



Industry/University
Cooperative
Research Centers

***A Multivariate Study of Graduate Student
Satisfaction and Other Outcomes Within
Cooperative Research Centers***

Thesis Research

by

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Assumptions

- I/UCRCs have a positive impact on student's training (Scott, C., Schadd, D. & Brock, D. (1991))
- The training experience provided by individual centers varies
- Those difference have the potential to affect student outcomes

Purpose of Research

- To explore benefits, experiences, and satisfaction of current graduate students in cooperative research centers
- To identify key center mechanisms needed to achieve those educational benefits
- To develop a tool for providing centers with immediate feedback from graduate students
 - Centers would benefit by more real time feedback from graduate students, providing a better understanding of which center components may assist in a better education/training of graduate students

Research Questions



- What individual and/or center characteristics are related to graduate students' ...
 - satisfaction with their center experiences?
 - outcomes (such as technical and non-technical skills)?
 - career goals (e.g: pursue careers in industry, academia, and/or government)?
 - scholarly achievements (e.g.: presentations, publications, patents)?
 - organizational commitment
 - perceptions of having a competitive advantage



Individual Center Mechanisms Lead to Process/Outcomes

Center Mechanisms

- Formal Activities
 - Meetings, Workshops, Seminars
- Center Projects
 - #, Involvement, Relevance to goals
 - Broad, Innovative, Applied
- Internships/Jobs
- Interactions
 - Frequency and Type
- Mentoring

Individual
Center

Process/Outcomes

- Benefits
 - Psychological
 - Knowledge/Skills
 - Career Marketability
- Satisfaction
 - Opportunities
 - Education
 - Support
 - Well prepared
 - Autonomy
 - Time
 - Management
- Organizational Commitment
- Competitive Advantage
- Scholarly Production
- Career Goals

Overview of Data Analysis Strategy



- Descriptive statistics
- Exploratory factor analyses
 - Scale construction
 - » Removed necessary items
- Regression hypothesis testing
 - Bivariate regressions
 - Multivariate regressions

Response Rate

- Response Rate
 - 528 Sent out
 - 208 Returned (39% response rate)
 - » 14 not useable (missing data, not qualified, etc.)
 - 194 Total (37% response rate)
 - » Excluding Center who used listserv
 - » 45% returned
 - » 43% useable
- Number of Centers: 34 (81%)
 - Includes 1 STC

Population and Sample Characteristics



- Average number of doctoral degree students
 - Participating Centers: 18.69
 - Full Population: 12.34
- Average number of master's degree students
 - Participating Centers: 10.10
 - Full Population: 7.59
- Multi site vs. single site universities
 - Participating Centers
 - » 22 Multi-site Centers = 64.7%
 - » 12 Single-site Centers = 35.3%
 - Full Population
 - » 27 Multi-site Centers = 64.3%
 - » 15 Single-site Centers Population = 35.7%

Student Characteristics



- Students have been in graduate school for an average of 3.2 years
- About half of them fall into the age range of 25-29 years old
- About three-fourths of participants are males and one fourth are females
 - Full population: 77.6% Male, 22.4% Female
- Almost all (90%) are current students, but about ten percent are recent center graduates

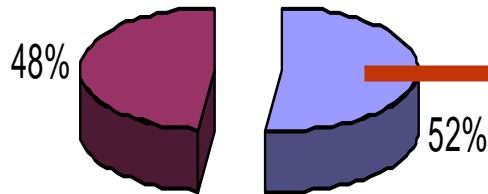
Citizenship



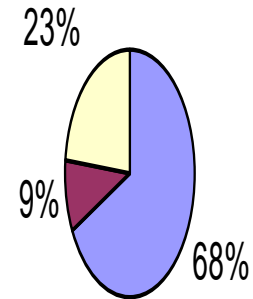
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Citizenship

