IUCRC Program Findings from The Center Structure Database

FY2018
Data collected from 67 out of 68 total active centers*
Trends from Center Structure Database: FY1980-2018

McGowen, L., Leonchuk, O. & Shayan, A.
IUCRC Evaluation Project at
North Carolina State University
Overview

- Fast Facts*
  - Slides 3-5
- Data collection methodology and timeframe
  - Slides 6-10
- Number of Centers through FY2019
  - Slides 11-13
- Detailed analyses through FY2018 (structural, outcomes)*
  - Slides 14-45
- CISE and ENG breakdowns*
  - Slides 46-53
- Comparison by program Phase (I, II, III)*
  - Slides 54-66

*Includes data from the 67/68 centers that reported data. Grid-Connected Advanced Power Electronic Systems transitioned to a new solicitation but stayed in the same phase. Change in the award date cut the current award year short by 7 months. Not data are collected for 2017-2018 fiscal year.
FY18 IUCRC Center Structural Fast Facts

68 active Centers at 182 University sites

1164 Memberships

810 Researchers + 1787 students

$79.8M in Total Program Funding; $1.2M per center

NSF invests $18M; $269K per Center

NSF Leveraging ratio 1:3.4
FY18 Member Fast Facts

1164 Memberships
196 new and 194 terminated memberships

$45M Provided by Members
53% of total IUCRC program funding

~17 Members per Center

Membership fee leveraging ratio 1:31
IUCRC Student Fast Facts: FY2018

- **1787 Students Trained**
  - 27 students per center

- **575 Students Graduated**
  - 9 graduates per center
  - 1/3 of trainees annually

- **266 Alumni Hired by Industry**
  - 46% of graduates
  - 32% by member organizations

IUCRC Evaluation Project at NCSU
Methodology

• Collection of FY2017-18 structural data from centers and sites completed between November 2017 and January 2019.
  • Centers were asked to report on their award year ending during FY2018 (10/1/17-9/31/18)
  • Data request synched with award end date and NSF annual reporting timeline for each center
  • Includes centers on NCE

• Data on number of funded centers collected from NSF (through 2019)

• Reporting issues
  • Need to develop decision rule for reporting time frame when a center gets a new award that changes their reporting time frame
  • Sometimes change in award dates can cause overlap or gaps between fiscal years
  • GRAPES Center did not provide data for this report because they were excused by NSF when their award date changed such that their new annual report due date fell outside FY2018 reporting timeframe. They will report the missing FY2018 data as part of their FY2019 report
NSF and Center Budgeting Life Cycle

- Structural report includes activities for most recently completed award year
- Excludes centers with less 1 year in operation

**NSF Fiscal Year**
- Oct FY1
- Mar FY1
- Aug FY1
- Oct FY2
- Mar FY2
- Aug FY2

**Center Project Year**
- First Center Project Year
- Included in report

- Not included in report

**Data Collection**
- Oct – Jan
- IUCRC Report
- March Report Complete

**Complete**
Understanding Center Counts Through FY2018

68 NSF Funded Centers Operating more than 1 year
(completed an award year)

8 NSF Funded Centers Operating less than 1 year
(award year not completed)

Statistics on Total and Average Activity
Slides 14-66

FY 2018

76 Funded Centers
Understanding Center Counts Through FY2019

FY 2018

68 NSF Funded Centers Operating more than 1 year (completed a project year)

+ 8 NSF Funded Centers Operating less than 1 year (project year not completed)

- 5 Centers Graduated/Closed

= 71 Funded Centers

Slides 11-13
FY2018 Graduated & Closed Centers

• Phase III centers dropped from the FY2018 report
  1. Berkeley Sensors & Actuator Center: *Univ. of California, Berkeley; Univ. of California, Davis.*
  3. Cooling Technologies Research Center: *Purdue Univ.*
  4. High-Performance Reconfiguration Computing: *Univ. of Florida; Brigham Young Univ., Virginia Tech.*

• Phase II centers dropped from the FY2018 report
  5. Dynamic Data Analytics: *Rutgers Univ.; State Univ. of New York.*
Center Life Cycle Through FY2019*

