IDEAS TO INNOVATION: WORKSHOP TO DEVELOP A RESEARCH AGENDA FOR SERVICE INNOVATION

Government-University-Industry Research Roundtable
University-Industry Demonstration Partnership

In the era of smart service systems, technology is critical to real-world value co-creation, making scientific and engineering research in service innovation critical for future economic progress. In 1988, the National Academies hosted a workshop on technology in services,[1] and in 2003, another workshop that considered the impact of service research on business.[2] In 2014, the University-Industry Demonstration Partnership (UIDP), an activity of the Government-University-Industry Research Roundtable (GUIRR) at the National Academies hosted the *Workshop to Develop a Research Agenda for Service Innovation*, with sponsorship from the California Center for Service Science, IBM, San José State University, and the National Science Foundation (NSF). The workshop brought together experts from academia, industry, and government to lay out the societal context for service research; to identify technology needs and knowledge gaps for service innovation; and to develop basic science, social science, and engineering questions to be addressed to satisfy the needs and fill the gaps.

According to "Succeeding Through Service Innovation," the definition of service innovation is as follows:

> "A combination of technology innovation, business model innovation, social-organizational innovation and demand innovation with the objective to improve existing service systems (incremental innovation), create new value propositions (offerings), or create new service systems (radical innovation). Often radical service innovation will create a large population of new customers ([e.g.,] public education - students; patent system - inventors; money markets - small investors). Service innovation can also result from novel combinations of existing service elements. Examples of service innovation include: On-line tax returns, e-commerce, helpdesk outsourcing, music download[ing], loyalty programs, home medical test kits, mobile phones, money market funds, ATMs and ticket kiosks, bar codes, credit cards, binding arbitration, franchise chains, installment payment plans, leasing, patent system, public education, and compound interest saving accounts."[3]

Over two days, workshop participants engaged in lively discussion on the context and challenges inherent in service research in general and service innovation research in particular. This meeting summary reports on what was presented and discussed.

[1] Quinn, J.B. *Technology in Services: Past myths and future challenges. Technology in Services: Policies for Growth, Trade, and Employment*. National Academy of Engineering, 1988.

[2] National Academy of Engineering. *The Impact of Academic Research on Industrial Performance*. Pp. 14-46. Washington, DC: National Academies Press, 2003.

[3] University of Cambridge and IBM, 2008, http://www.ceri.msu.edu/wp-content/uploads/2010/06/Cambridge_T-Shaped.pdf

THE NEED FOR SERVICE INNOVATION RESEARCH

Grace Wang, Director of NSF's Division of Industrial Innovation & Partnerships, set the context for the workshop with her perspective on service innovation. She stated that traditional economic measures show that service accounts for approximately 80 percent of the Gross Domestic Product (GDP) in the United States, the boundaries among service, manufacturing, and agriculture are blurring, and service innovation is poorly understood. Her key question was how to innovate in an increasingly technologically connected, customer-centric environment. She suggested taking a service-system perspective that incorporates a holistic view of human economic exchange beyond the service provider-customer dyad. She posed the question, "What are the fundamental basic research questions that are unique to service systems?"

Brainstorming: Challenges and Gaps

Each participant was asked to give a brief overview of his or her perspective and identify the disparate challenges and needs within the service innovation space. **Stephen Kwan** moderated the brainstorming session to identify needs, societal, and technological challenges, and where the knowledge gaps are. He asked the participants to consider: What are the basic needs in society-health, education, wealth, safe cities, security, efficiency? What are the measures of economic output (GDP) and societal well-being (happiness), and what new measures might be needed? **Irene Ng** suggested the participants also consider: Who wants to know? In a world of systems of service systems, who is deciding which measures matter to which stakeholders in the context of which service systems? Who is optimizing and who is choosing? To model me, you need my data—and that is mine, not yours.

Marietta Baba discussed the need for balance between the rule of law and security, privacy, and life, liberty, and the pursuit of happiness. **Ralph Badinelli** offered erosion of privacy and lack of meaningful work as two looming threats. He considered the example of meaningful work and the idea that one may lose his or her job or some freedom, because it makes the world safer or more efficient. As examples, he described the imminent automation of all forms of transportation as a service innovation that will take away the freedom and opportunity to drive one's own car or fly one's own airplane. If service innovation means a loss of individual freedom for a perceived benefit to society, the outcomes fail to balance objective measures with subjective experience for many individuals.