- Non-U.S. citizen
- U.S. Citizen



Employment Plans of Non-U.S. Citizens



- U.S.
- My country
- Don't know

Compare to full population: 56.4% U.S. citizens, 43.6% non-U.S. citizens

Degree & Thesis

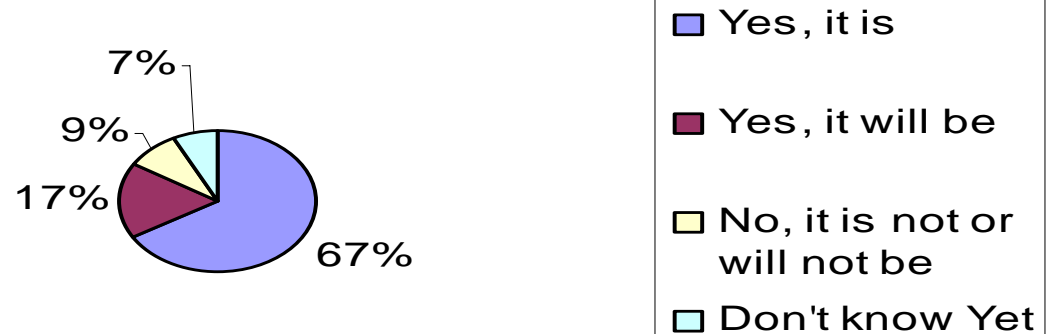


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Highest degree student will be pursuing



Thesis/dissertation based on a Center project

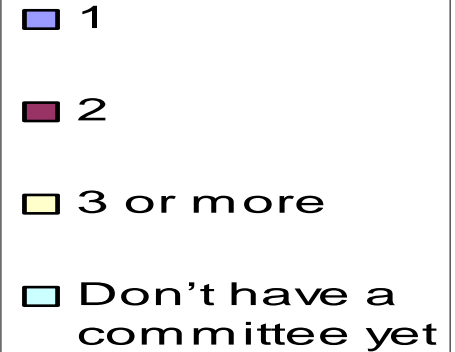
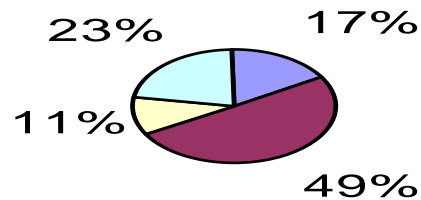


Thesis

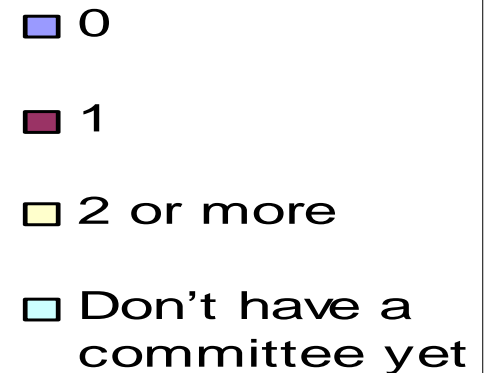
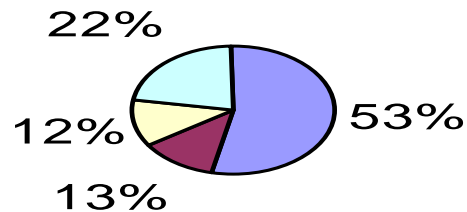


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Number of academic departments on committee



