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Descriptive Statistics Compiled from Industry and Faculty Surveys

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CONTENTS

REPORT PROCESSING & DATA ISSUES

This report provides descriptive statistics on the IUCRC Process Outcome Questionnaires. Data were collected during the fall of 2012 and refer to the Center activity for FY 2011-2012.

Since most evaluators use this report to benchmark their Center compared to a program-wide "norm", we have reported "Center-level" means and standard deviations, with the exception of the sections on Research Cost Avoidance, Research Savinces, and Stimulated New Research (see below). That is, means (unweighted) for each center were used to calculate a Center-level mean. Because questions that require a numeric answer (e.g. number of dollars) often have highly skewed distributions, we also reported the medians for these variables. For forced choice questions, frequencies for individual respondents were also reported.

Industry Questionnaires

All data were collected using a single industry questionnaire form. A major revision was made to the industry questionnaire during the past year.

Under the Research Program section, Q1 was revised to assess the percentage of projects that meet "current and future firm needs" rather than "active interest", as was the case on the previous version. The new survey also asks respondents about the number of scientist months it would take to complete a typical center project (Q1b) and the number of projects conducted by the center that they would have otherwise had to conduct internally (Q1c). These questions were added in order to better assess research cost avoidance. Question 2a and b from the previous version asking respondents to list their top two projects was dropped from the current survey.

Under the Benefits section, respondents were asked to rate the impact of their participation on networking and recruitment separately (Q7c is now Q4a and b). New questions were added to assess research efficiencies in the form of accelerated projects (Q5a) and avoided projects (q5b1) as well as their combined dollar value (Q5b2). The old survey version also assessed the value of new center-stimulated projects conducted by respondent firms but modified the question by asking respondents to indicate whether they had received that benefit (Q5c1 yes/no) in addition to indicating the number of projects and their combined dollar value (Q5c2 and 3 on current version, Q5a and b on old version). The question about commercial benefits (Q6a new version, Q7b old version) was amended to include impact on new technical knowledge and intellectual property resources. The open-ended question about commercial benefit (Q6b current version, Q8 old version) was reworded, the most significant change being that respondents are now asked about commercial benefit rather than technical benefit.

Under the section on Center Administration, the question about areas for improvement (Q8a current version, Q10 old version) was amended to include a greater variety of potential topic areas related to project development and selection, knowledge/technology transfer, meeting planning and execution, fund raising/membership, communication, and personnel issues. Additionally, data coding was changed such that responses to these specific categories (Q8aa-Q8an) are now captured in the data, rather than being combined as part of the comment/no comment coding.

See the table "New Industry Form vs. Old Industry Form" for the number of shared and unique questions. While the majority of centers used the current version of the industry survey, there were a few centers in which the old version was inadvertently used. The sample size for each survey version is also reported in the above referenced table.

Faculty Questionnaires

The faculty questionnaire includes two versions: a long version (13 items) that is used by centers in year 1-5 and a short version (6 items) that is used by centers in year 6-15. Since both the faculty long and faculty short questionnaires share some of the same questions, data for these shared questions were pooled for analysis. In the tables below, questions only included in the long version are noted as follows: (L).

RESPONSE RATES

Category	Center Level		Individual Level	
	Industry	Faculty	Industry	Faculty
Response Frequency				
Continuing Population from CD report	57	57	1093	929
1st Year Reporting Population from CD report	+0	+0	+0	+0
Retired/Defunct Centers [a]	2	2	21	12
Retired/Defunct Centers Reporting [b]	+0	+0	+0	+0
Phase III Centers Exempt	9	9	213	199
Phase III Centers Reporting [c]	+4	+3	+44	+37
Population [d]	50	49	903	755
Centers Excused from Evaluation [e]	5	7	88	113
Centers that did not return data	0	0	0	0
Available Population	45	42	815	642
Data Received	45	42	375	350
Received / Population	90.00%	85.71%	41.53%	46.36%
Received / Available Population	100%	100%	46.01%	54.52%

a. Retired/defunct Centers are not required to submit data, but some do submit some data. If relevant, those data were included in the analysis.
b. For Phase III Centers entering the program in 2011, process outcome data collection is optional. The current solicitation does not provide that option. Phase III Centers entering after 2011 are included in the continuing population.
c. Population was defined as centers that were at least 1 year old.
d. Centers were excused for reasons such as being in the midst of center restructuring and respondent refusal to complete surveys.
e. Numbers based on population minus excused and not returned counts.