Paul Maglio added that in the 1950s arguments were made that computers would cause massive unemployment—how did that work out? Today, the positive economic impact can be measured as well as the creation of whole new categories of high-skill, high-pay jobs. More and better education (a service) is needed for people to benefit from the new opportunities created by service jobs. It is all about skill sets and context.

Rohit Verma challenged the group by asking which is a greater innovation for economic output and societal well-being, the cellphone or the private toilet. Debating the pros and cons of each innovation is easy, but the relevance of supporting arguments depends heavily on context and environment. How can service innovation measures reflect pros, cons, and context?

Jim Spohrer explained that measurement is key to science and is the basis of shared objectivity. However, measurement is complicated by people in systems (variety creators and absorbers, who own their own data and may only share it for a beneficial purpose). Outcomes are therefore most often context dependent and subjective. This is a key priority for service science and innovation research—to simultaneously address objective measures and subjective experience in context.

George Hazelrigg and **Uday Apte** agreed that finding laws that govern service systems— as the book *Factory Physics* by Wallace Hopp and Mark Spearman sets out to do for manufacturing—would provide models that help predict the future, perhaps with much more uncertainty for service systems than manufacturing systems, and allow better service system and service innovation design. **Jim Spohrer** referenced a separate book, *Social Physics* by Alex Pentland, which might be a good starting point for "factory physics" for service systems. The book proposes "social physics" laws related to teams of people as idea factories and the spread of ideas and innovations.

Walter Ganz said service design needed new methods and approaches to bring in multiple viewpoints and make the design more flexible, distributed, and customizable. He elaborated that the ServCAD tool creates a more rational and repeatable design process. Better typologies are needed. **Tiina Tanninen-Ahonen** described how TEKES (Finnish Funding Agency for Technology and Innovation) started with innovation research, added service marketing (including Service-Dominant Logic), and then developed service engineering.

Richard Larson asked where NSF could support service innovation by closing existing knowledge gaps. He commented that without competition there is no incentive to innovate. Algorithms are better for pricing seating at Fenway Park (baseball), than in the utility industry. Rules that create more competition are not technology innovations but are service innovations.

Uday Karmarkar talked about cities and the need for service innovations that are not market driven. **Richard Larson** said looking at city population changes over time would be useful. He added that alumni get emails about donating to the university, rather than advertising career-appropriate learning opportunities. There are so many opportunities to improve service systems. **William Rouse** said it would be great if we could achieve a healthy, educated population that is competitive in the global marketplace.

Ralph Badinelli described the promise of big data as a possible solution to eliminate some conflicts caused by lack of information. **Jim Spohrer** said that big data was needed to create smart service systems, and suggested everyone see the LinkedIn NSF discussion group on this topic for examples of possible future smart service systems. Most business people think of a service system from the provider side only, but it includes customers and all other stakeholders. He suggested that a purely business or market focus was not the best perspective, and that whole cities, states, nations, continents, or even the whole global economy would make better starting points for defining what well-engineered service innovations are and are not. He noted that **Mark Haselkorn** urged us to consider the whole service system, across multiple generations, and create something new that can change the world. **Mary Jo Bitner** said that a service mentality requires a multi-stakeholder service perspective, and acknowledging the impact of one's innovations on others.

George Hazelrigg described a possible approach to defining a research agenda. He stated that the goal of the physical sciences is to understand nature, to uncover the laws of nature. The goal of engineering is to design. To do design, the engineer must be able to predict the outcomes of design decisions. Thus, engineering research focuses on understanding which laws of nature dominate the behavior of a system, and how to implement these laws with sufficient accuracy that the resulting predictions are useful. **Edwin Romeijn** added that defining research priorities becomes identifying; What do I need to know that I don't know to predict? What is the unit of analysis? Actors? Processes? Interactions? The system?

Paul Maglio stated that it is about the context for service innovation design (more like architecture or human-computer interactions). People are not things to be engineered out of the system, or made simple and predictable. He continued by explaining that we need to change the language; the whole point of human-centered service system engineering is creation of mutual benefits between the people in the system and on the platform being creative together and creating "good types" of variety. He further made the point that people in the system are important for both innovation and resilience. **Irene Ng** said language is very important, and that the time from discovery to impact is shrinking. **Edwin Romeijn** explained that creating the language is a valid research challenge. He said a set of laws related to human-centered technological change for service innovations is still needed. The community could create a common language and taxonomy of types of service systems and service innovations.

