Guiding Principles
for University-Industry Endeavors

Report of a Joint Project of the National Council of University Research Administrators and the Industrial Research Institute

April 2006

ACKNOWLEDGMENTS

The following Guiding Principles for University-Industry Endeavors is the product of a collaborative effort between the National Council of University Research Administrators (NCURA) and the Industrial Research Institute (IRI). This joint project, termed the University-Industry (U-I) Partnership, was launched–with the financial support of NCURA–in August 2003 with the goal of bringing the combined labor of many organizations working in the area of improved university-industry collaborative agreements to a level of national standardization and adoption. The project membership included approximately 35 delegates representing the university research administration and technology transfer communities, large and small companies, federal agencies, and other interested members of the research community. While the "Black Team" of the University-Industry Partnership was responsible for delivering the final draft of these Guiding Principles, the team would like to thank the entire membership of the University-Industry Partnership who, through countless hours of discussion, helped shape and define the content of the Guiding Principles.

The Black Team would additionally like to thank The National Academies' Government-University-Industry Research Roundtable (GUIRR) for serving as the neutral convener of the University-Industry Partnership and the discussions that gave birth to these Guiding Principles. In particular, we would like to express our appreciation to Laura Brockway, Hsiu-Ming Saunders, and Yvette White. Responsibility for the final content of this document rests entirely with the authors and not with the affiliated institutions.

Finally, we remain indebted to the sponsors of this effort, notably the Ewing Marion Kauffman Foundation, as well as the Sloan Foundation, Wallace Coulter Foundation, Boeing, Extrude Hone (now Ex One), IBM, Hewlett-Packard, and Microsoft.

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PREAMBLE

University-industry collaborations pair the discovery and dissemination of knowledge with the application of that knowledge to the creation of goods and services. Properly constructed, these collaborations ultimately endow society with a public good far exceeding the combined contributions of the parties: economic growth, an improved standard of living, an extension of humanity's intellectual reach. In the broadest sense, the goal of university-industry collaborations should be to create this public good while simultaneously satisfying the mission and objectives of each partner.

The minutes of Pennsylvania State University's University Research Council meeting of February 6, 1928 asked the following two very familiar questions: "To what extent should the College enter into agreements with commercial concerns and under what conditions? What should be the institutional policy in reference to patents and patent rights?" It is now 2006, and despite major changes – the enactment of Bayh-Dole, the increasing complexity of multiparty research arrangements, the impact of globalization on the availability of project opportunities – these same questions are still being asked. Industry asks an equally perplexing question: how can industry gain access to the research capabilities of U.S. universities to help solve problems of regional and national economic importance?

It is naïve to believe that a problem that has existed in varying degrees over the last 77 years will suddenly be solved this year or next. However, we need to recognize that intellectual property issues and relationships between industry and universities are becoming increasingly contentious and complex over time, and the urgency of addressing these is paramount. Like a marriage, university-industry collaborations will require continuing effort, because external circumstances affecting these collaborations will change over time. It is helpful to acknowledge that project arrangements do not have a one-size-fits-all solution, and to face them as a continuous work in process that addresses and respects the various parties' motivations and priorities. With the increase in global competitiveness, industry is facing intense pressure to increase innovation, contribution, economic development, and profitability. Within this perspective, we need to plan for increasing the success rate of collaborations.

Despite the many challenges that must be overcome to establish successful university-industry collaborations, few will deny the benefits outweigh the difficulties. Both parties can benefit from each other's infrastructure, which often represents an enormous investment of both public and private funds. Industry benefits from research innovation and the academic's ability to approach problems from angles that are not encumbered by commercial concerns. Universities benefit by having real-world problems for their students and faculty to investigate – problems whose solution can generate economic and social benefit. Universities, industry, and the public would be well-served when the university-industry collaboration is enabled.

