### NSF I/UCRC Logic Model, as of April 11, 2014

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Activities</th>
<th>Outputs</th>
<th>Short-term Outcomes</th>
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<th>Impacts</th>
</tr>
</thead>
</table>
| NSF    | - NSF Award: Funding & Prestige  
- Best Practices: Technical Assistance, Bylaws and Membership Agreement  
- Evaluator  
- NSF Supplemental Awards  
- NSF I/UCRC Program Solicitations & DCLs | University/Institutional  
- University Faculty/Students  
- Technology roadmap  
- Research proposals  
- Research project results  
- Proof of concept findings  
- Annual project reports  
- Student posters  
- Presentations at conferences (domestic, international)  
- Pubs in high-quality science journals  
- Center research reports for media release  
- Intellectual Property  
- Patent disclosures, patent apps, patents granted  
- Student graduates  
- Degrees awarded to | University/Institutional  
- Increased capacity to attract $ funding for res.  
- Attraction of add'l funding  
- Awareness of other NSF funding (for universities)  
- Increased prestige from hosting centers | University/Institutional  
- Attracting fac/students  
- Change in Institutional (univ.) attitude twd ind.  
- Faculty w/ diverse funding sources  
- Org learning, development (diffusion of center model)  
- Institutionalization of center operations and culture  
- Center research influences univ. courses/curriculum  
- Center growth | University/Institutional  
- New innovative grad students  
- Enhanced university capacity to attract external res. $  
- Enhanced Faculty  
- More entrepreneurial university culture  
- Univ. climate for partnering  
- Expanded research capacity | Public Benefit:  
- Enhanced research and innovation ecosystem |
| University/Institutional | - Leaders  
- Valuable equip. & facilities  
- Talented faculty, researchers and students  
- Research accomplishments  
- Nature of research  
- More complex, "team science"  
- Reduced indirect support  
- Supplemental support for admin and student  
- University buy-in  
- Existing international | Faculty  
- Increased faculty-to-faculty interaction (# of partner scientists)  
- Enhanced understanding of industry needs  
- Enhanced trust in industry  
- Advances in knowledge  
- Research procedural knowledge/testing set-up, know-how (unpub)  
- Increased scholarly reputation  
- Enhanced collaborative research management  
- Increased consulting and contract | Faculty  
- Faculty scientists trained @ centers => positions of science leadership | Faculty  
- Faculty scientists trained @ centers => positions of science leadership | Faculty  
- Increased participation in IUCRC by universities  
- Philanthropy increased from Ind. to Univ.  
- $ private foundation philanthropy/industry  
- $ support for innovative res. ideas  
- Greater industry support of academic research  
- Technology meets social needs  
- Technologies implemented and in use by consumers |
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<tbody>
<tr>
<td>Industry (collaborations)</td>
<td>presentations and formative feedback</td>
<td>center affiliated students/CTR YR (BA/BS, MA/MS, PHD)</td>
<td>• Strong commitment to ongoing participation&lt;br&gt;• New industry contacts/partners for universities&lt;br&gt;• Influence of research on other scientists&lt;br&gt;• Increase in publications</td>
<td>for industry&lt;br&gt;for industry&lt;br&gt; • Strong commitment to ongoing participation&lt;br&gt;• New industry contacts/partners for universities&lt;br&gt;• Influence of research on other scientists&lt;br&gt;• Increase in publications</td>
<td>=&gt; Ind. Product&lt;br&gt; • Private-sector/Industry Products developed/marketed</td>
<td>Centers create mechanism for intersection of business opportunity and public benefit (health, defense, environment)</td>
</tr>
<tr>
<td>Industry</td>
<td>Industry financial support</td>
<td>Evaluation reports and papers</td>
<td>Students&lt;br&gt; • Students' professional development (human capital)&lt;br&gt; • Student summer internships and jobs&lt;br&gt; • Enhanced &quot;soft skills&quot; for communication, teaming, etc.&lt;br&gt; • Skills to bridge industry &amp; academia effectively&lt;br&gt; • Thesis / dissertation research ideas and support</td>
<td>• Students&lt;br&gt; • New knowledge, new scientific knowledge - industrially relevant / application lens&lt;br&gt; • Customer orientation&lt;br&gt; • Project management / presentations to industry standards&lt;br&gt; • Student =&gt; Ind. job placements&lt;br&gt; • Center-trained scientists employed @ industry sponsors’ org.&lt;br&gt; • Increased social capital&lt;br&gt;</td>
<td>SYSTEM&lt;br&gt; • Tech. meets social needs directly/indirectly&lt;br&gt; • Spillover effects (for indirect beneficiaries/stakeholders)&lt;br&gt; • Technologies implemented and in use by consumers&lt;br&gt; • Technology implemented to meet social need&lt;br&gt; • Knowledge &amp; technology transfer&lt;br&gt; • Long-term industry-academic partnerships (economic competitiveness, industrially relevant)&lt;br&gt;</td>
<td>Promote the progress of science&lt;br&gt; • Economic competitiveness at multiple levels:&lt;br&gt; - National&lt;br&gt; - Global&lt;br&gt; - Ind. company&lt;br&gt; - Ind @ large&lt;br&gt; - GDP&lt;br&gt; Corporate $ profit/share prices&lt;br&gt; Expanded innovation capacity (national)&lt;br&gt; New fields of science&lt;br&gt; Human capital&lt;br&gt; Next-gen STEM cohort (academically trained, professionally developed) in working with industry&lt;br&gt; Social capital&lt;br&gt;</td>
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<tr>
<td>Industry</td>
<td>Technical insight and direction</td>
<td></td>
<td>• Strong commitment to continued membership&lt;br&gt; • New members join the center</td>
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<tr>
<td>Industry</td>
<td>Research accomplishments</td>
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<tr>
<td>Industry</td>
<td>Time</td>
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</table>