Mark Haselkorn inquired about how to scope a service innovation project and minimize unintended consequences. **Ralph Badinelli** asked about how to include the customer in the design and how a user-driven design could include the customers in the process, for example, healthcare designed by patients. **Richard Larson** opined that any new service design may include bugs. Therefore, recovery from service failures should be included in the design from the start. **Bill Hefley** suggested that the need to fix bugs must always be anticipated in development of any service system.

George Hazelrigg also made the point that problem-solving is disciplinary, but decision making for design is omni-disciplinary, so we have to decide what is "kept in" and what is "left out" in the models. Understanding demand is what helps the researcher know what to design. **Irene Ng** said this is the issue of boundaries in systems and defining useful models for types of systems. Understanding demand at scale is about understanding customers, as unique individuals and collectively as a market.

Uday Apte said the study of the success of Silicon Valley and the software industry in creating modularity and interfaces—Application Programmer Interfaces (APIs)—would be important to understand the best technology-based service innovation companies. **Paul Maglio** added this is about understanding the way information service platforms scale to millions and billions of customers. **Irene Ng** said that the more you (as a service provider) try to homogenize me (as the customer), the more I will fight back and try to show how I am unique. She said we need to think about modularity, boundaries, contextual hyper-variety, autonomous agents, resource givers, resource takers,

and resource creators. We do some things mindfully, some things mindlessly. There are substitutable resources in service systems including people. In a service system, people are both variety creators and variety absorbers; entropy, stability, scalability are all important research topics for human-centered service-system engineers.

George Hazelrigg highlighted pre-existing engineering disciplines like industrial and systems engineering and human factors engineering that design systems with people in them. Meanwhile, **Charlie Bess** posited that it is not automation in the traditional sense. Instead, it is human-augmented automation; people are not in the core adding "bad variations," but around the edges doing what people are good at, being creative and unique.

Stephen Kwan concluded the brainstorming session. He commented that to address societal needs and technological opportunities would surely require engineering, management, and public policy professionals to work together with a shared language, common typology, and better tools to design service systems.

Industry and Government Perspectives

Jim Spohrer discussed IBM's revenue stream from service, outsourcing for efficiency, and scalability. Smart service systems are interconnected and instrumented, leading to big data and improved mobile access, he explained. Spohrer questioned how to make a system (flow of things, human activities, governance, and security, etc.) smarter and thereby improve the quality of life, quality of jobs, and investment opportunities. Cognitive computing with natural language and machine learning builds a next service layer. By 2017, 10 percent of all computers will be learning; cognition will be a service; and issues of trust will become more important and challenging, he concluded.

Ammar Rayes discussed the concept of "everything as a service" where customers are moving from the traditional approach of buying infrastructure to being offered infrastructure as a utility. Most IT jobs in 2014 did not exist a few years ago (e.g., data scientist, social media analyst) and most of the tech jobs of the future do not exist today. Therefore, it is difficult to find out what is needed for radical innovations.

Alexandra Medina-Borja described the organizational structure of NSF and how the organization views smart service systems as human-centered and designed around human needs. Such systems utilize smart technology or smart materials that, with the right integration, become services, she elaborated. These smart systems can be combined with the "internet of things." Medina-Borja described how NSF has a vision of creating partnership between industry and academia to increase innovation capacity with end-game service systems. She believes there is a need to define goals, eligibility, and funding criteria.

Sally Tinkle introduced the Science and Technology Policy Institute's (STPI) task to help the Office of Science Technology Policy (OSTP) perform research and analysis in strategy development for the United States government by identifying immediate and long-term concerns to prioritize federal funding. Tinkle said that the 2011 strategy for American innovation invested in the building blocks of innovation to promote entrepreneurial ecosystems and to catalyze breakthroughs to support national priorities. Currently, the 2014 strategy for American innovation is being developed by OSTP and the National Economic Council. Tinkle noted that the strategy includes education to keep the United States in a leadership position in fundamental research, by building a leading physical infrastructure, and by developing an advanced IT ecosystem (investment in neuroscience, security issues, etc.). She explained how service innovation should be integrated into the 2014 strategy by incorporating it into existing goals. STPI needs to do more work to look into the overlap between science and technology and service innovation research in order to identify opportunities to promote technology innovation in the service sector, Tinkle concluded.