NEW INDUSTRY FORM VS. OLD INDUSTRY FORM

	New Form	Old Form
# of items	24	20
# of questions in common	16	16
# of unique questions	8	4
Sample size	314	61

LONG FACULTY FORM VS. SHORT FACULTY FORM

	Long Form	Short Form
# of items	13	6
# of questions in common	6	6
# of unique questions	7	0
# of Centers using form	27	15
Sample size	217	133

Industry Results: 2011-2012

Table 1: Research Program

1. Think about the [N of projects] currently funded Center research projects

	0-19% (1)		20-39% (2)		40-59% (3)		60-79% (4)		80-100% (5)		Missing Data	Center Level	
	N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
a. Percentage of currently funded research projects relevant to the organization's current or future R&D needs.	47	12.7	90	24.3	106	28.6	91	24.5	37	10.0	4	3.07	0.58

	Mean	S.D.
b. Number of scientist-months (full-time) your organization would take to plan, conduct, and complete a typical Center project internally *Sample: N of respondents = 285 ; N of centers = 45*	13.14	4.67
c. Number of the Center's research projects considered high enough priority that your organization would conduct internally or by contract *Sample: N of respondents = 312 ; N of centers = 45*	2.29	0.82

	Mean N of Center Projects	SD N of Center Projects	Mean % of Projects Avoided	SD % of Projects Avoided
Average percent of the Center's research projects considered high enough priority that the organization would conduct internally or by contract % projects avoided = N of avoided projects (Q1c)/N of Center projects) *Sample: N of centers reporting N of Projects = 35, N of respondents = 288*	13.09	7.70	21.09	13.49

Research Cost Avoidance Estimates for Center Members:

Research Cost avoidance (RCA) is defined as savings a member obtains by having "necessary" research projects performed by a center rather than performing them internally. The following RCA estimates are based on a member's report of the number of projects they consider a "high enough priority they would conduct internally" (Q1c), number of scientist months it would take to complete a project (Q1b), the cost of a scientist month (based on archival data), and cost of center membership (archival data). For a more detailed explanation of how this estimate is calculated see Appendix A.

Average Research Cost Avoidance (RCA)			
Member Level Scores	**Mean**	**Median**	**S.D.**
a. Average dollar value (in thousands) of avoided projects per respondent organization Av.RCA member = (N of projects * N of months * Average salary per month) – Primary Fee *Sample: N of respondents = 287, N of centers = 41*	487.55	243.91	847.55*
Center Level Scores	**Mean**	**Median**	**S.D.**
b. Average dollar value (in thousands) of avoided projects per respondent organization *Sample: N of respondents = 287, N of centers = 41*	4353.40	2897.37	5686.20
Program Level Scores	**Sum**		
c. Total dollar value of avoided projects by respondent organizations RCA program = Av.RCA member * N of members *Sample: N of respondents = 314 N of centers = 45*	$153,090,700		
51 members (16.9%) have negative RCA that results in standard deviation larger than the mean or median.			

2. During the past year, how satisfied were you with the following features of the Center's research program?

| | Individual Frequencies | | | | | | | | | | | Center Level | |
| | Not Satisfied (1) | | Slightly Satisfied (2) | | Somewhat satisfied (3) | | Quite Satisfied (4) | | Very Satisfied (5) | | Missing Data | | | |
	N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
a. Capabilities of the researchers & quality of the research program	2	0.5	4	1.1	30	8.2	192	52.7	136	37.4	11	4.28	0.36
b. Breadth of the research topics covered	1	0.3	15	4.1	81	22.3	174	47.9	92	25.3	12	3.93	0.39
c. Focus of the research	4	1.1	18	5.0	83	22.9	182	50.3	75	20.7	13	3.86	0.44
d. Relevance of research to my organization's needs	7	2.0	28	7.9	101	28.5	160	45.1	59	16.6	20	3.70	0.40

Table 2: Benefits

A. Networking and Human Resource Benefits

| | Individual Frequencies | | | | | | | | | | | Center Level | |
| | No Impact (1) | | Slight Impact (2) | | Moderate Impact (3) | | High Impact (4) | | Very High Impact (5) | | Missing Data* | | | |
	N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
4a. Enhanced ability to network and build scientific capability via cooperation with industry and scientists outside the organization.	9	3.0	53	17.4	121	39.7	79	25.9	43	14.1	70	3.25	0.44
4b. Enhanced ability to identify and recruit well-qualified graduate students.	85	31.3	62	22.8	66	24.3	37	13.6	22	8.1	103	2.50	0.57

*These questions are new to the current survey version. Because some centers used a previous version of the survey which did not include these items Missing Data is higher than normal.