Narrowing the Focus to Sponsored Research Collaborations

A subset of all potential university-industry interactions is unique in that it is usually governed by a formal agreement or contract because each party is expecting to receive some specific benefit from the project. These interactions include sponsored research and technology transfer via licensing of inventions. In sponsored research, the industry partner provides money, non-monetary resources or in-kind contributions and the university provides research activity and the associated work product. In the case of technology licensing, the industry partner provides money and the university grants to the industry partner certain rights to use the work product and any resulting university-owned technology. Negotiation of agreements governing these interactions can break down or be delayed when the parties cannot agree on the value of the research or technology or the rights that each party should have to the work product resulting from the sponsored project. Both collaborative, sponsored research – where both parties contribute to the development of technology – and straight technology licensing – where an industry desires to acquire a patent license to practice and commercialize technology developed and owned by the university – could benefit from rational approaches to structuring the relationships and the agreements that govern them. This document will focus on the creation of sponsored research collaborations.

The Business-Higher Education Forum's publication, "Working Together, Creating Knowledge: The University-Industry Collaboration Initiative" sets out the primary concerns of both industry partners and universities in negotiating research collaborations.[1] The current document intends to build on the foundation provided by that study and explore specifically the guiding principles that should be followed when building agreements that structure and shape research collaborations between universities and industry partners.

Guiding Principles for University-Industry Collaborations

These principles are intended to support more productive collaborations between university and industry research leaders while recognizing that the missions and objectives of the university and industry partner are distinct. It is a fallacy to assume they are identical, or even in all cases compatible or complementary. The challenge then lies in understanding how the missions and objectives of both sides differ, and to shape relationships that allow both sides to achieve their desired objectives. With these guiding principles as a starting point, strategies and processes can be brought to bear to develop collaborations in which the parties' disparate missions, objectives, and constraints can be simultaneously addressed to achieve a more beneficial outcome.

1. http://www.acenet.edu/bookstore/pdf/working-together.pdf

GUIDING PRINCIPLES FOR UNIVERSITY-INDUSTRY COLLABORATIONS

Institutional Missions Define the Scope of Potential Collaborations

Guiding Principle # 1: A successful university-industry collaboration should support the mission of each partner. Any effort in conflict with the mission of either partner will ultimately fail.

The core mission of the university has three major components: the education of students, the creation of knowledge, and the dissemination of knowledge. Traditionally, universities create knowledge through open inquiry by faculty and students. Dissemination of knowledge is achieved through the education of students who disperse after graduation and transmit that knowledge broadly. Knowledge is also disseminated through publication and technology transfer. In recent decades universities have added a component of economic development to their missions, accomplished largely through transfer of university technology to existing or new businesses. Any project that places limitations on these core mission elements – education of students, the creation of knowledge, the dissemination of knowledge – fundamentally opposes the mission of the university. Such a project is virtually intractable from the university standpoint.

The core mission of industry is to create value for investors, provide useful goods and services, and expand the state of the art. In doing so, industry contributes to society by developing and providing leading-edge products and services, and provides employment and stability for individuals and their families. Knowledge is transferred by continuously educating employees and encouraging their personal development. The products and services created by industry must generate the profit that is needed to sustain a healthy industry. Analogous to the university mission above, a project that limits these core mission elements fundamentally opposes the mission of industry, and such a project would be intractable from the industry standpoint.

A successful project must ultimately satisfy the complementary missions of the two partners. To help achieve this goal, the following "Guiding Principles" were created to help novices and experts in industry and universities as they craft formal collaboration agreements.

❖ Contribution in Support of Missions – The Larger University-Industry Relationship

Though the missions of universities and industry partners are fundamentally distinct and occasionally opposed, the most successful collaborations contribute to the missions of each party. The parties help reach this point by acknowledging each other's mission, as well as the objectives and constraints each faces.

Below are some specific examples of how each partner may contribute to the mission of the other, as well as the objectives of each party:

❖ University Contribution to the Industry Mission:

- Training of future and current industry workforce (students) through undergraduate and advanced degrees (retention of trained work force)
- Contribution to the general knowledge base for public benefit (publication)
- Advancing the state of the art in a field
- Acting as a filter to distill, from the general public knowledge base, a subset of that knowledge particularly applicable to industry's product needs (knowledge transfer)
- Performance of specific research on behalf of industry (sponsored research)
- Licensing inventions and developments (Intellectual Property) for commercial purposes, including revenue generation (technology transfer)
- Providing access to university-owned equipment, materials, facilities and specialized resources
- Fostering economic development that expands markets
- Objectively testing, evaluating and reporting on new technology.