Number of industry or government Center members/participants on committee

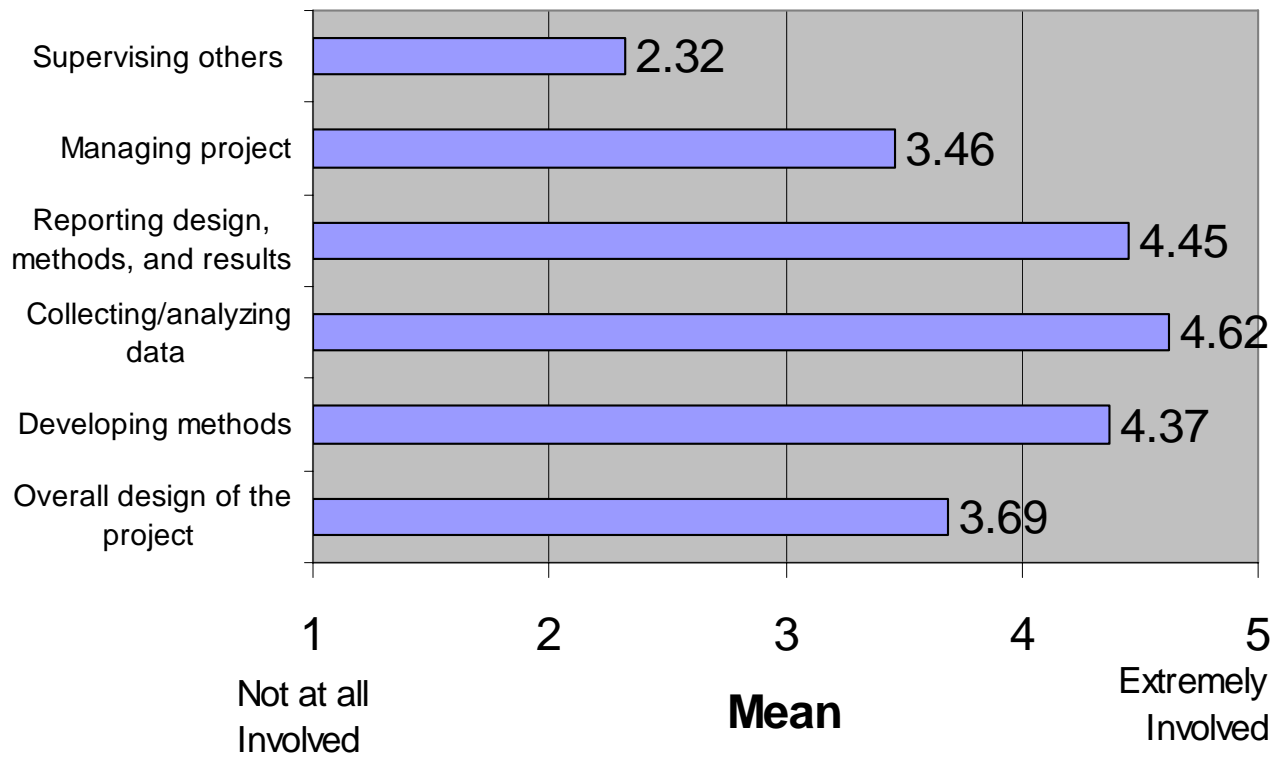


Technical Project Involvement



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Technical Project Involvement



1 Factor: 5 items

Scale Mean = 4.11 (S.D. = .74)