PRELIMINARY BREAKOUT GROUP REPORTS

Participants broke up into five groups, each of which discussed the broad question, "What are the fundamental basic research questions that are unique to service systems?" At the end of the first day of the workshop, each of the groups reported on their preliminary discussions.

Laurie Garrow, speaking for **Group 1**, discussed the problems with educating the workforce for future jobs and the need for T-shaped students and faculty.[4] A T-shaped person has both breadth and depth of knowledge within a select discipline. She said that innovation creates jobs, which in turn creates demand for educated employees. Therefore, education has to run ahead of, or parallel to, innovation. **Charlie Bess,** from **Group 2**, made the point that service system modeling is important, but that defining the boundaries of a system for modeling purposes is

[4] See also National Research Council. *Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond*. Washington, DC: The National Academies Press, 2014.

difficult. According to Bess, the first task is to develop a common language or formalism for modeling. **Jim Spohrer,** speaking for **Group 3**, equated service innovation with system innovation. He described how service innovation is dependent on understanding "as-is" systems and modeling potential changes to explore "should-be" systems. Different disciplines may all work on the same problem but use different language and terminology. This requires the development of a new, common language. For service, technology platforms are also important.

Ralph Badinelli, speaking for **Group 4**, described technology as an enabler of solutions, and suggested that some technologies can redefine what people can accomplish. He raised the prospect of smart service systems that learn or adapt automatically. **Mark Haselkorn,** speaking for **Group 5**, described the tradeoff between the use of more and more behavioral data to model service systems and the public's misgivings about the collection of such data, which also raises the question of trust and the problem of incorporating trust into service system design. There is also the problem of creating resilient service systems, according to Haselkorn.

INTERNATIONAL PERSPECTIVES

The second day of the workshop began with presentations by participants from Europe and Asia, who provided perspectives on service innovation and research from their respective regions.

Walter Ganz provided the fourth industrial revolution perspective of the Fraunhofer Institute's research. The Institute has a focus on service engineering and on new service development. It applies manufacturing techniques and processes in an integrated approach. Ganz discussed the impact of societal needs and cultural expectations in Germany on mobility, energy, and demographic change. These needs and expectations guide advances in the industrialization of services, which lead to improvement in the economy, employment, and quality of life. He also described the use of ServLab for modeling, simulating, and training about service processes and concepts in a learning environment. More tools, methods, and ideas are needed to develop and test new services.

Irene Ng described her leadership role in the Hub of All Things (HAT) project at Warwick University, which focuses on new business models and transformation in organizations. HAT is a market-making platform for personally controlled data. She indicated that there is no value in data unless the data is contextualized and transformed in order to improve new personalized services. Through HAT, the individual who created and collected the data could negotiate access to data, and ensure privacy in a marketplace.

Yuriko Sawatani described the S3FIRE projects in Japan, which are funded by the Ministry of Education in order to extend basic research to service and connect it to innovation. The projects involve a broad research agenda and goals for creating value from transactions between service providers and service customers.

Tiina Tanninen-Ahonen, from Finland, described her funding agency's strategy (Tekes), launched in 2011, which focuses on natural resources and sustainability, vitality of people, business concepts, digitalization, and services and intangibility as value creators. Many of the funded projects focus on understanding the sources of intangible value, with exploration of emotions, experiences, and intangible capital as drivers of growth and innovation in social services, innovative cities, and healthcare services in Finland.

Human-centered Service Systems

Paul Maglio summarized workshop discussions, stating that service system modeling was key but that system boundaries were fluid, and that human roles are often hard to model. Service system modeling requires a common language across multiple disciplines. Prediction in the context of service systems requires understanding individual values, and multiple stakeholder perspectives. These make up the critical differences between systems and service systems and will lead us to focus on *human-centered service system* (HCSS) engineering. Maglio asked, what are the key things that we need to know to about HCSSs? How are new approaches to HCSSs different from existing approaches? What are the fundamental laws or patterns of HCSSs?

William Rouse made an impromptu presentation on human-centered service systems, focusing on healthcare systems and urban systems. He emphasized the problem of how to consider and evaluate the role of people in these settings. He distinguished four levels in such systems: the service ecosystem (society), system structure (organization), operations (processes), and practices (people). Cities are just big human-centered service systems. Cities cannot be studied like businesses, because they are not engineered; they grow organically. For cities, the technical problem is getting things to work, keeping them working, and understanding impacts of weather threats, infrastructure outages, and terrorist acts. The behavioral and social problem is understanding human perceptions, expectations, and inclinations in the context of social networks, communications, and warnings. The contextual problem is understanding

how norms, values, and beliefs affect people, including the sources of these norms, values, and beliefs.

