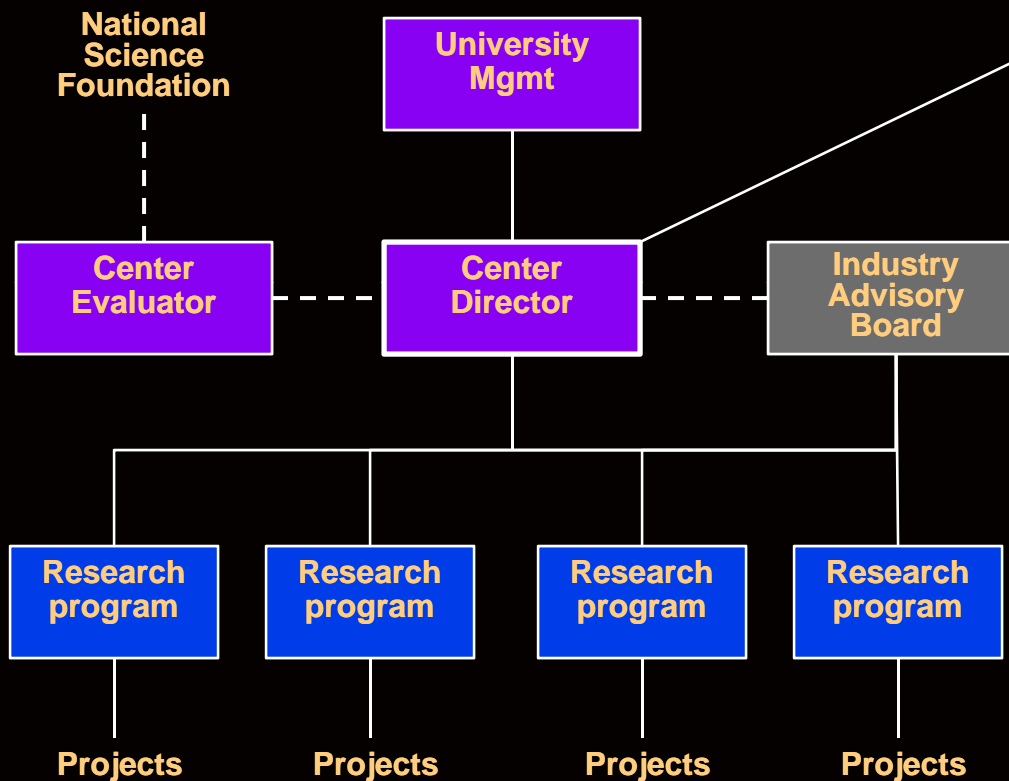
Authors	Types of Centers	General Findings
Gaughan & Bozeman (2002)	Engineering Research Centers, Science & Technology Centers	Center-affiliated faculty were more likely than unaffiliated faculty to receive industry grants.
Dietz & Bozeman (2004)	Dept of Defense, Dept of Energy, and NSF centers	Center-affiliated faculty with past industry experience produced more patents than those without prior industry experience.
Turpin, Garrett-Jones, & Diment (2007)	Australian Cooperative Research Centers	Center-affiliated faculty develop diverse networks of partners, with implications for career-related outcomes.
Ponomariov & Boardman (2010)	Various	Center affiliation has positive implications for faculty productivity and for inter-institutional, inter-disciplinary, and cross-sector collaboration.
Boardman (forthcoming)	Various (based on degree of ties to industry)	Faculty at centers with industry ties were more likely to interact with private companies.

- What about the faculty scientists who create and manage these complex, multifaceted boundary-spanning organizations?

Structure of an IUCRC

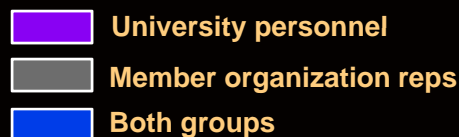


Industry/University
Cooperative
Research Centers



Regular faculty members who:

- Have no position authority
- Act as an intrapreneur
- Manage center operations
- Develop a technical vision
- Span multiple boundaries
- Create a multi-disciplinary research team