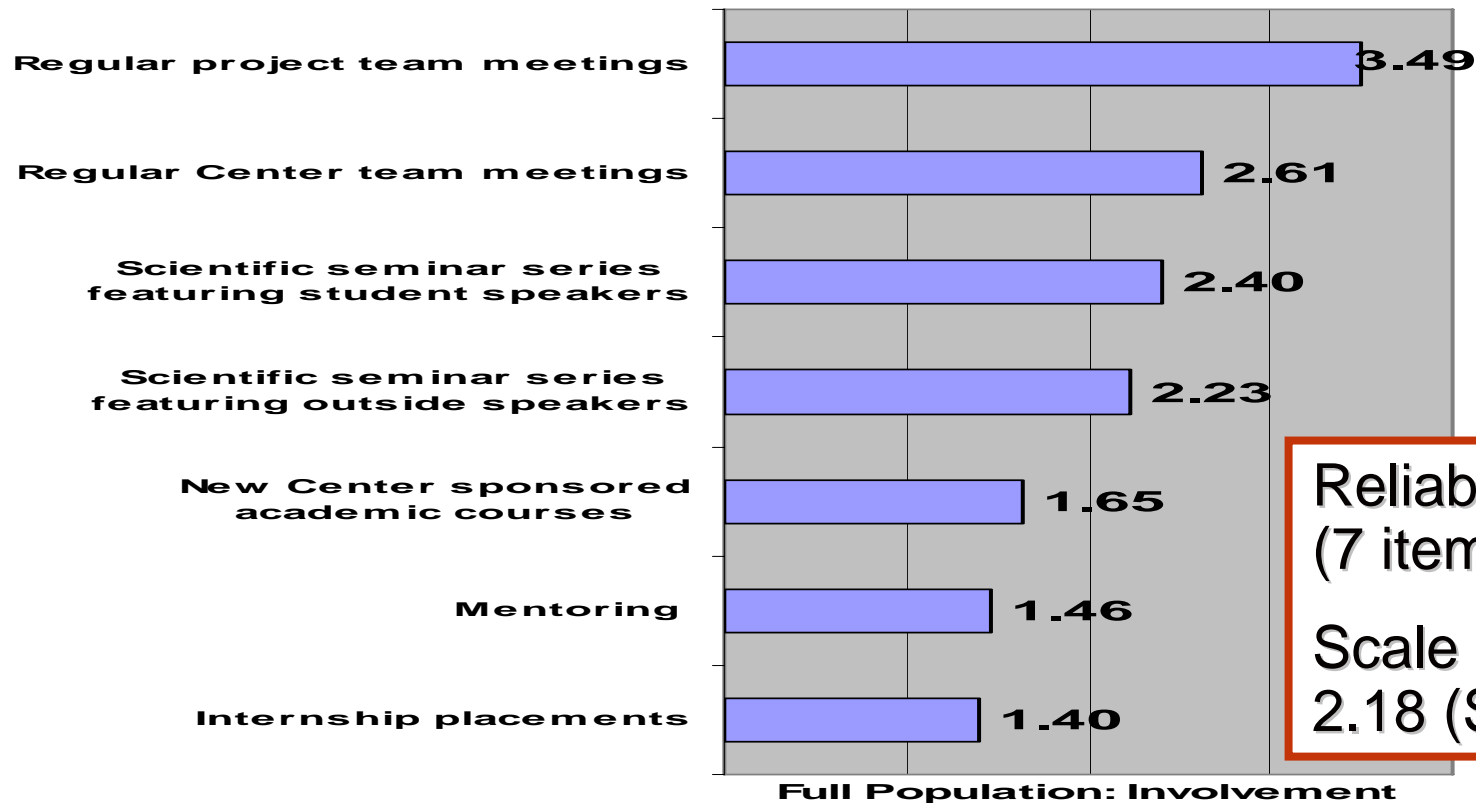
Reliability = .78

Formal Training Mechanisms



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Enhanced Technical Mechanisms



Reliability = .68
(7 items)

Scale Mean =
2.18 (S.D. = .74)

Level of Involvement:

1 = "Not at all involved" to 5 = "Extremely involved"

Center Experiences



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Experiential and Expanded Center Experiences:

Reliability = .726 (7 items)

| Experiential and Expanded Center Experiences (Scale Mean = 3.2 (S.D. = .41)) | Mean | SD |
|---|------|------|
| Working on scientific problems that are innovative and on the cutting edge | 3.43 | 0.64 |
| Opportunities to be a leader | 2.96 | 0.80 |
| Relying on the cooperation and collaboration of other principal investigators/scientists | 3.01 | 0.80 |
| “Hands-on” learning/learning-by-doing approach | 3.34 | 0.62 |
| Receiving an education that encourages me to listen, discuss, evaluate, and to learn from the ideas of others | 3.21 | 0.63 |
| Showing how a particular concept can be applied to an actual problem or situation | 3.23 | 0.65 |
| Working with people from diverse backgrounds (e.g., ethnicity, gender, nationality) | 3.26 | 0.77 |