❖ Industry Contribution to the University Mission:

- Employing students and graduates
- Donating (equipment and money – either unrestricted or earmarked e.g., for scholarships, research, or facilities)
- Providing either materials or funding for student internships and faculty sabbaticals
- Employee time and knowledge donation through involvement in activities such as assisting student projects, guest lectures, service on thesis committees, service on advisory boards.
- Enabling access to industry-owned equipment, materials, facilities and specialized resources
- Providing leading-edge research directions
- Providing financial and/or in-kind support for specific research activities of interest to the industry partner (sponsored research)
- Paying technology licensing fees and royalties, which support ongoing research and educational programs
- Contributing to general knowledge base (publication)
- Bringing university contributions to the public in the form of goods and services (technology transfer)

❖ University Objectives:
- To benefit the public by adding to and sharing knowledge broadly
- Educate and support an educated and well-trained workforce
- Transfer technology and knowledge to enhance commercialization
- Foster economic development at state and national levels

❖ Industry Objectives:
- Create and deliver new and improved products and services to enhance profitability
- Locate advancements made by others that solve/answer general and specific problems faced by the industry partner
- Develop and support an educated, well-trained, and competitive workforce

In addition to supporting each other's mission and objectives, both parties must recognize the constraints facing universities and industry in a collaboration. Some specific constraints follow:

❖ University Constraints:
- Must educate students
- Must perform research for public benefit
- Must operate within changing federal and state rules and regulations, e.g. non-profit tax rules, export regulations and increased regulations on the use of humans, animals and hazardous materials
- Must manage potential and actual conflicts of interest and commitments
- Must be consistent with all sponsors
- Academic year limitations on student and faculty time
- Facing federal funding that is limited or nonexistent
- Lack of match between industry segmentation of research and university segmentation (shared constraint)

❖ Industry Constraints:
- Research investments must show returns
- Can distinguish basic and applied research, but distinction not always recognized by universities
- Differences between external and internal research must be recognized and planned for by industry
- External research must be part of a competitive business plan and budget
- Must establish agreements in a commercially timely manner
- Must establish agreements to ensure the ability to commercialize with appropriate returns
- Research funded by industry usually requires clear goals, milestones, and specific time frames for completion

Prior or current interactions between the parties may predispose either one to trust or be suspicious of the other. Understanding each partner's missions, goals and constraints will assist in defining initial expectations. A frank discussion on these points – preferably one that includes all potential participants and decision-makers – will also illuminate contributions or mission conflicts that may not have been obvious to the other party. It is important to recognize that any individual project may play out against a complex backdrop of a multi-faceted relationship between a particular industry and a particular university.

A Long-Term Relationship is the Desired End State

Guiding Principle # 2: Institutional practices and national resources should focus on fostering appropriate long-term partnerships between universities and industry.

The university/industry partnership extends human intellectual reach and is key to U.S. competitiveness, innovation and economic development. In turn, this economic growth is the foundation for social development and an improving standard of living. It is vital to invest in and insure the success of this university/industry innovation ecosystem.

Short-term transactions and long-term relations are not mutually exclusive. While individual transactions must take into account missions and objectives, the underlying interchange should strive to enhance a long-term relationship that accelerates collaborative efforts. The value of a long-term relationship can be greater than the sum of the individual transactions, and the relationship between the university and the industry partner may be more important than the results of one isolated project.[2]

The execution of an effective university-industry collaboration requires engagement across a wide range of university units and departments, with simultaneous coordination of the corporate stakeholders. The process must be viewed as holistic for long-term success, and individual institutions should examine their policies, training, reward structures and business practices with an eye to whether they promote long-term partnering. In addition, while this discussion focuses on relations between organizations, a key factor in the success of a collaboration also is the relationships between the persons involved.

2. There are many collaboration models created by companies, associations and universities.

In this framework, the number of potential opportunities for interaction becomes great, and the benefits can be broadly spread across the university and industry missions. To meet these goals, academia and industry should look towards establishing long-term, multifaceted relationships that maximize returns across a spectrum of interaction opportunities.

Establish a Framework that Encourages Long-Term University/Industry Collaborations

Guiding Principle #3: Universities and industry should focus on the benefits to each party that will result from collaborations by streamlining negotiations to ensure timely conduct of the research and the development of the research findings.

University-industry collaborations create value beyond the fruits of any single interaction: their value can also be maximized by including multiple players from across both the university and the industry when appropriate.

