BIC PROGRAM OBJECTIVES

- Support industry-academic partnerships, which are led by an interdisciplinary academic research team with at least one industry partner, to collaborate in building technological and human innovation capacity. Characteristics of this partnership are that it is:
  - Intended to endure beyond the initial award
  - Expected to be effective at innovating and able to continue to innovate
  - Highly intentional about creating an environment that fosters innovation
  - Develop new technology and the development of human capital that embraces a culture of change, nurtures the generation of new ideas, and considers feedback an integral part of innovation processes
  - Diverse and collaborative, representing a spectrum of backgrounds, perspectives, and skills: engineering, computer science, and other fields of science, together with social, behavioral, or cognitive sciences must be represented in the partnership

- The project should focus on:
  - Technological innovations with potential for significant economic/societal impact
  - Novel applications motivated by existing research discoveries
  - Platform technologies with the potential to achieve transformational change in existing service systems or to spur entirely new service systems
  - An understanding of the potential interaction of the technology with customers and the broader public affected by the technology, the “social-technical system”

- Participation of students and all postdoctoral researchers should:
  - Develop the skill sets, capabilities, and motivation to become future innovators in partnership collaborations
  - Enculturate the students and postdoctoral researchers in innovation
  - Be immersed in the interaction and collaborate actively with the partners from industry as well as from academe

- **The hallmark of PFI:BIC is an academe-industry partnership crafted to address the central issue of identifying and advancing key platform technologies so as to enable “smart” service systems to enter into the commercialization process.** The partnership should have:
  - A deep understanding of potential service systems where the technology could be implemented
  - A clear understanding of the market need and the competitive landscape

BIC LONG-TERM LOGIC MODEL

INPUTS

- Initial discovery
- Funding and Logistics (up to $800K for 3 years)
- Expertise of engineers, computer scientists, cognitive, social, or behavioral scientists, and other researchers and industry participants
- Resources to help connect BIC awardees with industry participants
- PI training
- Process, Materials and Resources (facilities contributed by industry and academic)
- Descriptions of the potential impact
- Other coordinating entities
- Student and Postdoc Mentoring Plans
- Cooperative Research Agreements between partners and Partnership Letters detailing their respective commitments

PROJECT ACTIVITIES

- Interdisciplinary research considerations of service systems as they relate to needs of the users and to advance the platform technology
- Inclusion of service industry R&D
- Partners jointly identify possible markets and commercial applications for the platform technology
- Partners jointly identify and overcome technical and/or market barriers to the success of the platform technology
- Establishment of a sustainable relationship between academic research team and industry partners
- Education of students in design process
- Leveraging of additional capital from sources outside the university or NSF

OUTPUTS

- Interdisciplinary publications on platform technology are developed from BIC-funded awards
- Technical barriers to commercialization feasibility are overcome
- Marketing obstacles to commercialization are overcome
- A subset of partners continue the relationship after the life of the award
- Students are trained in interdisciplinary approach to service system engineering
- Memoranda of Understanding or Cooperative Research Agreements between partners are renewed if appropriate for continuation of the relationship
- A business plan for commercialization is developed, where appropriate

IMMEDIATE OUTCOMES

- Feasibility of commercialization is tested
- New research directions are developed
- Patent and license applications of new technology developed from BIC awards (a subset of awardees)
- Researchers and/or students (academic and/or industry) working on BIC research become innovators and/or entrepreneurs in other contexts
- Researchers and/or students pursue further funding for the platform technology
- Students contextualize their attitudes to and proclivities for innovation

INTERMEDIATE OUTCOMES

- Platform technologies tested in new contexts considering needs of customers
- Platform technology iteration cycle shortened due to involvement of industry participants and customers
- Licensing of platform technology to industry
- Partnerships from BIC awards sustained over time to work on new technologies
- New academia-industry partnerships formed by BIC awardees
- Student participants pursue career in similarly interdisciplinary research
- Research and partnership increase academic institutional reputation as an “innovation hub”
- “Best practices” for academic-industry partnerships established and disseminated
- Workforce development as new positions or employee training opportunities are created by BIC partnership

LONG-TERM OUTCOMES/ IMPACT

- Improved “smart” technology available to the service industry
- Increased retention of BIC-funded students to engineering careers/research and/or entrepreneurship
- A subset of BIC awardees form start-up or spin-off companies
- Continuation of the cycle of innovation as BIC funded students become PIs with industry partnerships or industry researchers with academic partnerships
- University continues to promote and support similar partnerships via BIC or other avenues
- Adoption/dissemination of the BIC partnership model by other institutions

Life of award | 1 yr post-award | 2-5 yrs post-award | 5-10 yrs post-award

Possible Indicators for BIC

Identification of new markets, or potential markets ruled out

- **ATTRIBUTION**
  - Number of technical or market barriers identified to commercialization of the platform technology
  - Number of solutions devised for overcoming these barriers
  - Number of potential service markets for the platform technology identified during/after the life of the award
  - Number of potential service markets for the platform technology ruled out during/after the life of the award

Enhancement of academic team's and institution's technical capacities and visibility, development of human resources for innovation