Multidisciplinary Experiences: Reliability = .762 (4 items)

| Multidisciplinary Center Experiences (Scale Mean =2.98 (S.D. = .58)) | Mean | SD |
|--|------|------|
| Integrating and synthesizing information from different fields in solving problems | 3.20 | 0.60 |
| Working/interacting regularly with faculty from other disciplines | 2.60 | 0.87 |
| Using knowledge and research from other disciplines *** | 2.89 | 0.71 |
| Frequent interactions with students from other disciplines *** | 2.82 | 0.91 |

“My involvement in the Center includes...

1 = “Strongly Disagree” to 4 = “Strongly Agree”

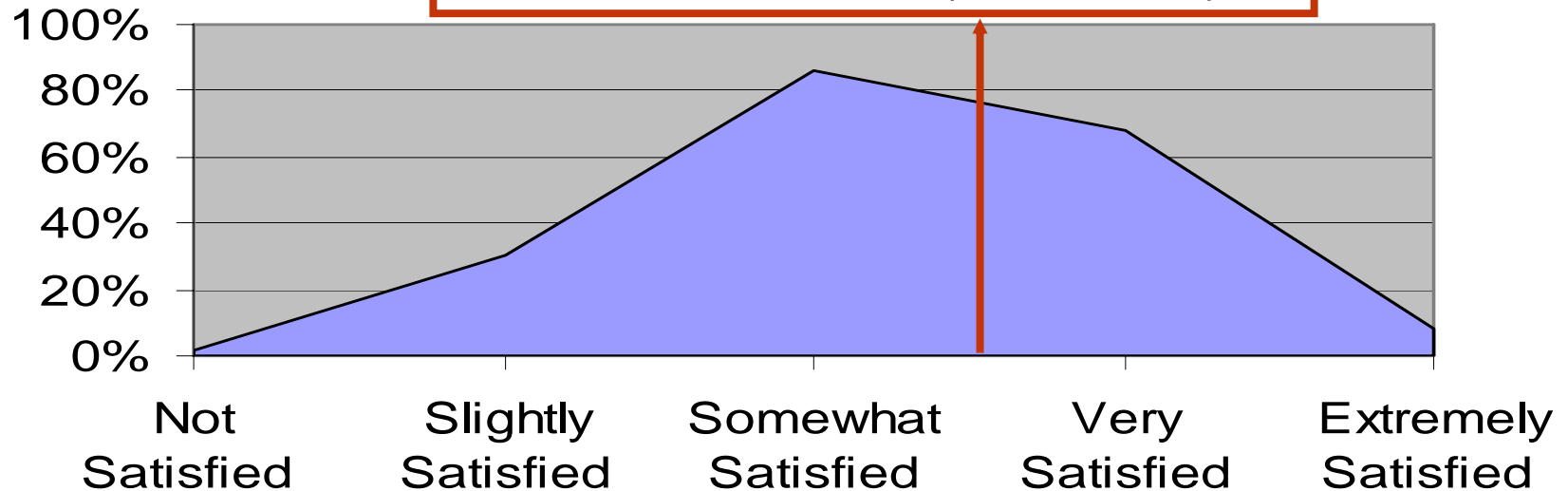
Satisfaction



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Satisfaction

Scale Mean = 3.68 (S.D. = .72)