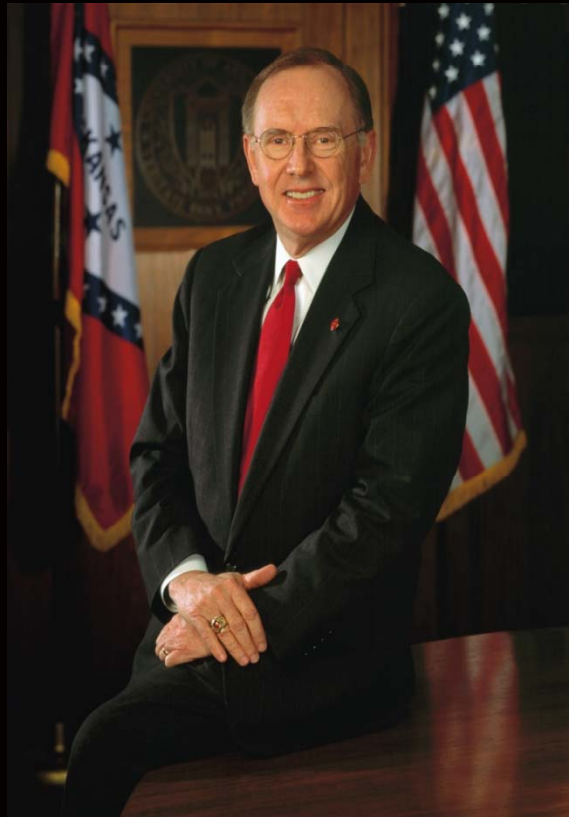


Gray & Walters (1998). Managing the IUCRC. Battelle Press : Columbus OH

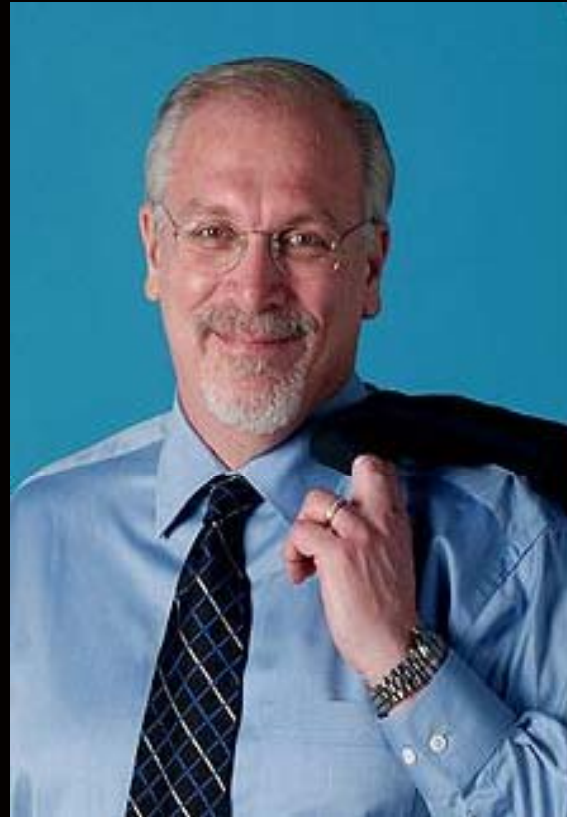
Exceptions or the Rule?



Industry/University
Cooperative
Research Centers



Dr. John White



Dr. Richard DeMillo



Dr. Sarah Rajala

Study Objectives



- **Goals**

- To determine the professional trajectory and achievements of CRC directors and extent to which these outcomes can be attributed to their CRC experience and training.

- **Objectives**

1. To understand what the center director experience is like
2. To assess the extent to which faculty exhibit various career and professional outcomes after serving in the role of IUCRC director.
3. To understand the extent to which various factors including center involvement, personal characteristics and institutional characteristics are related to career trajectory, productivity and achievement outcomes
4. To shed light on the knowledge and skills directors need to be successful during and after their appointment

Study Design



- Mixed methods
 - Qualitative
 - » Focus group with IUCRC directors
 - » Interviews
 - Quantitative
 - » Web-based survey (98 tenure/ tenure-track faculty, current/former IUCRC directors)
 - » CV Analysis (in progress)

On-the-job Training



Industry/University
Cooperative
Research Centers

“Becoming a facilitator.
Becoming someone who brings
faculty and industry together.
Becoming a lawyer all the time.
Being a tech transfer officer.
Becoming a contracts and grants
negotiator... I do all the
negotiations before I hand it over
to anybody, because they will
screw it up 9 times out of 10.”

