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

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Overview

- Faculty and research centers
- Study goals and methods
- Study findings on S&T Human Capital outcomes
- Center director as a career path
- **Themes from the interviews**
- Implications for 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?



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 (Administrative acceptors vs. decliners)
 - Quantitative
 - Web-based survey (98 tenure/ tenure-track faculty, current/former IUCRC directors)
 - CV Analysis



On-the-job Learning

“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

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



Item stem	Strongly Agree	Mn
...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

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



<u>Item stem</u>	<u>Significantly incr'd</u>	<u>Mn</u>
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?

“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

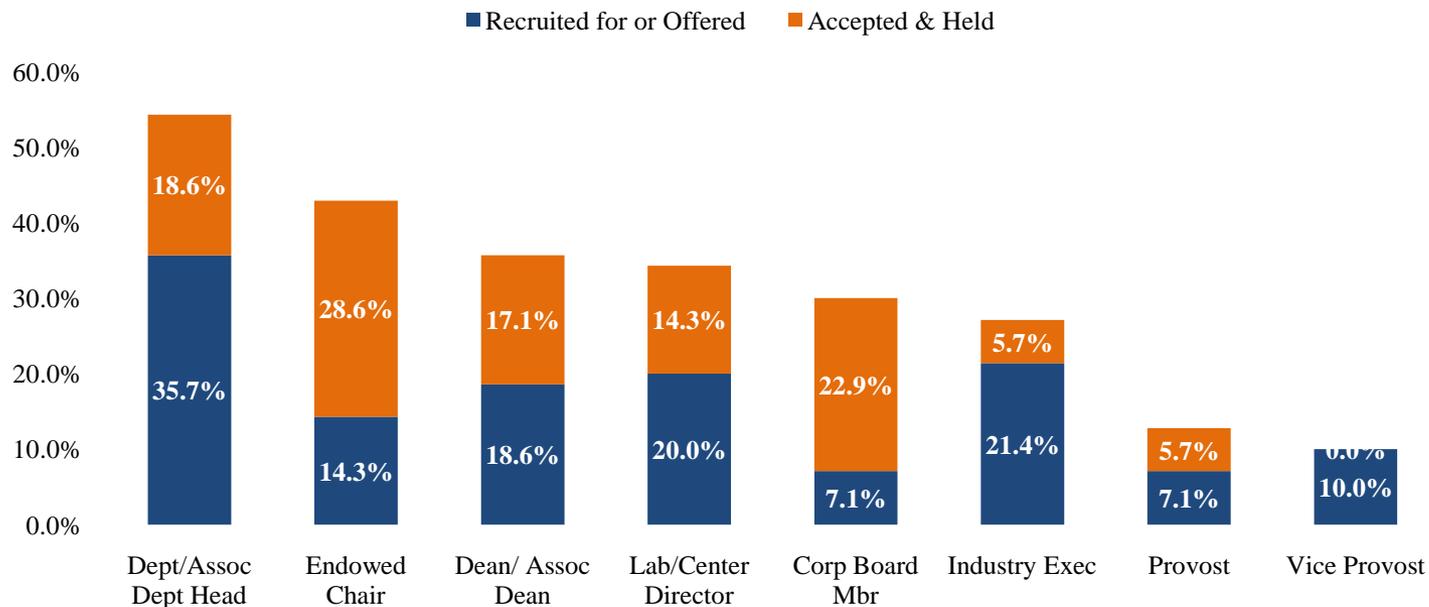
- 15% reported a decrease in interactions with students in their own labs.
- 13% reported a negative impact on their journal publication rate.
- 26% reported a negative impact on their teaching involvement.
- 11% reported a negative impact on their overall satisfaction at the university.



Career Opportunities

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

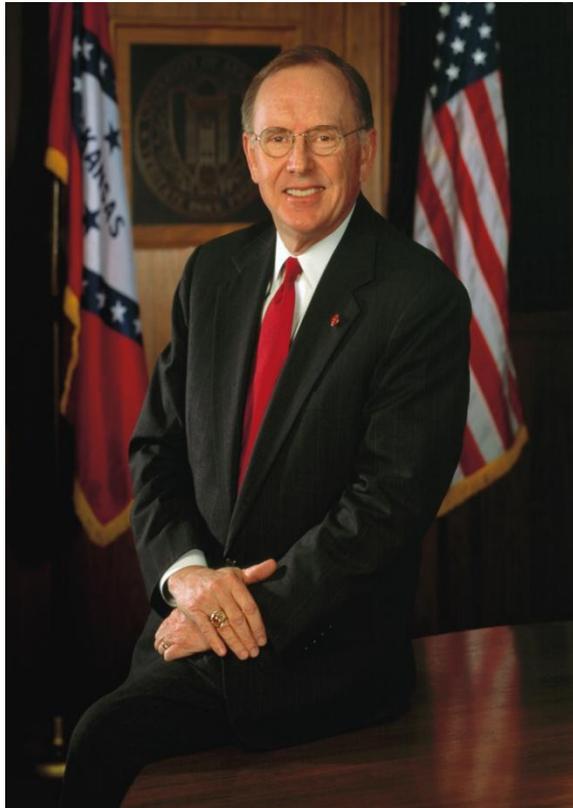
Career Impacts on Former Directors and Current Directors with 5+ Years of Service in the Role (n=70)



Exceptions or the Rule?