In addition, lowering the transaction costs and accelerating the completion of transactions between the parties facilitates mission fulfillment. While Guiding Principle #2 supports long-term relationships, maximizing value may require reducing the time spent in negotiating terms so that the parties can devote more time and resources to the actual engagement.

Finally, to achieve a successful collaboration, one must be able to measure the value it creates. For guidelines to locate and assess value in a university-industry collaboration, see the Appendix.

SUMMARY

The examination of university-industry collaborations led the University-Industry Partnership project towards the following "guiding principles."

Institutional Missions Define the Scope of Potential Collaborations

Guiding Principle # 1: A successful university-industry collaboration should support the mission of each partner. Any effort in conflict with the mission of either partner will ultimately fail.

Decisions of whether to engage, and how to engage, in a particular project should be made by determining whether the specific arrangement is capable of furthering each party's core mission. Potential arrangements that have no possibility of furthering both parties' missions – however attractive otherwise – should be discouraged.

A Long-Term Relationship is the Desired End State

Guiding Principle # 2: Institutional practices and national resources should focus on fostering appropriate long-term partnerships between universities and industry.

Long-term collaborations provide a wider variety of benefits than short-term ones. Accordingly, individual institutions should examine their policies, training, reward structures and business practices with an eye to whether they promote long-term partnering. At the same time, national professional organizations can support more extensive training and networking options for those charged with negotiating collaboration agreements, which is a systemic national need. National organizations can also forge ways to reduce transactional costs through planned, joint university-industry demonstrations and experiments. Both the institutional and national efforts would elevate the success probability for long-term partnering.

Establish a Framework that Encourages Long-Term University/Industry Collaborations

Guiding Principle # 3: Universities and industry should focus on maximizing value resulting from collaborations by streamlining negotiations and measuring results.

University-Industry collaborations will be more productive when negotiations are accelerated to allow the research to begin more quickly, but with proper attention to the first two guiding principles. Once completed, measuring results and assessing the quality of the collaboration will help correct inefficiencies and promote the long-term relationships that are often more effective.

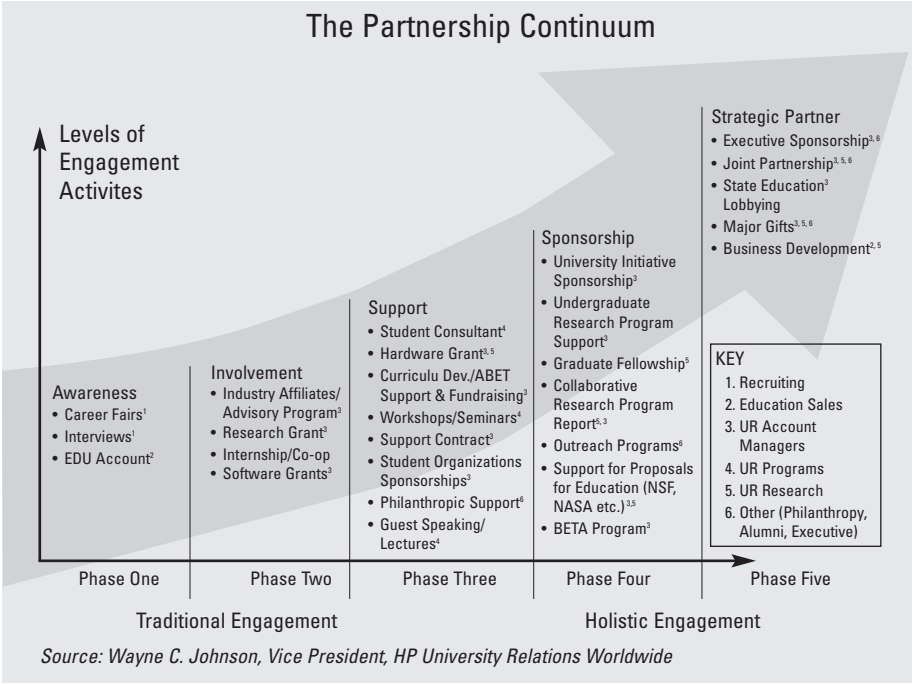
University-Industry Partnerships will Require Continuing Effort

University-industry partnerships, and their associated challenges, are a perpetual feature of the national innovation landscape. Documented concerns date back to the 1920's, and the issues do not appear to be abating in scope or complexity. For this reason, universities and industry partners need to commit to long-term practices that will increase the success rate of partnerships over time. The guiding principles above, and the materials that complete this work, are seen as first steps in this direction.

