



Industry/University
Cooperative
Research Centers

Predictors of Graduated I/UCRC Success

Thesis Proposal Research

by

Lindsey McGowen

North Carolina State University



Background: Program Goals

- “develop long-term partnerships among industry, academe, and government.”
- “develop a plan to work toward self-sufficiency from NSF”
- “NSF intends to seed partnered approaches to ... research, not to sustain the Centers indefinitely. The Foundation intends for Centers gradually to become fully supported by university, industry, state, and/or other non-NSF sponsors. “
- “Over 80% of the Centers established continue on as successful centers without NSF funding”.

(NSF IUCRC website)



Purpose of Research

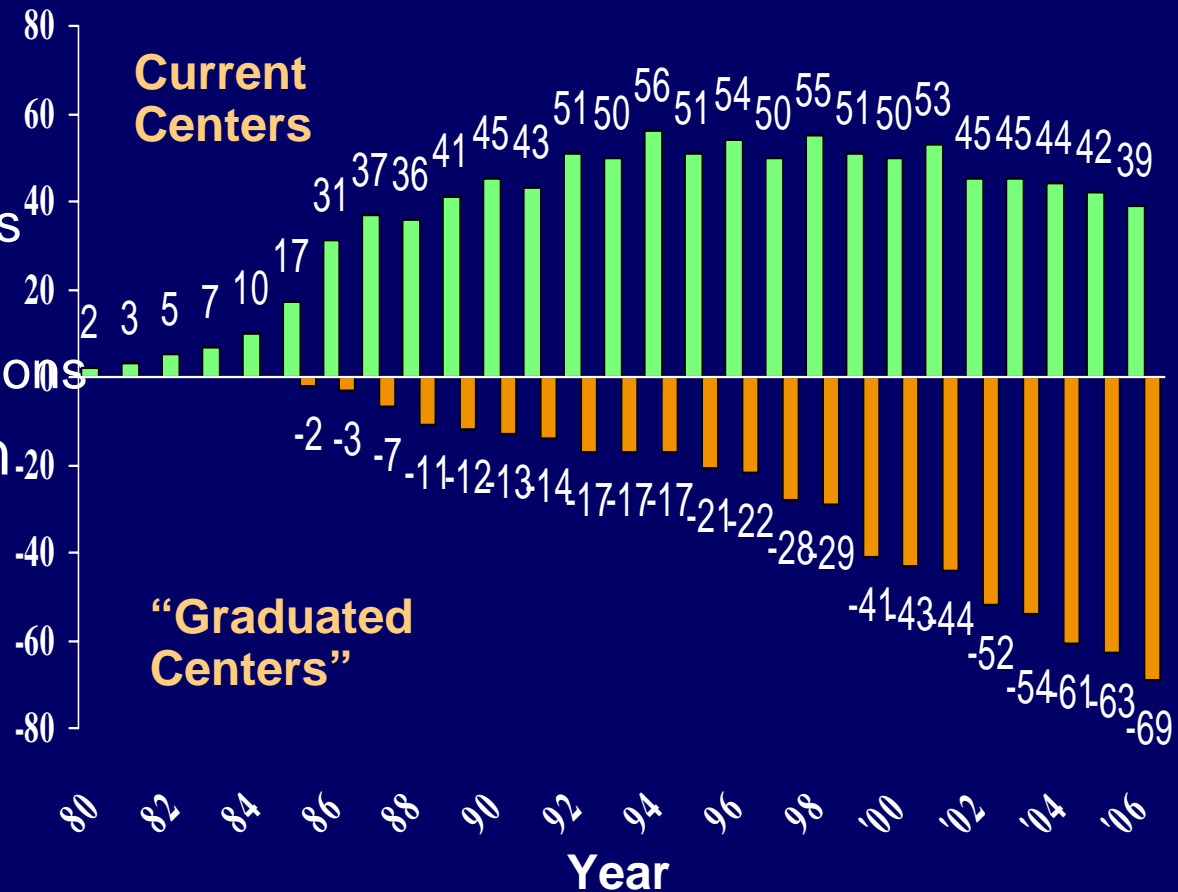
- To assess the extent to which the I/UCRCs become “successful” after graduation
- To assess the extent to which graduated I/UCRCs maintain fidelity to the I/UCRC model
- To determine what factors predict Center “success” post graduation from NSF support



What is known about the NSF's track record of producing sustainable Centers?

- Lots of archival data while supported by NSF
 - Total budget, by source
 - Industry membership descriptors
 - Faculty and student stats
 - Center Director info
 - Degrees, hires, publications
- No info post-graduation
- Where did that 80% estimate come from?
- What does "success" mean?

Center Life Cycle





Theoretical/Conceptual Literature

Social Entrepreneurship

NSF I/UCRCs bridge the gap between industrial and academic sectors, by (Dees, 2001):

- Adopting a mission to create and sustain industrial collaboration,
- recognizing and pursuing opportunities,
- engaging in a process of continuous innovation, adaptation, and learning,
- acting boldly without being limited by resources currently in hand
- and exhibiting heightened accountability to the industry, faculty, and university served and for technology transfers.