- **ATTRIBUTION**
  - Number of academic participants pursuing continued relationship with their BIC partners or pursuing involvement with other industry partners
  - Number of BIC PIs submitting to other IIP programs (e.g., I-Corps, SBIR, AIR, etc.), or other NSF programs, or other federal agencies
  - Number of new or continuing awards from other agencies or institutions leveraged from the BIC award
  - Number of students and postdocs trained by BIC PI
- **CONTRIBUTION**
  - Number of students/postdocs continuing in related fields and/or similar innovation or entrepreneurial partnerships
  - Number of faculty reporting career changes/enhancements or research approaches as a result of the relationship sponsored by the BIC award
  - Number of start-ups formed by members of the BIC partnership team

Advancement of emerging technologies

- **ATTRIBUTION**
  - Number of BIC partnerships reporting development of a business plan for the platform technology
  - Number of BIC partnerships reporting that commercialization of the platform technology is feasible
  - Identification of the reason for failure if the innovation does not make it to market
- **CONTRIBUTION**
  - Publications on technology and/or advancements in the underlying discovery supported by the BIC award
  - Growth in IP position of the platform technology (patent and licensing application and activities)
  - Number of products on market that are derived from BIC-supported platform technology
  - Shortening of average development cycle of platform technology to commercialization that researchers attribute to the partnership

Increased viability and visibility of industry partner's investment in technology

- **ATTRIBUTION**
  - Number of industry participants pursuing continued relationship with their BIC partners or other academic partners
  - Number of BIC platform technology-related patents or licenses purchased from university IP
- **CONTRIBUTION**
  - Number of new professional development opportunities for employee/researcher training and/or exchange created as a result of the BIC partnership.

Quality, health, and sustainability of partnership model

- **ATTRIBUTION**
  - Academic researchers report success/value of the partnership (7 Keys for Successful Project Management)
  - Industry partners report success/value of the partnership (7 Keys for Successful Project Management)
  - Dissemination of "best practices" related to these relationships (data from 7 Keys, produced by NSF and/or universities)
- **CONTRIBUTION**
  - Number of similar partnerships via BIC or other avenues that university continues to promote and support
  - Number of universities adopting similar partnership programs
  - Number of new potential industry partners that seek relationships with the academic institution due to BIC success

New research directions

- **ATTRIBUTION**
  - Number of new research directions identified
- **CONTRIBUTION**
  - Number of related "smart" service system applications of platform technology

Data Sources for BIC Indicators

RPPR/Annual Report

- **Publications on platform technology and/or advancements in the underlying discovery supported by the BIC award**
- **Growth in IP position of the technology (patents and licensing activities)**
- **Number of patents or licenses purchased from university IP**
- **Number of students and postdocs trained by BIC PI**

Other NSF Data Systems

- **Number of BIC PIs submitting to other IIP programs (e.g., I-Corps, SBIR, AIR, etc.) or other NSF programs**
- **Number of new or continuing awards from NSF**

Life-of-award Monitoring System

- **Academic researchers report success/value of the partnership (7 Keys for Successful Project Management)**
- **Industry partners report success/value of the partnership (7 Keys for Successful Project Management)**
- **Number of technical or market barriers identified to commercialization of the platform technology**
- **Number of solutions devised for overcoming these barriers**
- **Number of potential service markets for the platform technology identified during the life of the award**
- **Number of potential service markets for the platform technology ruled out during the life of the award**
- **Identification of the reason for failure if the innovation does not make it to market**

Post-award Monitoring System

- **Number of BIC platform technology-related patents or licenses purchased from university IP after the award**
- **Number of academic participants pursuing continued relationship with their BIC partners or with other industry partners**
- **Number of industry participants pursuing continued relationship with their BIC partners or other academic partners**
- **Total number of new partnerships developed out of this relationship (aggregate data from post-award monitoring system)**
- **Number of BIC PIs submitting to other federal agencies**
- **Number of new or continuing awards from other agencies or institutions leveraged from the BIC award**
- **Growth in IP position of the technology (patents and licensing activities) after the award**
- **Number of products on the market that are derived from BIC-supported platform technology**
- **Number of potential service markets for the platform technology identified after the life of the award**
- **Number of potential service markets for the platform technology ruled out after the life of the award**
- Number of new positions and opportunities for employee training created as a result of the BIC partnership
- Number of students/postdocs continuing in related fields and/or similar innovation or entrepreneurial partnerships
- Number of faculty reporting career changes/enhancements or research approaches as a result of the relationship sponsored by the BIC award
- **Number of new research directions identified**
- **Number of related "smart" service system applications of platform technology**
- **Number of start-ups formed by any members of the BIC partnership team**
- **Number of BIC partnerships reporting development of a business plan for the platform technology**
- **Number of BIC partnerships reporting that commercialization of the platform technology is feasible**
- Shortening of average development cycle of platform technology to commercialization
- **Identification of the reason for failure if the innovation does not make it to market**

Other Data Sources (University Reporting, Google Scholar, Internal NSF)

- **Dissemination of "best practices" related to these relationships (produced by NSF and/or universities)**
- **Number of coauthored publications by academic and industry partners after the award**
- Number of similar partnerships via BIC or other avenues that university continues to promote and support
- Number of universities adopting similar partnership programs
- Number of new potential industry partners that seek relationships with the academic institution due to BIC success