*Data Current for FY2019
Active Centers and Sites by Year*

*Data Current for FY2019
Single & Multi-Site Centers*

*Data Current for FY2019
Total Program Funding

*Declining funding over last 4 years primarily due to graduation of highly successful phase 3 centers that re-entered the program in 2010-2011

^Univ. & Other Cash data collected prior to FY2016 is excluded
Average & Median Total Center Funding

$1.19M

$1M

$0

$500,000

$1,000,000

$1,500,000

$2,000,000

$2,500,000

$3,000,000

'06  '07  '08  '09  '10  '11  '12  '13  '14  '15  '16  '17  '18

Average  Median

^Univ. & Other Cash data collected prior to FY2016 is excluded

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IUCRC Evaluation Project
NSF Budget by Year

Total Dollars in Millions

$19.5M
NSF Budget by Year

![NSF Budget by Year Graph]

- ENG
- CISE
- FRP Program
- SBE

Other Programs co-fund too!

'Millions

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IUCRC Evaluation Project
NSF : Total Funding Leveraging Ratios^  

NSF IUCRC Program Budget Leveraging Ratio = Total Funding All Sources / NSF IUCRC Program Budget  

NSF Awards Reported Leveraging Ratio = Total Funding All Sources / NSF IUCRC Awards and Supplements Reported  

^Univ. & Other Cash data collected prior to FY2016 is excluded
NSF : Total Funding (Excluding NSF IUCRC) Leveraging Ratios^
Average NSF IUCRC Awards & Supplements per Center

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<th>Year</th>
<th>Awards &amp; Supplements</th>
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<td>2018</td>
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</tr>
</tbody>
</table>

Industry/University Cooperative Research Centers

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IUCRC Evaluation Project
Average NSF IUCRC Awards & Supplements per Site*

*The averages do not include international sites or sites that were on no-cost extension and received $0 from NSF during that fiscal year (FY2018 N = 9 sites excluded).
Total Funding by Source in Dollars^
Total Funding by Source in Percentages

^Univ. & Other Cash data collected prior to FY2016 is excluded

IUCRC Evaluation Project

4/17/2019
Industrial Memberships

**Total Number of Memberships**

- Yearly data from '85 to '18 is represented.
- The membership count shows a significant increase, peaking at 1164 in '18.

**Average Number of Memberships**

- Average membership count displayed from '85 to '18.
- The average membership count is shown to increase, reaching 17.37 in '18.

**Complex Changes**

- From 2011 to 2014, there was a massive growth in new centers established (N = 31), leading to a decrease in the average membership count.
- In 2017, the graduation of 3 highly successful Phase III centers decreased the average.

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*4/17/2019 IUCRC Evaluation Project*
Average Membership Turn Over

[Graph showing the average membership turn over from 1989 to 2018, with two lines indicating members added and members left each fiscal year.]

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IUCRC Evaluation Project
Membership Turnover Rate

Turnover % = Members terminated in “year X+1” / Total members in “year X”
Membership Composition 2009-2018*


^ Categories comprising Others include: non-profit, non-US gov’t, and other org.
Membership Composition 2009-2018

^ Categories comprising Others include: non-profit, non-US gov’t, and other org.
Average Number of Researchers per Center
Average Funding per Researcher^
Total Intellectual Property & Commercialization Events


*** Patents Granted Outliers: 2016: BSAC = 6, DDA = 11.
Average Intellectual Property & Commercialization Events


*** Patents Granted Outliers: 2016: BSAC = 6, DDA = 11.
Total Students Trained

- PhD (2018 Mean = 13.52)
- Masters (2018 Mean = 5.22)
- BS (2017 Mean = 7.93)

* Prior to FY2003, the data on PhD and Master’s students were collected together.
Average Students Trained

* Prior to FY2003, the data on PhD and Master’s students were collected together.
Total Students Graduated

PhD (2018 Mean = 2.63)  Masters (2018 Mean = 3.61)  BS (2018 Mean = 2.34)

0 50 100 150 200 250 300 350 400 450

'01  '02  '03  '04  '05  '06  '07  '08  '09  '10  '11  '12  '13  '14  '15  '16  '17  '18

242 176 157

4/17/2019 IUCRC Evaluation Project
Average Students Graduated

Total Graduates Hired by Industry & Government Members

- PhD (2018 Mean = .69)
- Masters (2018 Mean = .70)
- BS (2018 Mean = .22)