Sector

- Private
- Non-profit
- Public
- Academic

A typology of the construct (Peredo & McLean, 2006):

- Integrated social entrepreneurship
 - Double bottom-line: social & financial
 - Earned income activities themselves create social value
 - Hybrid organizational structure
- Partnered social entrepreneurship
 - Partnerships with for-profit entities make social value creation possible
 - Licensing, contracting, job creation
- Market-based social entrepreneurship
 - Social goals guided by market demands
 - Business orientation toward social value

Empirical Literature



Industry/University
Cooperative
Research Centers

Ailes, Roessner, & Coward (2000)

- **Goals:** To explore issues of self-sustainability, funding, cultural change for graduated ERCs

- **Methodology**

- Interviews with Center leadership
- N = 16, response rate = 100%, Centers from 5 cohorts, 1985-1990, Data collected year before graduation and year of graduation (11th year)

- **Results**

- Outcomes:
 - » All centers survived as research entities to some extent
 - » Fidelity to ERC model varied
 - » Changes in research focus
 - » Negative effects
- Hypothesized Predictors:
 - » Infrastructure
 - » Transition planning
 - » Center management
 - » Faculty involvement
 - » Institutional factors
 - » Research area
 - » Industrial participation
 - » Educational programs

Mujumdar (2005)

- **Goals:** Investigated what happened to ERCs after graduation, how Center's changed, and the consequences of graduating from NSF support.

- **Methodology**

- 22 item survey completed by Center leadership
- N = 10, response rate = 62.5%, follow-up to Ailes et al. (2000) study

- **Results**

- Outcomes:
 - » Sources of Funding
 - » University (75%)
 - » Industry (100%)
 - » Government (63%)
 - » Other (89%)
 - » Funding Range \$500K - \$27M
- Predictor Factors Identified
 - » Mission/Vision
 - » Tech Transfer
 - » Research
 - » Education/Outreach

Research Questions



- What is the status of graduated I/UCRCs?
- How much fidelity to IUCRC model do graduated centers maintain?
- How “successful” are graduated I/UCRCs? How do you measure success?
- To what extent do pre-graduation archival data predict success?
- What transition strategies do Centers use to manage graduation? To what extent does transition strategy predict success?

Participants



- Any NSF I/UCRC that is beyond the 10th year of funding and ...
 - graduated (completed funding cycle)
 - did not graduate but is no longer in the program
 - graduated and was absorbed by another Center
 - N = 69

Status & Fidelity



Industry/University
Cooperative
Research Centers

Status:

- Drop out – alive
- Drop out – dead
- Graduated – alive
- Graduated – dead
- Graduated – merged/absorbed

Fidelity: (high, medium, low)

- Industry support
- Consortial/membership format
- Shared research & IP
- Strong industrial influence

Method:

- Follow-up interview with director, evaluator, or other informant

Analyses:

- Descriptive

Results

- Survival rate at x years post-graduation
 - 1 year post-grad %
 - 3 years post-grad %
 - Etc.

Graduated Centers



Industry/University
Cooperative
Research Centers

Center Name	Year
Interactive Computer Graphics (RPI)	79-89
Research on Polymers (UMass)	80-96
Welding Research (Ohio State)	80-90
Applied Polymer Research (CWRU)	81-98
Robotics (U of RI)	82-87
Computing and Comm. (NCSU)	82-04
Ceramics Research (Rutgers)	82-98
Logistics Institute (Georgia IT)	82-02
Hydrogen Research (Texas A&M)	83-87
Steel Research (Colorado SM)	84-98
Hazardous & Toxic Waste (NJIT)	84-00
Optoelectric Devices Interconnects & Packaging (U of AZ/Maryland)	84-03

Center Name	Year
Math. Modeling & Comp./Petroleum Research (Wyoming)	84-88
Process Analytical Chemistry (UW)	84-98
Innovation Mgmt. Studies (Lehigh)	84-98
Engineering Tribology (NWU)	84-04
Electromagnetics (NEU)	85-98
Plastics Recycling (Rutgers)	85-94
Lymphocyte Tech. (UNC/Duke/NCSU)	85-89
Health Sciences (UT San Antonio)	85-92
Iron & Steelmaking (Carnegie M.)	85-98
Adv. Electronic Materials Devices & Systems (UT/TX A&M)	85-01
Chemical Process Modeling & Control Research (Lehigh)	85-96
Glass Research (Alfred/MO/PennSt)	86-04

Graduated Centers



Industry/University
Cooperative
Research Centers

Center Name	Year
Integrated Info & Telecomm. Systems (IIT)	86-89
Web Handling (OK State)	86-98
Software Engineering Research (UF/Purdue/UO/WVU/Ball State)	86-04
Energetic Materials (NM Tech)	86-98
CAPPS (NCSU/UC Davis/Ohio St.)	87-04
Manufacturing Automation (USC/UC)	87-94
Simulation & Design Optimization of Mechanical Systems (Iowa)	87-96
Microwave, Optical & Digital Electronics (CU Boulder)	88-05
Biolosurfaces (SUNY Buffalo)	88-05?
Thin Films & Interfaces (Brown/URI)	89-94
Information Mgmt. (GIT/U of AZ)	89-96