**Inputs:**
- Industry financial support
- Technical insight and direction
- Research accomplishments
- Time

**Activities:**
- Industry collaborations
- Industry financial support
- Technical insight and direction
- Research accomplishments
- Time

**Outputs:**
- Center affiliated students/CTR YR (BA/BS, MA/MS, PHD)
- Evaluation reports and papers

**Short-term Outcomes:**
- Students
  - Students' professional development (human capital)
  - Student summer internships and jobs
  - Enhanced "soft skills" for communication, teaming, etc.
  - Skills to bridge industry & academia effectively
  - Thesis / dissertation research ideas and support

**Intermediate Outcomes:**
- Industry
  - Incorporation of Center of business plan (industry stakeholders)
  - Company Patent disclosures, patent apps, patents granted
  - Strong commitment to continued membership
  - New members join the center

**Long-term Outcomes:**
- Industry
  - Industry scientist professional development (more up-to-date)
  - R&D Efficiency (research avoided or savings)
  - Student trained @ IUCRCS with shorter learning curves as industry employees
  - Awareness of proof-of-concept from center projects
  - New knowledge, new scientific knowledge - industrially relevant / application lens
  - Customer orientation
  - Project management / presentations to industry standards
  - Student => Ind. job placements
  - Center-trained scientists employed @ industry sponsors’ org.
  - Increased social capital

**Impacts:**
- Centers create mechanism for intersection of business opportunity and public benefit (health, defense, environment)
- Promote the progress of science
- Economic competitiveness at multiple levels:
  - National
  - Global
  - Ind. company
  - Ind @ large
  - GDP
- Corporate $ profit/share prices
- Expanded innovation capacity (national)
- New fields of science
- Human capital
- Next-gen STEM cohort (academically trained, professionally developed) in working with industry
- Social capital
- Networked students, faculty, industry
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<td></td>
<td>• Guest Speakers</td>
<td>• Expanded network of scientific experts</td>
<td>INDUSTRY</td>
<td>• Work cited in patent applications</td>
<td>• Expanded research capacity</td>
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<tr>
<td></td>
<td>• Demos</td>
<td>• Access to center licenses</td>
<td>System</td>
<td>• New line of research (from center project) “disruptive tech” predecessor</td>
<td>• Shorten innovation circle</td>
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<td></td>
<td>• Best Poster Award</td>
<td>• More awareness of university/industry interdependence</td>
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<td>• Prototypes developed and tested in ind. labs</td>
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<td></td>
<td>• Resume Book</td>
<td>• Leveraged taxpayer research $</td>
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<td></td>
<td>• Member recruitment efforts</td>
<td>• Advances in knowledge</td>
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<td></td>
<td>• Center workshops for industry</td>
<td>• Skills in collaborative research management</td>
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<td></td>
<td>INDUSTRY</td>
<td>• Graduates who bridge/work industry &amp; academia effectively</td>
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<td></td>
<td>• Participation in meetings</td>
<td>• IAB influence on research: % of proposals funded (research guided by ind.)</td>
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<td></td>
<td>• Member feedback and voting</td>
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<td></td>
<td>• Interaction and collaboration among member companies</td>
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<td>• Internal gatekeeping, boundary-spanning &amp; championing</td>
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<td>• Trusting relationship among industry</td>
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<td></td>
<td>• Learning from other members</td>
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<td>• Opportunity to identify and do research with risk-sharing, able to do work otherwise couldn’t do</td>
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<td>Industry - IAB rep</td>
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<td>• Professional development</td>
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<td>• Relationships with faculty</td>
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<td>• Leadership development</td>
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<td>• Prestige in company</td>
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<td>• Career opportunities</td>
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<td>• Industry, University, Scientist</td>
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<td>cooperative res.</td>
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<td>projects @ industry</td>
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<td>• New industry contacts/partners for universities</td>
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<td>• New university-scientist relationships for industry</td>
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<td></td>
<td>• Influence of research on other scientists</td>
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<td>• Center-trained scientists employed @ industry sponsors’ org.</td>
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Feedback loops

- Fundamental research prop. to NSF
- Feedback to public policy (coop research)

Indirect effects

- Spillover effects (for indirect beneficiaries/stakeholders)
  - Energy conservation from new tech

*Center model in research policy*
Innovation and Research Ecosystem Dynamics

- Quality Relationships and Mutual Understanding
- Shared Research Agenda
- Quality and relevance of research
- Level of mutual benefit