Some key questions include: How can cities best be understood as a collection of communities and neighborhoods, all served by common urban infrastructures? How do policy (e.g., zoning, codes, taxes), development (e.g., real estate, business formation and relocation), immigration, and so forth affect the evolution of communities and neighborhoods within a city? When technical problems arise, what message is appropriate, and who should deliver it to each significantly different community and neighborhood within the city? How can we forecast and monitor the responses of each community and neighborhood to the information communicated, especially as it is shared across social networks?

Rouse made the point that we cannot address cities or other human-centered service systems in the same ways we address airplanes, factories, and power plants. Cities include too many complex behavioral and social phenomena. However, he explained that we can systematically explore the ways in which cities might respond to opportunities, incentives, and inhibitions. We can then identify conditions that are likely to lead to one system response rather than another.

FINAL BREAKOUT GROUP REPORTS[5]

At the end of day two, five breakout groups presented possible research questions and possible laws governing of service systems. **Stephen Kwan,** for **Group 1,** summarized six research questions and three possible laws: Significant innovations alter individual and collective human behavior; what tools and methods are needed to model these changes? How does brand loyalty impact customer behavior? How does learning and self-correction impact the design and operations of service systems? How do alternative governance mechanisms impact the dynamics of nested, networked service systems, especially after a shock? How would the tools and methods for service innovation vary depending on different market/political regimes (e.g., monopoly)? What are the limits of existing engineering tools and methods, and how would overcoming those limits enable improved service innovations? Suggested laws to examine included: People trust peers more than authorities; service systems have both static and dynamic characteristics; service systems learning is triggered more by failures than by success.

Paul Maglio, for **Group 2,** identified five research areas: models, innovation environment, evolving jobs, smart technologies, and extreme events. For each research area, a specific question was posed, along with discussion of with social context, knowledge gaps, and other considerations. How can we formally model human-centered service systems? What environmental characteristics best encourage service innovations? How might the future landscape of jobs change as a result of service innovations? What are the best metrics to use when integrating “smart” technologies into complex human-centered service systems? What service innovations can best respond to disruptions caused by climate change and other extreme events? A key discussion topic, in this group, was the balance between entity and/or interactions as the primary unit(s) of analysis. Infrastructure degradation and investment to address was also discussed.

Jim Spohrer, for **Group 3,** began by showing an IBM slide to illustrate the complex interactions between different sectors of the global economy (e.g., transportation, water, agriculture, energy, communications, retail, finance, healthcare, education, etc.). How can we create a common language and typology of service systems to enable multi-sector, multi-disciplinary, multi-stakeholder teams to do the analysis they want to do on service systems? What are the data sets we need to move forward and make progress (close knowledge gaps)? What are the visualization and mathematical methods we need to move forward? What are service innovation platforms, and how do people (customers and citizens) co-create new things that get adopted into the service systems? Human-centered holistic service systems (like cities) require multi-stakeholder data sets, visualization and mathematical methods, and innovation platforms to be properly formalized for scientists and engineers.

Ralph Badinelli, for **Group 4,** described three perspectives and four research themes. The perspectives included basic research, multidisciplinary research, and context for large-scale, complex human-centered service systems. Research themes included: (1) measurement and language, (2) testing and modeling, (3) governance, policy, and strategy, and (4) trust and risk. How can we build rigorous testing systems for service to accommodate a natural development environment, human-centered design and smart service system design? How can service systems be scaled? How do service system governance factors vary across countries and what difference does it make? How can trust be created and maintained between data-sharing service systems?

[5] Name of group members are listed in the Appendix**.**

Mark Haselkorn, for **Group 5,** identified three areas of research: ontology, epistemology, and ethics. What is the "data ontology" for human-centered service systems engineering? How can we support formative evaluation for human-centered service systems engineering? How are the ethics of human-centered service systems incorporated, especially when it comes to visible and invisible service interactions? Haselkorn also noted the need for a flexible and adaptable framework to make progress.