APPENDIX A: BACKGROUND ARTICLES

Article I.

One guiding framework for the development of these relationships is Hewlett Packard's model "Partnership Continuum."



Source: Wayne C. Johnson, Vice President, HP University Relations Worldwide

In this model, the development of a strategic collaboration between universities and industry proceeds along a continuum. This continuum has many of the same characteristics as Abraham Maslow's Hierarchy of Needs.[3] The fundamental needs of an institution (i.e., safety and security) must be satisfied before one can move toward strategic collaboration (i.e., self-actualization).

Accordingly, it is possible to map a series of representative activities of engagement between an industry partner and a university, from the more traditional industrial investments (recruiting, sales, job fairs) to those that may be described as strategic (business development, joint partnership). Moving up the continuum requires greater group and leadership involvement. Activities can take place out of order within the Traditional Engagement levels of Awareness, Involvement and Support, but the Holistic Engagement levels of activity—Sponsorship and Strategic Partner—will not be successful unless the Traditional Engagement levels are secured. The most important ingredient for success in this paradigm is trust and transparency.

Based upon experience in working with universities, this process typically takes up to five years to reach the level of Strategic Partner. Most companies and universities typically operate at the Traditional Engagement levels.

3. Abraham H. Maslow, Personality and Motivation. New York: Harper, 1954.

Article II.

❖ Implementation Guidelines:

Individual institutions can change policies, training, reward structures and business practices to promote long-term collaboration. Nationally, a more conducive environment for long-term university-industry partnerships can be established through two initiatives, described below:

a. More extensive training of contract negotiators. In order to effectively navigate towards an overall success rate for the institution, junior sponsored research officers, junior contract negotiators and junior licensing officers must understand how each research collaboration they work on reflects forces in the larger world. Junior staff are most often involved in the majority of negotiations, but they rarely have the sophisticated knowledge base they need to succeed. A successful and productive collaboration is not just a matter of filling out the forms or following templates. Quality generic training is available through national professional societies, and junior officers should be encouraged to participate in these activities, despite the short-term expense. In-house training can then be used to overlay the institution's own culture, values and procedures on the fundamentals. Three additional missing elements for effective negotiation deserve national implementation: a) co-education of staff from universities alongside industry, to develop a shared understanding, b) the creation and availability of on-demand learning modules, accessible from the desktop, that can quickly and effectively identify and reduce knowledge gaps and c) social and professional interaction between the two parties on a regular basis.

b. Systemic reduction of transactional inefficiencies. Part of the "total package" value of a long-term collaboration lies not only in the benefits added, but the transactional costs deducted. Systematically reducing these transactional costs should be a major combined effort of both the university and industry sectors. A model can be found in the 20-year old Federal Demonstration Partnership, which sought (and still seeks) to eliminate transactional inefficiencies in government-university partnerships, generally, and government-university research agreements, specifically. This successful enterprise, currently involving 10 federal agencies and over 90 research universities (including 8 Emerging Research Institutions whose annual federally supported research & development expenditures are less than $15,000,000), has developed numerous innovations that have since been nationally adopted, such as allowed carryover of prior year funding, a common set of terms and conditions among participating agencies, etc. The result has been a significant reduction in transactional costs, with 73% of those eliminated costs being reinvested in the research itself (FDP Phase II survey).

A national effort both to improve the training of junior officers and establish mechanisms to reduce transactional inefficiencies would promote long-term collaborations across all institutions.

Article III.