Center Name	Year
Ultra High-Speed Integrated Circuits & Systems (UCSD)	89-99
Electronics Packaging (Maryland)	89-92
Parallel & Distributive Intelligence Systems Research (UPitt)	89-94
Analog & Digital Integrated Circuits (WA State/UW/OR State)	89-04
Air Conditioning & Research (UI)	90-01
Grinding Research (UConn)	90-98
Dimensional Measurement & Control in Manufacturing (UMich)	90-01
Nanostructural Materials (North TX)	91-96
Coatings Research (East MI/SMS)	91-05
High Speed Image Proc. (UC Irvine)	92-94
Separations Using Thin Films (CU)	92-98

Graduated Centers



Industry/University
Cooperative
Research Centers

Center Name	Year
Polymer Interfaces (Lehigh)	92-01
Integrated Pest Mgmt. (NCSU)	92-01
Wireless Info. Networks (Rutgers)	92-01
Adv. Communications (Villanova)	92-01
Building Performance & Diagnostics (Carnegie Mellon)	92-01
Corrosion in Multiphase Syst. (Ohio)	93-02
Machine Tool Systems (UI)	94-03
Polymer Biodegradation (UMass)	94-98
Emission Reduction (NJIT/Penn St/MIT/Ohio St)	94-98
Ocean Technology (URI)	94-97
Composite Design (Stanford)	94-96
Control of Energy & Power Systems (CSM/AZ State)	94-99

Center Name	Year
Ergonomics (Texas A&M)	95-02
Pharmaceuticals (Purdue/UConn/U of PR/Minnesota)	95-05
Particulate Materials (Penn State)	95-04
Packaging & Resource Recovery (Rutgers)	95-95
Wireless Electromagnetic Compatibility (U of OK)	97-04
Quality & Reliability Eng. (Rutgers)	97-03
Next Generation Video (RPI/NJIT)	99-02
Intelligent Biomedical Devices & Musculoskeletal Systems (CSM)	99-03
Fundamentals & Applications of Photopolymerization (Iowa/CU)	99-05
Earth Oceans and Space (UNH)	99-00
Tech. & Innovation Mgmt. (NWU)	03-05

How “successful” are graduated I/UCRCs?



Industry/University
Cooperative
Research Centers

Success Operationalized

- Survival as a research entity
- NSF minimum funding criteria
- Funding changes
 - Overall
 - By source
- Size
 - Faculty
 - Students
 - Projects
- Research focus & scope
- Technology transfer

Method:

- Interview/Survey with current director, last director of record, other informant

Analyses:

- Descriptive

Results:

- Funding changes
 - No change %
 - Increase %
 - Decrease %
- Size
 - No change %
 - Increase %
 - Decrease %
- Research focus & scope
 - Qualitative
- Technology transfer
 - Qualitative
 - No change %
 - Increase %
 - Decrease %

To what extent do pre-graduation archival data predict success?



DVs

- Status
- Success

IVs

- Director Structural Report
 - Funding at year 10
 - N of members
 - Change in members
- Process Outcome
 - Industry
 - » Satisfaction
 - » Research relevance
 - » Etc
 - Faculty
 - » Satisfaction
 - » Commitment

Method

- Archival data
 - Director Structural Report
 - Industry Process Outcome
 - Faculty Process Outcome

Analyses

- Predictive OLS Regression
- Logistic Regression
- Event history

Results

- Correlations among variables
- % of variance in DVs accounted for by IVs (R^2)

* Controlling for age

What transition strategies do Centers use? Do they predict success?



Industry/University
Cooperative
Research Centers

Strategic Planning

- Plan exists
 - Components
 - » Research
 - » Member recruitment
 - » Faculty recruitment
 - » Other funding sources
 - » IP & Tech. transfer
 - » Other
 - Stakeholders involved
 - » Center Administration
 - » Faculty
 - » Industry
 - » University
- Plan does not exist

Social Entrepreneurship

- Ent behaviors
- Leadership
 - Bart's variables

Method

- Interviews with Evaluator

Analyses

- Qualitative analyses of interviews
 - What contributed to success?
- Descriptive
- Regression

Results

- Strategic Planning
 - % using various tactics identified
 - % plan exists
 - % no plan
 - Correlation b/t planning IVs and post graduation DVs

Implications of Research



- Many government programs are designed to provide time-limited support
- Self-sufficiency is an explicit or implicit goal
 - ERCs, STCs, etc.
 - Various S&T and social programs
- This research may provide information that helps promote the success of Graduated Centers.
- It adds to the scholarly understanding of the life cycle for programs with time limited grant funding.

Timeline



June, '06 | July-Sept., '06 | Oct.-Nov., '06 | Jan., -Feb., '07 | March, '07 | April-June, '07 | July-Aug., '07

- Approved 
- Extended Lit Review 
- Archival Data Cleaning 
- I/UCRC Approval, Sample Identification 
- Proposal 
- Data collection 
- Analysis and Reports 