4c. During the past year, how many students trained in the Center research projects were hired by your organization?
Sample: N of members = 358; N of centers =45

| | Member Level | |
Member Level Scores	Mean	S.D.
a. Number of students hired per respondent organization	0.34	0.90
Center Level Scores	**Center Level**	
b1. Number of students hired per respondent organization per center	0.38	0.43
b2. Number of students hired by respondent organizations per center	2.73	2.69
Program Level Scores	**Program Level**	
c. Total number of students hired by respondent organizations	123	

B. Research & Development Benefits

| | Yes | | No | |
	N	%	N	%

5a. During the past year, access to Center research findings and outputs has helped accelerate the pace and/or completion of some R&D projects already underway at the organization	199	64.2	111	35.8
5b. During the past year, access to Center research findings and outputs has helped the organization to decide against initiating a new project we otherwise would have conducted.	161	52.1	148	47.9

Research Cost Savings

If yes, taking into account personnel, facility and related costs how much would you estimate these accelerated AND/OR avoided project(s) would have cost your organization.

Sample: all respondents: N of respondents = 255; N of Centers= 39

Member Level Scores	Member Level		
	Mean	**Median**	**S.D.**
a. Dollar value of accelerated/avoided projects (in thousands) per respondent organization	226.90	50.00	813.13

Center Level Scores	Center Level		
	Mean	**Median**	**S.D.**
b. Dollar value of accelerated/avoided projects (in thousands) per center	1483.59	850.00	2524.86

Program Level Scores	Program Level
c. Total dollar value of accelerated/avoided projects supported by respondent organizations	$57,860,000

* It is worth noting that since only 46% of members completed the questionnaire; this is a very conservative estimate of the value of accelerated/avoided projects supported by members.

Interpreting Research Cost Savings

- The average member saved $226.9K in R&D costs in the last year as a result of participation in the IUCRC program.
- Center's have an average of 19 members. The average Center saved its members $1.48M in R&D costs in the last year as a result of participation in the IUCRC program.
- There were 57 active Centers, serving 1093 members in FY2011-2012. The IUCRC program saved participating companies a total of $57.9M in R&D costs in the last year as a result of participation in the IUCRC program.
- These figures are based on feedback from firms responding to this survey. Member response rate was 46% (375 out of the available population of 815 responded to the survey) from 45 centers included in the data collection. Therefore, these are conservative estimates of the Research Cost Savings at the member, center and program levels.

	Yes		No	
	N	**%**	**N**	**%**
5c. During the past year, access to Center research findings/outputs has triggered development of new R&D projects at my organization, or signiffically redirected current R&D.	155	49.1	161	50.9

Stimulated Research Projects

Member Level Scores	Member Level		
	Mean	**Median**	**S.D.**
Includes All Cases			
a. Number of center-stimulated research projects per respondent organization *Sample: N of respondents = 309 ; N of centers = 43*	0.81	0.00	1.00
b. Dollar value of center-stimulated projects (in thousands) per respondent organization *Sample: all respondents: N of respondents = 329 ; N of Centers= 42*	133.98	100.00	294.09
Includes Only Cases Citing 1 or more projects			
c. Number of center-stimulated research projects per respondent organization *Sample: N of respondents = 151; N of Centers = 42*	1.65	2.00	0.80
d. Dollar value of center-stimulated projects (in thousands) per respondent organization *Sample: N of respondents = 171 ; N of Centers = 41*	257.78	150.00	367.12
e. Dollar value of each center-stimulated project (in thousands) *Sample: N of respondents = 129; N of Centers = 40*	182.66	100.00	208.06

Center Level Scores	Center Level		
	Mean	**Median**	**S.D.**
Includes All Cases			
f. Number of center-stimulated research projects per center *Sample: N of respondents = 224 ; N of Centers = 43*	5.53	5.00	4.55
g. Dollar value of center-stimulated projects (in thousands) per center *Sample: all respondents: N of respondents 195 = ; N of Centers= 42*	1001.82	812.50	972.35

Program Level Scores	Program Level
h. Total number of center stimulated projects supported by respondent organizations *Sample: N of respondents = 224 ; N of Centers = 43*	249
i. Total dollar value of center-stimulated projects supported by respondent organizations *Sample: all respondents: N of respondents = 195 ; N of Centers= 42*	$44,080,000

* It is worth noting that since only 46% of members completed the questionnaire; this is a very conservative estimate of the value of center stimulated projects supported by members.