❖ Explicit Value of Early-Stage University-Industry Collaborations

- Trained Students
- Interactions in a network of interesting people
- Flow of ideas (vs. static assets or events)
- Catalyze and amplify thought leadership in areas of interest to industry and market development
- Technology familiarization and promotion
- Early adoption and acceptance
- Research collaborations
- Contributions to industry technology roadmaps
- More competitive products and services

- ❖ Implicit Value of Early-Stage Relationships
  - Worldwide advancements
  - Responsible citizenship
  - Market development
  - Seat at the table/influence among the leaders
  - Societal participation and leadership
  - Brand enhancement
  - Advocacy on industry positions
  - Intellectual exchange and networking

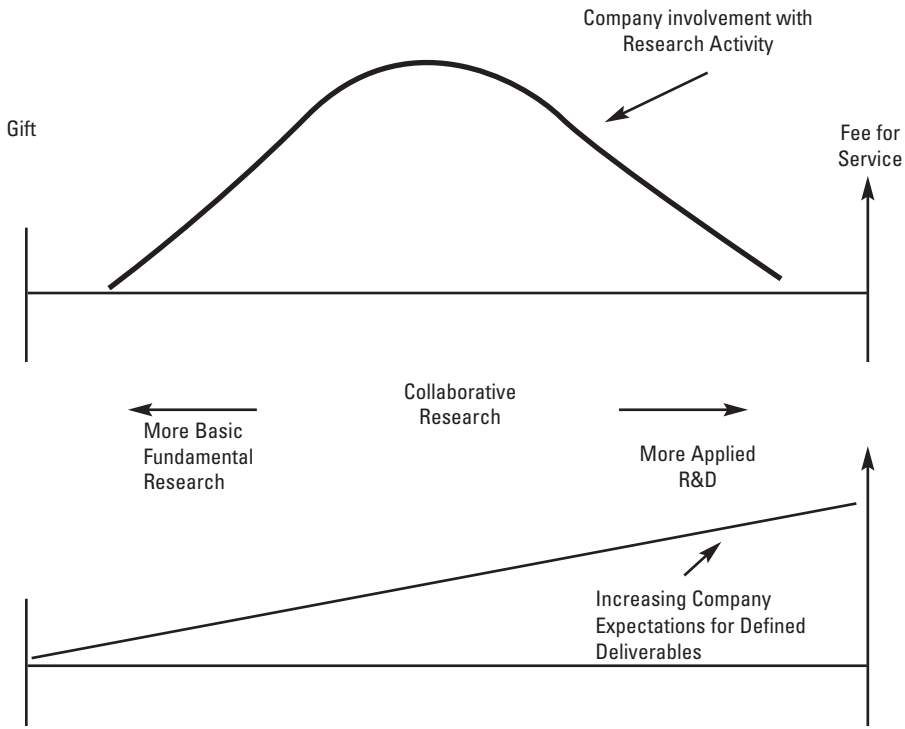
Article IV.

- ❖ Establishing a Framework for Specifying Contributions and Needs, and Building an Agreement that Incorporates Them

Both universities and industry can improve the probability that a sponsored research agreement will be successfully negotiated by creating a framework for determining how the magnitude and nature of contributions made by each party should lead to appropriate rights to the research outcomes for each party. Such a framework will provide a basis for understanding how the arrangement is likely to satisfy (or not) the two partner institutions' missions and priorities, and whether the rights offered to each party are commensurate with its overall investment and specific contribution to the project.

Industry supported research collaborations can cover the entire spectrum ranging from making a gift to engaging in collaborative research to paying a fee for a defined service such as testing.

Spectrum of Industry-Supported University Research Activities



This spectrum depicts the wide range of situations that could fit under the general description of industry-sponsored collaborative research. The deliverables change along this continuum, but they do not necessarily increase or decrease. A number of parameters vary across the spectrum. The industry partner's expectations for the performance of specific research related activities and deliverables starts with a minimum amount on the left and increases to a maximum on the right. The degree of industry involvement with the university research activity is at a minimum at both ends of the spectrum and reaches a maximum in the center with true research collaborations. At the center the industry sponsor can be making many more contributions to the collaborative research project besides funding. These can include having industry researchers working in parallel with the university researchers, sharing results, validating each other's conclusions, jointly making decisions about the direction of the program, and having a student perform project-related work at the industry partner's facilities. Either party may also provide to the other proprietary information and materials, background intellectual property, proprietary materials, access to equipment, and other resources.

The industry partner's expectations for rights to use the research results, including patentable inventions, likewise vary across the spectrum. On the left, an industry partner making an outright gift receives no rights to use the research results beyond those available to the general public. On the right, the industry partner expects to retain all rights relating to their property and the data that is generated using industry's materials and/or data since the university is just performing a specified test or procedure on the industry partner's materials or data. As one moves to the right, the expectation of industry is to improve its competitive position in one way or another.