- Total Graduates Hired:
  - '02: 46
  - '03: 47
  - '04: 15
  - '05: 0
  - '06: 20
  - '07: 40
  - '08: 60
  - '09: 80
  - '10: 100
  - '11: 120
  - '12: 140
  - '13: 120
  - '14: 100
  - '15: 80
  - '16: 60
  - '17: 40
  - '18: 20

- Degree Type:
  - PhD (Mean = .69)
  - Masters (Mean = .70)
  - BS (Mean = .22)
Average Graduates Hired by Industry & Government Members

![Graph showing average graduates hired by industry & government members from 2004 to 2018, with data points for PhD, Masters, and BS degrees.](image-url)
IUCRC Alumni Career Outcomes: Total FY2018 Graduates Hired

- Industry: 182 graduates hired
  - Continuing Edu.: 84
  - Postdoc: 22
  - Faculty: 10
  - Non-Member Org.: 93
  - Member Org.: 91
- Govt: 37 graduates hired
  - Continuing Edu.: 37
  - Postdoc: 22
  - Faculty: 10
  - Non-Member Org.: 27
  - Member Org.: 0
- Academia: 93 graduates hired
  - Continuing Edu.: 93
  - Postdoc: 27
  - Faculty: 10
  - Non-Member Org.: 0
  - Member Org.: 0
- Not Reported: 91 graduates hired
  - Continuing Edu.: 0
  - Postdoc: 0
  - Faculty: 0
  - Non-Member Org.: 91
  - Member Org.: 0

4/17/2019 IUCRC Evaluation Project
IUCRC Alumni Career Outcomes: Percent of FY2018 Graduates Hired

- Industry: 46.7%
- Academia: 23.8%
- Govt: 8.9%
- Not Reported: 16.7%

- Continuing Edu.: 15.4%
- Postdoc: 4.0%
- Faculty: 4.9%
- Non-Member Org.: 1.8%
- Member Org.: 33.3%

4/17/2019
IUCRC Evaluation Project
IUCRC Alumni Career Outcomes: Mean FY2018 Graduates Hired per Center

Industry: 2.72
    - Continuing Edu.: 1.25
    - Postdoc: 0.55
    - Faculty: 0.33
    - Non-Member Org.: 2.72
    - Member Org.: 0.15

Govt: 0.55
    - Continuing Edu.: 0.40
    - Postdoc: 0.15
    - Faculty: 0.15
    - Non-Member Org.: 0.55
    - Member Org.: 0.15

Academia: 1.39
    - Continuing Edu.: 1.39
    - Postdoc: 0.40
    - Faculty: 0.15
    - Non-Member Org.: 0.40
    - Member Org.: 0.15

Not Reported: 1.36
    - Continuing Edu.: 1.36
    - Postdoc: 0.40
    - Faculty: 0.15
    - Non-Member Org.: 1.36
    - Member Org.: 0.15
IUCRC Alumni Career Outcomes:
Total Graduates Hired over time

- Industry Mem.
- Industry Non-Mem
- Govt Mem
- Govt Non-Mem
- Faculty
- Postdoc
- Cont Edu

4/17/2019
IUCRC Evaluation Project
IUCRC Alumni Career Outcomes:
Total FY2018 Graduates Hired by Degree Level

Industry Member
- BS: 11
- MS: 36
- PhD: 37

Industry Non-Member
- BS: 42
- MS: 77
- PhD: 63

Government Member
- BS: 4
- MS: 9
- PhD: 9

Government Non-Member
- BS: 13
- MS: 16
- PhD: 8

Faculty
- BS: NA
- MS: 3
- PhD: 7

Postdoc
- BS: NA
- MS: NA
- PhD: 27

Continuing Education
- BS: 53
- MS: 40
- PhD: NA

Not Reported
- BS: 28
- MS: 43
- PhD: 20

IUCRC Evaluation Project
4/17/2019
IUCRC Alumni Career Outcomes: Percent of FY2018 Graduates Hired by Degree Level