C. Commercial Benefits

	Individual Frequencies												Center Level	
	No Impact 1		Slight Impact 2		Moderate Impact 3		High Impact 4		Very High Impact 5		N/A 9		Missing Data		
	N	%	N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
6a. During the past year, to what extent has participation in the Center enhanced your organization's commercialization efforts via new technical knowledge; expanded intellectual property resources; improved or new products, processes, services, improved sales; or new or retained jobs?.	100	28.1	98	27.5	68	19.1	31	8.7	15	4.2	44	12.4	19	2.23	0.64

Table 3: Center Administration and Operations

7. During the past year, how satisfied were you with center administrative operations?												
Individual Frequencies											Center Level	
Not Satisfied (1)		Slightly Satisfied (2)		Satisfied (3)		Quite Satisfied (4)		Very Satisfied (5)		Missing Data		
N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
5	1.7	18	5.1	56	15.8	155	43.8	119	33.6	21	4.03	0.45

8. How can the Center improve it's administration and operations? Please mark areas that need improvement.

	Individual Frequencies	
	N of Responses	% of Respondents*
a. Planning the Research Program	46	13.9
b. Project Selection	56	16.9
c. Project Development and Management	53	16.0
d. Dissemination of Results via Publications	57	17.2
e. Technology Transfer	64	19.3
f. Intellectual Property Management	24	7.3
g. Fundraising & Recruiting New Members	56	16.9
h. IAB Meeting Planning	17	5.1
i. IAB Meeting Content	16	4.8
j. IAB Meeting Execution	12	3.6
k. IAB Meeting Follow-up	30	9.1
l. Communications	52	15.7
m. Center Personnel	8	2.4
n. Other	10	3.0
Total N	545	162.9

*Respondents were encouraged to check as many boxes as applied. Therefore, the percentage across all items may total to greater than 100%.

Table 4: General Evaluation

9. Will your organization renew its membership?

Individual Frequencies											Center Level	
Definitely Not (1)		Probably Not (2)		Uncertain (3)		Probably Yes (4)		Definitely Yes (5)		Missing Data		
N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
4	1.1	7	2.0	64	17.9	167	46.6	116	32.4	17	4.09	0.36

11. Organization Type/Size

	Individual Frequencies	
	N	%
1. For-Profit Large (> 500 employees)	227	60.5
2. For-Profit Small (< 500 employees)	79	21.1
3. Non-Profit/Government	58	15.5
Missing Data	11	2.9

Faculty Results: 2011-2012

Table 1: Research

1. Compared to the research projects that you typically conduct outside the Center, would you describe your Center funded research as: (L)*

Individual Frequencies											Center Level	
Much more basic (1)		More basic (2)		Same (3)		More Applied (4)		Much more applied (5)		Missing Data*		
N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
1	0.5	10	4.7	72	33.6	112	51.9	20	9.3	2	3.59	0.40

* Indicates a question that is unique to the long version of the faculty questionnaire.

2. During the past year, how satisfied were you with the following?

	Individual Level											Center Level	
	Not Satisfied (1)		Slightly Satisfied (2)		Somewhat Satisfied (3)		Quite Satisfied (4)		Very Satisfied (5)		Missing Data		
	N	%	N	%	N	%	N	%	N	%	N	Mean	S.D.
a. Quality of the Center-supported research program	3	0.9	9	2.6	34	9.7	153	43.8	150	43.0	1	4.20	0.34
b. Relevance of the Center's research program to my professional goals	1	0.3	10	2.9	42	12.1	129	37.2	165	47.6	3	4.24	0.39