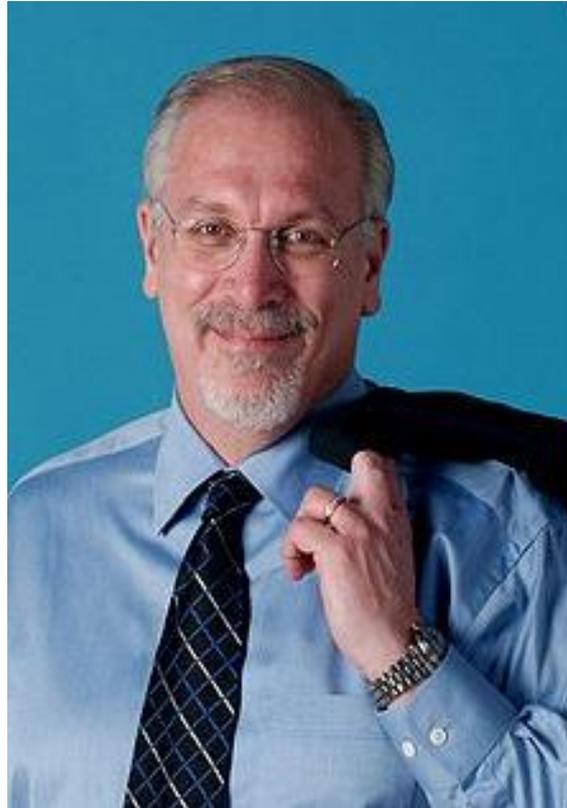
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Academic positions of former and current IUCRC directors



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University-level Administration

- President, Excelsior College
- Chancellor, Polytechnic University of New York
- Vice President for International Affairs, Lehigh University
- Chancellor, Univ. of Arkansas
- Assistant Vice Chancellor, University of Massachusetts
- Vice President for Academic Affairs and Provost, Wentworth Institute of Technology
- Vice President of University Partnerships, Oak Ridge Associated Universities
- Chancellor, University of Wisconsin-Milwaukee
- Provost and Academic Dean, Naval Postgraduate School
- President, Milwaukee School of Engineering

College-level Administration

- Dean, College of Engineering, University of Arkansas
- Director, School of Engineering, Oklahoma Christian University
- Deputy Dean, School of Engineering and Applied Science, Univ. of Pennsylvania
- Dean, College of Engineering, Architecture, & Technology, Oklahoma State Univ.
- Associate Dean of Engineering and Computing Sciences, Univ. of Iowa; Texas A&M University Corpus Christi
- Dean, College of Engineering, Oklahoma University
- Associate Dean, Instruction and Extension, Oklahoma State Univ.

College-level continued

- Dean of the College of Engineering and Architecture, Washington State University
- Dean, School of Public Health, Univ. of California - Berkeley
- Dean, College of Computing, Georgia Institute of Technology
- Dean of the College of Engineering and Applied Sciences, Stony Brook University
- Associate Dean of the Graduate School, Clemson Univ.
- Interim Dean, College of Engineering, Univ. of Iowa
- Dean, Glass Science, Alfred University
- Dean, College of Engineering, Mississippi State University
- Associate Dean, School of Engineering, Arizona State Univ.
- Executive Director, College of Engineering, Univ. of Wisconsin - Madison
- Dean, School of Engineering, Case Western Univ.
- Associate Dean for Research, College of Engineering, Georgia Institute of Technology
- Associate Dean, School of Engineering, Univ of California, Santa Cruz
- Associate Dean, College of Engineering and Architecture, Washington State Univ.
- Associate Dean, Research & Graduate Education of School of Engineering, Univ. of Connecticut