WRAP-UP DISCUSSION

Many participants expressed their views on the equal importance of technical changes (e.g., search engines, smart phones) and regulatory changes (e.g., taxes, deregulation of industries, Supreme Court decisions) in driving service innovations for HCSSs. It was also noted that different regions have different technology-adoption levels (e.g., Africa and cellular phones vs. electricity) and different types of regulation (e.g., Europe privacy laws). What about when service is provisioned or delivered across regions with different laws and regulations? The complexity level is high, with many types of constraints influencing interactions and system dynamics–technical, legal, political, economic, social, and more–making HCSSs intellectually and electronically challenging and economically significant entities.

PARTICIPANTS: Uday Apte, Naval Postgraduate School; **Marietta Baba**, Michigan State University; **Ralph Badinelli**, Virginia Tech; **Charlie Bess**, Hewlett Packard; **Mary Jo Bitner**, Arizona State University; **Melissa Braxton**, University of Washington; **Christoph Breidbach**, University of California, Merced; **Jessica Brooks**, Science and Technology Policy Institute; **Bradford Clark**, United States Coast Guard; **Dan Correa**, Science and Technology Policy Institute; **Ann Drobnis**, CRA; **Walter Ganz**, Fraunhofer Institute, Germany; **Laurie Garrow**, Georgia Tech; **Mark Haselkorn**, University of Washington; **George Hazelrigg**, National Science Foundation; **Bill Hefley**, University of Pittsburgh; **Kenneth Holiday**, National Intelligence; **Uday Karmarkar**; University of California, Los Angeles; **Stephen Kwan**, San José State University; **Dick Larson**, Massachusetts Institute of Technology; **Paul Maglio**, University of California, Merced; **Alexandra Medina-Borja**, National Science Foundation and University of Puerto Rico; **Mark Miller**, United States Coast Guard; **Sara Nerlove**, National Science Foundation; **Irene Ng**, Warwick University, UK; **Yanfeng Ouyang**, University of Illinois; **Leslie Parish**; National Maritime Intelligence; **James Ramming**; Intel; **Ammar Rayes**, Cisco; **Edwin Romeijn**, National Science Foundation; **Bill Rouse**, Stevens Institute of Technology; **Yuriko Sawatani**, Waseda University, Japan; **Jim Spohrer**, IBM; **Miron Straf**, National Academy of Sciences; **Tiina Tanninen-Ahonen**, Tekes, Finland; **Sally Tinkle**, Science and Technology Policy Institute; **Kostsa Triantis**, National Science Foundation; **Sean Tweed-Kent**, United States Coast Guard; **Rohit Verma**, Cornell University; **Grace Wang**, National Science Foundation.

DISCLAIMER: This meeting summary has been prepared by **Stephen Kwan**, **Jim Spohrer**, and **Paul Maglio** as a factual summary of what occurred at the workshop. Rapporteurs, **Melisa Braxton** and **Christopher Breidback** prepared the initial draft. The committee's role was limited to planning the workshop. The statements made are those of the authors or individual meeting participants and do not necessarily represent the views of all meeting participants, the planning committee, GUIRR, UIDP, or the National Academies.

The summary was reviewed in draft form by **Charles Bess**, Hewlett Packard and **Candace Yano**, University of California, Berkeley, to ensure that it meets institutional standards for quality and objectivity. The review comments and draft manuscript remain confidential to protect the integrity of the process.

ABOUT THE GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE (GUIRR) AND THE UNIVERSITY-INDUSTRY DEMONSTRATION PARTNERSHIP (UIDP)

GUIRR's formal mission is to convene senior-most representatives from government, universities, and industry to define and explore critical issues related to the national and global science and technology agenda that are of shared interest; to frame the next critical question stemming from current debate and analysis; and to incubate activities of on-going value to the stakeholders. The forum is designed to facilitate candid dialogue among participants, foster self-implementing activities, and, where appropriate, carry awareness of consequences to the wider public. For more information about GUIRR visit our web site at http://www.nas.edu/guirr.

The purpose of the UIDP is to enhance the value of collaborative partnerships between university and industry in the United States. UIDP is an organization of universities and companies who seek to build a stronger relationship between these parties. UIDP provides a unique forum for university and industry representatives to meet and discuss operational and strategic issues such as contracting, intellectual property, and compliance matters. These conversations might otherwise never take place, and they serve to help university representatives better understand the culture and constraints of their industry counterparts, and vice versa. This initiative is supported by the Government-University-Industry Research Roundtable (GUIRR). For more information about UIDP visit our web site at http://www.uidp.org.

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