- center director, faculty
member

- **Leading** or managing diverse teams
- **Securing** financial support for new ventures and activities
- **Developing** a broad research strategy or road map
- **Championing** ideas and projects with higher level administrators
- **Managing** budgets and allocating financial resources
- **Navigating** bureaucratic processes and procedures

Human Capital



Industry/University
Cooperative
Research Centers

As an IUCRC director I enhanced my skills and abilities to...

Strongly disagree (1)	Moderately disagree (2)	Somewhat disagree (3)	Neither agree/ disagree (4)	Somewhat agree (5)	Moderately agree (6)	Strongly agree (7)
--------------------------	----------------------------	--------------------------	-----------------------------------	-----------------------	-------------------------	-----------------------



<u>Item stem</u>	<u>Strongly Agree</u>	<u>Mn</u>
...lead or manage diverse teams.	31.6%	5.80
...secure financial support for new ventures and activities.	29.6%	5.80
...develop a broad research strategy or road map.	26.5%	5.75
...champion ideas and projects with higher level administrators.	25.5%	5.60
...manage budgets and allocate financial resources.	24.5%	5.55
...navigate bureaucratic processes and procedures.	23.5%	5.52

Social Capital



Industry/University
Cooperative
Research Centers

During your tenure as an IUCRC director, did the frequency of your interactions with the following groups increase or decrease?

Significantly decreased (1)	Moderately decreased (2)	Somewhat decreased (3)	No change (4)	Somewhat increased (5)	Moderately increased (6)	Significantly increased (7)
--------------------------------	-----------------------------	---------------------------	------------------	---------------------------	-----------------------------	--------------------------------



Item stem	Significantly incr'd	Mn
Researchers in U. S. industry	40.8%	6.03
Faculty researchers in U. S. universities other than my own	23.5%	5.71
University administrators and support offices	22.4%	5.56
Faculty researchers in my department or program	18.4%	5.28
Faculty researchers outside my department or program	18.4%	5.46
Researchers who reside in nations other than the U.S.	11.2%	4.98
Students I supervised in my lab or group	8.2%	4.46
Students outside my lab or group	7.1%	5.13
Researchers in U. S. government laboratories	7.1%	4.96

Negatives?



Industry/University
Cooperative
Research Centers

“That's a really good question because in my field at least there are conferences and meetings that mostly academics go to; I no longer go to them because that is not where my customer is. So I go where my customers are which is mostly industry.”

**- Center director,
faculty member**

- 15% reported a decrease in interactions with students in their own labs.
- 13% reported a negative impact on their journal publication rate.
- 26% reported a negative impact on their teaching involvement.
- 11% reported a negative impact on their overall satisfaction at the university.

Enabling Others



Industry/University
Cooperative
Research Centers

As an IUCRC director I was able to...

Strongly disagree (1)	Moderately disagree (2)	Somewhat disagree (3)	Neither agr/ disagr (4)	Somewhat agree (5)	Moderately agree (6)	Strongly agree (7)
--------------------------	----------------------------	--------------------------	-------------------------------	-----------------------	-------------------------	-----------------------