1 Factor: 10 items such as workload, center management, interactions, financial support, equipment, supervision, etc.

Reliability = .90

Scales



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| | Mean | S.D. | Reliability | # of items |
|--|------|------|-------------|------------|
| Center Experiences (2 factors) Scale: 1 = "Strongly Disagree" to 4 = "Strongly Agree" | | | | |
| Experiential and Expanded Center Experiences | 3.20 | 0.41 | 0.73 | 7 |
| Multidisciplinary Center Experiences | 2.98 | 0.58 | 0.76 | 4 |
| Formal Training Mechanisms (2 factors): Scale: 1 = "Not at all involved" to 5 = "Extremely involved" | | | | |
| Enhanced Technical Mechanisms | 2.18 | 0.74 | 0.68 | 7 |
| Unconventional Formal Mechanisms | 1.36 | 0.76 | 0.63 | 2 |
| Technical Project Involvement (1 factor) Scale: 1 = "Not at all involved" to 5 = "Extremely involved" | | | | |
| Technical Project Involvement | 4.11 | 0.74 | 0.78 | 5 |
| Satisfaction (1 factor) Scale: 1 = "Not Satisfied to 5 = "Extremely Satisfied" | | | | |
| Satisfaction | 3.68 | 0.72 | 0.90 | 10 |
| Organizational Commitment; Scale: 1 = "Strongly Disagree" to 5 = "Strongly Agree" | | | | |
| Organizational Commitment | 3.89 | 0.84 | 0.89 | 2 |
| Skills (2 factors) Scale: 1 = "Beginner" to 5 = "Expert" | | | | |
| Advanced Technical and Problem Solving Skills | 3.83 | 0.66 | 0.88 | 6 |
| Soft/Applied Skills | 3.84 | 0.61 | 0.80 | 4 |



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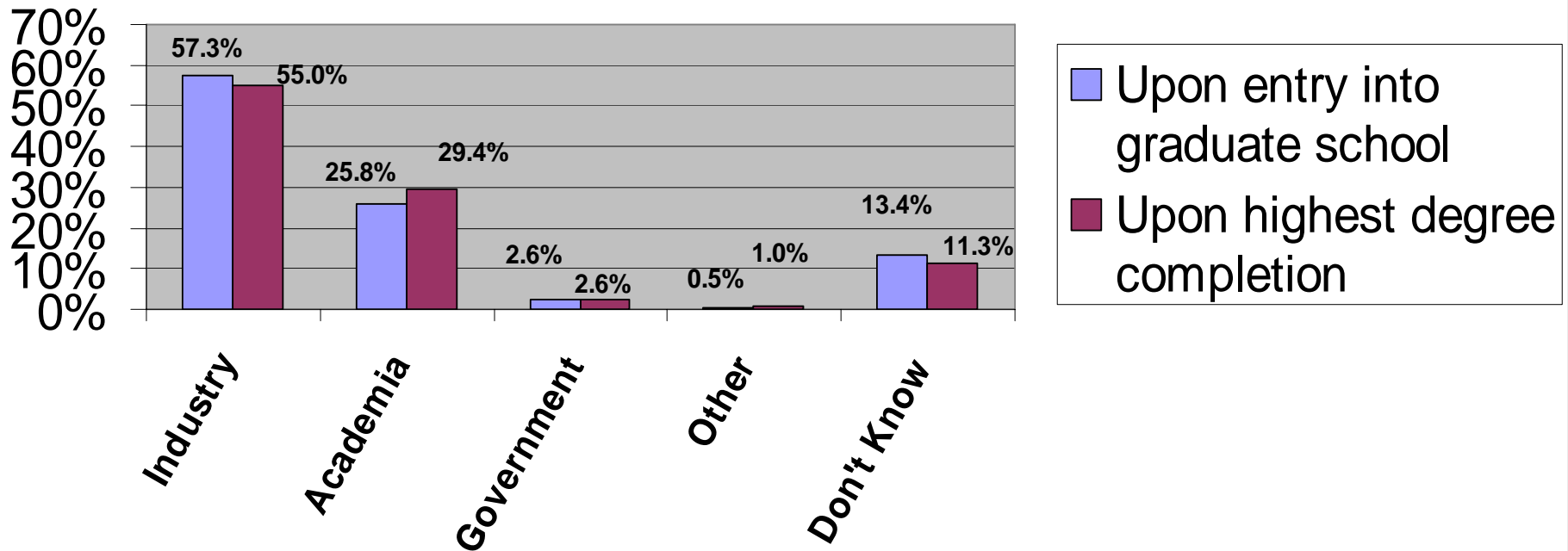
Outcomes