Department –level Administration

- Director, Graduate Program in Nuclear Engineering, University of Maryland
- Program Chair, Glass Science, Alfred University
- Chair, School of Industrial and Systems Engineering, Georgia Institute of Tech.
- Department Chair, Chemical Engineering, Michigan Tech. Univ.
- Chair, Department of Mechanical Science and Engineering, Univ. of Illinois Urbana-Champaign
- Department Head, Department of Industrial and Systems Engineering, Virginia Polytechnic Univ.
- Chairman, Department of Industrial Engineering and Operations Research, Univ of Cal- Berkeley
- Associate Chair, Department of Computer & Information Science & Engineering, University of Florida
- Department Head, Department of Metallurgy, Univ. of Connecticut
- Chair, Engineering, Ohio State Univ.
- Chairperson, Chemical Engineering Department, Arizona State University
- Department Head, Department of Forestry and Environmental Resources, North Carolina State Univ.
- Department Head, Department of Chemical Engineering, Kansas State Univ.
- Associate Head for Graduate Programs, Univ. of Illinois at Urbana-Champaign
- Chair, Department of Pharmaceuticals, University of Minnesota
- + 12 more



Phone Interviews

- 19 interviews with current and former IUCRC directors currently serving as professors, center directors, department heads, deans, vice presidents, chancellors, and/or entrepreneurs
- 20 to 40 minutes, recorded, transcribed
- Major topics covered
 - Motivation for becoming an IUCRC director; why *and* how
 - Relative influence of IUCRC experience on career trajectory; being considered for positions *and* personal decision whether to pursue them
 - Relative influence of IUCRC specifically with regard to any offers declined



Some Preliminary Highlights

- *In the right place at the right time:* How becoming a CRC director can be serendipitous
- *There's nothing more personal than business[1]:* How mentors and influencers affect career paths and success
- *Spanning the boundaries:* how job descriptions influence administrative role acceptance

[1] Steve Carell as Michael Scott, in *The Office*



Right place; right time

Informant: One day, I was sitting in my office at [University] and a guy, [guy's name], who was in the [Research Corporation], a full-time research professional, came to see me, and he said, "I'm thinking about trying to form a [field] research center. Would you be interested in participating?"

I said, "Look, if there's a [field] research center," and I was so cocky, I couldn't believe it, "Look," I said, "If there's going to be a [field] research center, I'm going to be in charge of it, and I would love to do that," I said. "I am doing lots of work in consulting with lots of companies and I am coming across lots of neat research problems everywhere I go..."

So, when [guy's name] walked into my office—and I mean, I was flummoxed. I thought: ...He didn't know a thing, I thought, about [field].—but he just had heard that there was this thing called NSF I/UCRC program, and there wasn't one in [field].

Drew: Had you heard of that program before [guy's name] came into your office?

Informant: No, had no clue what it was.



Career influencers

Drew: One of the first things that I noticed about you was you had about four years of industry experience at [company]. After that, you were doing a lot of things that involved industry-university partnership and commercialization...

Informant: Oh, I think—I often described it as the time where I learned the difference between the forest and the trees... I was researching very specific topics, deep and narrow, and then I went to industry. ...I really saw a much bigger picture. So that led me in a much different direction in my career...

[Name] was the founder of [company], and my last two years of working there, I worked directly with him. He and I worked very closely together.

Drew: So, did you maintain your relationship—was it [Name]?

Informant: Yes, yes!

Drew: So you've maintained that kind of a—was it a colleague relationship or a mentor relationship that you've had with—

Informant: It was kind of both. Well, obviously, we were colleagues that developed software together, but he was—yeah—mentor may not quite the right word. He was somebody that really was—it was very motivational to me, and I learned a lot from him just by the way he did things and how he made decisions.



Boundary spanning

Drew: ... What was it about the administrative path that appealed to you more than maybe the science-leadership path of an I/UCRC?

Informant: Initially, I was forced into it.

Then, I think, probably, it was—I bet it was—the external engagement—engaging externally to the university. Really, I've never given this full thought, but it probably drove a lot my desire to at least try my hand at going beyond being department head. Because, I'm sure that my working with the faculty and securing new members for the center: that's not too far from what you do in fundraising. One, you're selling a research agenda, and the other, you're selling the opportunity to invest in a university that you believe in.

So, I probably discovered that external constituency is something I enjoyed working with. As a dean, it's probably the part I enjoy the most. The part I enjoy the least is the daily grind: the operational stuff. ... So, I probably would have never discovered the external side of the job if I hadn't done a I/UCRC director's job.



Alternative Career Path

“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



2. Scientific/ Technical



3. Science- saturated administrative





Conclusions

- Beginning to understand 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
 - **Influence the research strategy of universities**
 - 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

- **Content analysis** on interviews to try to understand causal factors
- **Finalize** predictive analyses to investigate influence of various personal and experience factors on subjective and objective outcomes; revisit CV data for analysis
- **Compare** survey results to RVM study data
- **Report to NSF**



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...



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QUESTIONS?