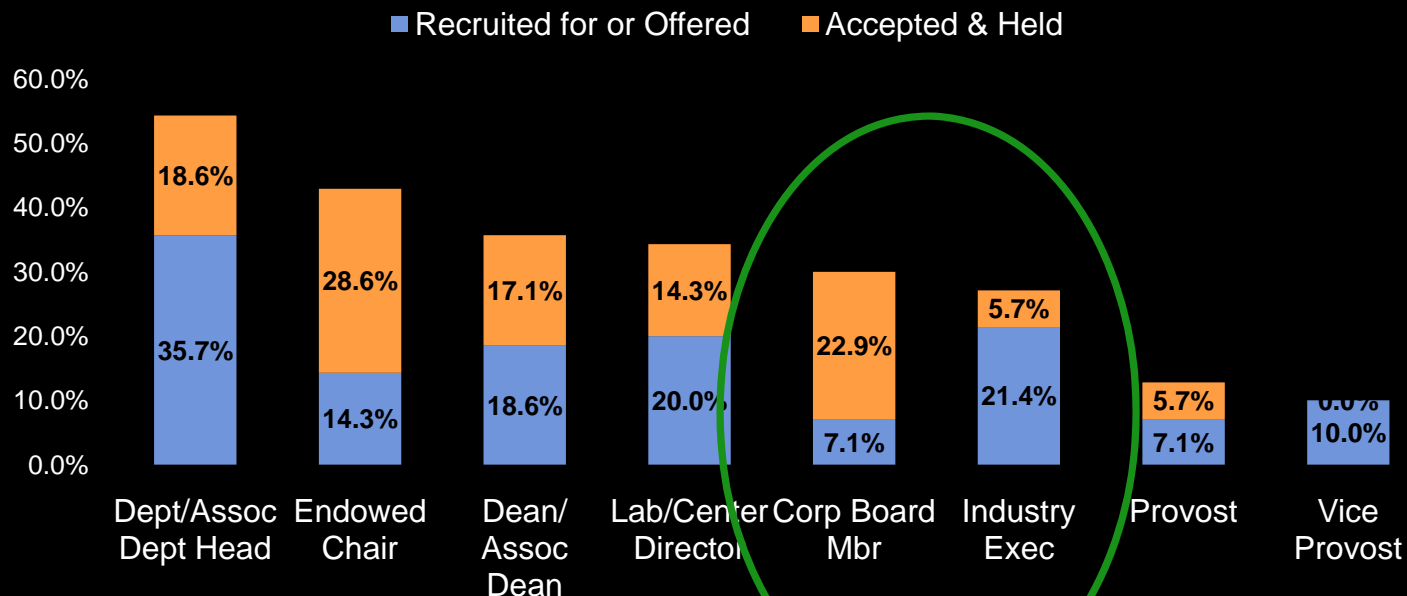
<u>Item Stem</u>	<u>Strongly Agree</u>	<u>Mn</u>
...positively impact the image or prestige of my home university.	42.4%	6.05
...enhance the experience for graduate students in my own lab.	33.3%	5.73
...enhance the career prospects of graduate students.	33.3%	5.99
...connect together organizations and researchers with similar interests.	33.3%	5.98
...enhance the careers of other faculty researchers.	28.3%	5.86
... address important industrial or societal needs.	28.3%	5.71
...enhance the experience of graduate students outside my own lab.	17.2%	5.49

Career Opportunities



Since beginning your role as IUCRC director, what positions were you recruited for or offered, and what positions did you accept?

Career Impacts on Former Directors and Current Directors with 5+ Years of Service in the Role (n=70)



Alternative Career Path



Industry/University
Cooperative
Research Centers

“And then I was offered a dean position and then I went through with it because some friends asked me to look at it. I went through with it, I looked at it, and it really took me about half a day to say ‘no.’ And again I just am having fun. I think I am having a lot more impact; I think about the students that we are training, the industries that we are creating.”

- Center director, faculty member

1. Administrative/ Managerial

Associate
professor

Professor

Dept head

Dean

Provost

2. Scientific/ Technical

Associate
professor

Professor

3. Science- saturated administrative

Associate
professor

Professor

Center
director

(Open innovation champion)

Conclusions



- Beginning to understanding what it means to a faculty member to become a CRC director
- Role of CRC director offers faculty an opportunity to:
 1. Dramatically enhance their capacity to generate and diffuse knowledge
 - » Rapid accumulation of human capital and social capital
 - » Strategic leadership and influence over center resources
 2. Gain skills and competencies to create and manage mechanisms to further develop the capacity of the broader system.
 - » Capability to grow and expand existing centers
 - » Capability to create cross-sector research organizations

Conclusions cont'd



- *CRC director opportunities cont'd:*
 3. Make significant and enduring contributions to their field (and to economic development)
 - » Augment the human and social capital of others
 - » Leverage the resources of a center to achieve a technology vision
 4. Become a champion for open innovation
 - » Move beyond a traditional academic career framework
 - » Encourage and support open innovation by creating:
 - » Knowledge value collectives
 - » cross-sector collaboration
 - » Inter-institutional collaboration

Next Steps



- CV analysis
- Predictive analyses to investigate the influence of various personal and experience factors on subjective and objective outcomes (both self report and CV)
- Strategically sampled interviews to try to understand causal factors
 - Accepted leadership role vs. declined vs. not offered

Cautions



- Cautions:
 - Generalizability: single program; volunteer sample
 - Self report evaluations (social desirability bias)
 - No comparison group
- But this is the first systematic data on this important group...

Questions?



Industry/University
Cooperative
Research Centers

- Comments or Questions

- Acknowledgement: The authors acknowledge support provided by the National Science Foundation Industry/University Cooperative Research Centers Program (EEC-0631414) in preparing this paper