- **Industry Member**
  - BS: 7%
  - MS: 16%
  - PhD: 22%

- **Industry Non-Member**
  - BS: 28%
  - MS: 34%
  - PhD: 37%

- **Government Member**
  - BS: 3%
  - MS: 4%
  - PhD: 5%

- **Government Non-Member**
  - BS: 9%
  - MS: 7%
  - PhD: 5%

- **Faculty**
  - BS: NA
  - MS: 1%
  - PhD: 4%

- **Postdoc**
  - BS: NA
  - MS: NA
  - PhD: 16%

- **Continuing Education**
  - BS: 35%
  - MS: 18%
  - PhD: NA

- **Not Reported**
  - BS: 25%
  - MS: 19%
  - PhD: 12%
## IUCRC Alumni Career Outcomes:
### FY2018 Graduates Hired per Center by Degree Level

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<thead>
<tr>
<th>Category</th>
<th>BS</th>
<th>MS</th>
<th>PhD</th>
<th>Other</th>
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</table>

*Note: BS represents Bachelor of Science, MS represents Master of Science, PhD represents Doctor of Philosophy.*

4/17/2019

IUCRC Evaluation Project
CISE & ENG Partnership

Some Comparisons and Recent Trends
Growth in N of CISE & ENG Centers over time

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<th>N ENG</th>
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</table>
FY2018 CISE & ENG: Funding by Source
CISE & ENG: Average Students Trained

CISE

- PhD
- Masters
- BS

ENG

- PhD
- Masters
- BS
CISE & ENG: Average Students Graduated

**CISE**

- PhD: 4.74
- Masters: 3.39
- BS: 2.61

**ENG**

- PhD: 3.02
- Masters: 2.23
- BS: 2.2

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<thead>
<tr>
<th>Year</th>
<th>PhDCISE</th>
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</table>

4/17/2019 IUCRC Evaluation Project
CISE & ENG: Average Students Hired by Members

CISE

ENG

PhD  Masters  BS

0.22

0.55

0.52

0.23
CISE & ENG: Total Intellectual Property & Commercialization Events

CISE & ENG: Average Intellectual Property & Commercialization Events

FY2018 Phase-based comparison
Total Program Funding

Phase I (N=26):
$23,877,011

Phase II (N=34):
$47,363,453

Phase III (N=7):
$8,525,156

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IUCRC Evaluation Project
Average & Median Total Center Funding

- Phase I (N=26): Average $918,346.58, Median $748,192.50
- Phase II (N=34): Average $1,393,042.74, Median $1,161,000.00
- Phase III (N=7): Average $1,217,879.41, Median $854,348.00

IUCRC Evaluation Project

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Average NSF IUCRC Awards & Supplements

- **Phase I (N=26)**: $288,146
- **Phase II (N=34)**: $272,235
- **Phase III (N=7)**: $177,555
Industrial Memberships

Total Number of Memberships

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<tr>
<td>II (N=34)</td>
<td>708</td>
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<tr>
<td>III (N=7)</td>
<td>117</td>
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Average Number of Memberships

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<thead>
<tr>
<th>Phase</th>
<th>Average Number of Memberships</th>
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<tbody>
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<td>I (N=26)</td>
<td>13.04</td>
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<tr>
<td>II (N=34)</td>
<td>20.82</td>
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<tr>
<td>III (N=7)</td>
<td>16.71</td>
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</table>
Average Membership Turn Over

Phase I (N=26):
- Members Added this FY: 2.08
- Members Left this FY: 1.65

Phase II (N=34):
- Members Added this FY: 3.71
- Members Left this FY: 3.91

Phase III (N=7):
- Members Added this FY: 2.29
- Members Left this FY: 2.57

*Newly funded Centers’ members are not counted as Members Added
Membership Turnover Rate

Turnover % = Members terminated in “year X+1” / Total members in “year X”
Average Number of Intellectual Property & Commercialization Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Phase I (N=26)</th>
<th>Phase II (N=34)</th>
<th>Phase III (N=7)</th>
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<tbody>
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<td>Spinoff Companies Formed</td>
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<td>0.12</td>
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<td>Royalties Realized</td>
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4/17/2019

IUCRC Evaluation Project

Industry/University Cooperative Research Centers
Average Students Graduated

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<th>Phase II (N=34)</th>
<th>Phase III (N=7)</th>
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Phase I (N=26)

Phase II (N=34)

Phase III (N=7)
Average Students Hired by Members

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Questions?

iucrc@ncsu.edu