Table 2: Impact

4. During the past year, what impact has participation in the Center had for YOU in the following areas? (L)*													
	Individual Level											**Center Level**	
	No Impact (1)		Somewhat Positive Impact (2)		Moderately Positive Impact (3)		Very Positive Impact (4)		Extremely Positive Impact (5)		Missing Data		
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**Mean**	**S.D.**
a. The feeling of accomplishment I get from the research I do.	8	3.8	12	5.7	39	18.4	106	50.0	47	22.2	4	3.79	0.43
b. Opportunities for research contracts/grants.	8	3.8	23	10.8	43	20.2	83	39.0	56	26.3	3	3.60	0.49
c. Recognition I receive for the work I do.	10	4.7	22	10.4	61	28.8	75	35.4	44	20.8	4	3.39	0.78
d. Access to useful equipment.	56	26.9	19	9.1	44	21.2	50	24.0	39	18.8	8	2.93	0.84
e. Ability to support graduate students.	11	5.2	23	10.8	38	17.9	56	26.4	84	39.6	4	3.74	0.69
f. Ability to publish my work in quality proceedings and journals.	24	11.4	26	12.4	48	22.9	66	31.4	46	21.9	6	3.35	0.62

* Indicates a question that is unique to the long version of the faculty questionnaire.

Table 3: Commitment

5. Which option best expresses your current intentions?													
	Individual Frequencies											**Center Level**	
	Definitely Not (1)		Probably Not (2)		Uncertain (3)		Probably Yes (4)		Definitely Yes (5)		Missing Data		
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**Mean**	**S.D.**
Next year I will submit my best research ideas in a center funded proposal*	7	2.0	20	5.7	51	14.7	134	38.5	136	39.1	2	4.05	0.38

* Item presented for the first time on the 2006-2007 Faculty Questionnaire

Table 4: Satisfaction

6. During the past year, how satisfied were you with center administrative operations?													
	Individual Frequencies											**Center Level**	
	Not Satisfied (1)		Slightly Satisfied (2)		Somewhat Satisfied (3)		Quite Satisfied (4)		Very Satisfied (5)		Missing Data		
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**Mean**	**S.D.**
	6	1.7	7	2.0	38	10.9	126	36.2	171	49.1	2	4.18	0.49

Appendix A

Calculation of Research Cost Avoidance for Center Members:

Research cost avoidance is a way of estimating one benefit firms may realize from center participation. *Research cost avoidance is defined as savings a firm obtains by having "necessary" research projects performed by a center rather than performing them internally.* If a firm reports that a particular "necessary" project would cost $100,000 to carry out internally (counterfactual estimate) but that project was actually carried out by a center to which they pay a $50,000 membership fee that firm has avoided $50,000 of R&D costs. A firm's research cost avoidance (RCA) can be estimated by knowing a firm's costs to carry out a project (C_f) and the cost of center membership (C_c). C_f can be calculated by knowing: number of center projects a firm considers "high enough priority they would have conducted them internally or by contract" ($N_{projects}$), how many scientist months those projects would take to complete (N_{SM}), the cost of a scientist month (C_{sm}). Member firms provide estimates of $N_{projects}$ (Q1c) and N_{SM} (Q1). We obtain estimates of C_{sm}[1] from archival sources and C_c from center records. The formula for obtaining an estimate for cost avoidance is:

$$RCA = \sum C_f - C_c$$

C_f is calculated as follows: $C_f = N_{projects} \times N_{SM} \times C_{sm}$

Once a firm's cost avoidance has been estimated, one can calculate the average RCA for members in a particular center or for the whole program and RCA totals for a given center or program. For a more detailed description of research supporting this estimate please refer to: Gray, D.O. & Steenhuis, H-J (2003). Quantifying the benefits of participating in an industry university research center: An examination of research cost avoidance. *Scientometrics*, *58*, 281-300.

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[1] * In an attempt to develop a conservative and defensible estimate of firm costs, we resorted to using salary data from the Engineering Workforce Commission as the basis for our calculations. More specifically, we used data from the *Engineers' Salaries: Special Industry Report, 2011* survey as our starting point. Industry costs were calculated by using the median salary for individual with a PhD, who was early career (4+ years), and in the appropriate field for the industry in question (e.g., engineering). This value was multiplied by 1.35 to reflect a conservative estimate of fringe benefit costs and then multiplied by 1.50 to reflect a conservative overhead rate. This annual rate was then divided by 12 (and rounded to the nearest thousand) to produce an estimate of the cost/month for an industry scientist.