Career Goals



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Career Goals

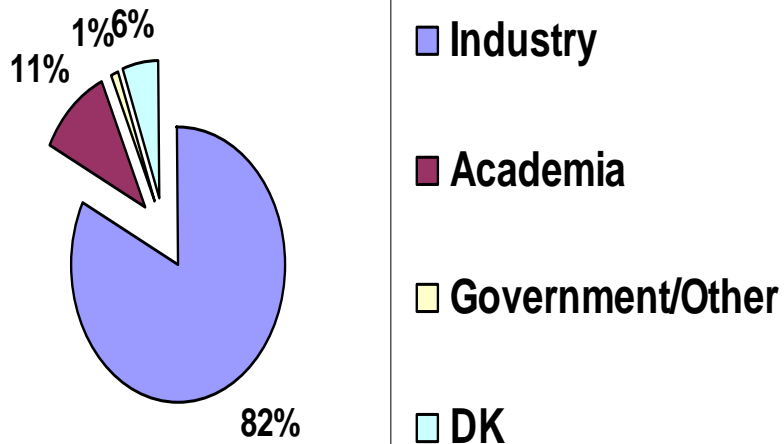


Career Goals

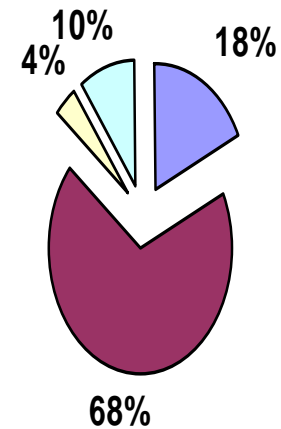


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Expected to go into Industry:
Current Goals



Expected to go into Academia:
Current Goals



Regressions: Satisfaction

| Satisfaction | | |
|--|-------------|-------------|
| R Squared = .46 | Beta | Sig. |
| Gender | 0.152 | 0.018 |
| # of interactions with advisor | 0.222 | 0.001 |
| # of interactions with industry members | 0.147 | 0.034 |
| Technical project involvement | 0.118 | 0.074 |
| Experiential and expanded center experiences | 0.303 | 0.000 |
| Multidisciplinary center experiences | 0.179 | 0.029 |

Regressions: Advanced Technical and Problem Solving Skills

Advanced Technical and Problem Solving Skills

R Squared = .31

Beta

Sig.

Number of years in university

0.302

0.000

of interactions with committee

0.227

0.000

Technical project involvement

0.237

0.000

Multidisciplinary center experiences

0.248

0.000

Regressions: Soft/Applied Skills

Soft/Applied Skills

| R Squared = .22 | Beta | Sig. |
|-------------------------------|-------------|-------------|
| Citizenship status | 0.225 | 0.001 |
| Number of years in university | 0.240 | 0.000 |
| Technical project involvement | 0.271 | 0.000 |
| Enhanced technical mechanisms | 0.111 | 0.094 |

Regressions: *Organizational Commitment*

Organizational Commitment

R Squared = .30

Beta

Sig.

of interactions with center director

0.146

0.034

Experiential and expanded center experiences

0.365

0.000

Multidisciplinary center experiences

0.144

0.056

Preliminary Conclusions

- There is a fair amount of variability on characteristics and experiences across centers
- Experiential and expanded center experiences and multidisciplinary center experiences strong predictors
 - Particularly for satisfaction and organizational commitment
- Formal training mechanisms seem to have a smaller effect
- Explain modest amount of variance
 - High homogeneity across centers
- Strong potential for an IUCRC student feedback questionnaire