Agreements governing collaborations at either end of the spectrum are typically simple and do not require much negotiation. Gifts may be made without any agreement; the industry donor may spell out his/her general intentions regarding the use of the gift in a cover letter only. Fee-for-service interactions are often governed by standard purchasing agreements. The challenges and conflicts arise over those collaborations that fall in the middle of the spectrum – those collaborations where each party makes tangible and in-kind contributions to the research either during or after the project ends and each party expects some rights to the outcomes.

It is in these complex cases that a framework for guiding the negotiation would be most beneficial. It would do two things. First, it would prompt each party to articulate the contributions that it will make to the project (monetary, tangible, intangible, in-kind). Second, it would guide the parties toward selecting terms and conditions that are appropriate to the magnitude and nature of their relative contributions. Such a framework would ideally take into account factors such as the industry sector of the industry partner (which may strongly influence needs such as degree of control over intellectual property rights) and laws or regulations governing the university (e.g., non-profit status). Such a framework should lead the parties to a more complete understanding of each other's contributions, needs and constraints, and facilitate the negotiation of a win-win agreement. It is important to realize that most collaborations will not involve equal contributions from each party. The agreement governing the project should provide benefits that are commensurate with total contributions or investments of each party and appropriately address specific needs or constraints of each party.

Article V.

❖ The Special Challenge of Foreground Intellectual Property

Although most sponsored research collaborations do not ultimately generate patentable inventions, many negotiations initially bog down over the issue of who has access to intellectual property that may or may not materialize. Since the research agreement is negotiated prior to the start of the project, neither party knows with certainty whether an invention will occur, who will be the inventor(s), what the invention will or can be used for or what the value of the invention will be. Yet each party wants to protect its potential benefit by reaching agreement as to the dispensation of their rights in advance. The conflict over rights to intellectual property can cause the parties to walk away from a project. This strategy of trying to maximize potential future benefit is, in effect, the same as trying to minimize the risk of losing benefits. This raises the interesting question of the size of the risk. If the risk is small, is it worth the time and good will that may be lost in negotiating a strong position?

It may be possible through data collection to better understand the risk – that is, to better understand the probability that intellectual property will result from a particular sponsored collaborative research project. The university, for example, can look at the past and expected record of other collaborations in the same field of endeavor. Did they yield value to the university? On average, how much? Is this an area where IP is growing in importance and expected future value? Will there be another industry that could utilize resulting intellectual property? Universities can classify and examine data by research sponsor (federal government, state government, small industry, large industry), by type of research (basic, applied, problem solving, engineering solutions, development), by type of arrangement (gift, unrestricted grant, consortium membership, individual PI research grant, contracted research, purchase order), by academic field (for example, bio/health, physical sciences and technology), by individual PI (historically low producers/high producers), or any number of known variables. Industry partners can do a similar analysis.

Conducting a refined data analysis of this type by pooling historical data of university-industry interactions would provide a national resource. It is estimated by preliminary study that very few industry/university collaborations (about 3%) generate intellectual property that is actually worth vigorous protection; it is in both parties' interests to be able to quickly define and discard most of the other 97% through some kind of triage mechanism, informed by historical trends. If the probability of a valuable invention occurring is very low, strategies can be implemented depending on the specific circumstances. For instance, if the research is highly fundamental then the scales might tip toward the university; if highly applied and based on existing industry technologies and processes, then ownership decisions might lean more towards the industry. In cases in which the contributions are relatively equal and the stakes are high, the parties may elect to invest considerable effort into negotiations, parsing out the relative contributions of each party.
In most cases, however, where there is a mix of contributing factors and a high level of uncertainty about outcomes, keeping the intellectual property terms in the research agreement quite simple and deferring the negotiation of specific licensing terms unless and until an invention results makes a great deal more sense and speeds negotiations.

APPENDIX B

Black Team Membership, 2005

Bill Guidera (Team Lead)
Policy Counsel
Microsoft Corporation

Connie M. Armentrout
Director, Technology Licensing
Monsanto Company
Technology Alliances Team

Ann M. Hammersla
Senior Intellectual Property Counsel,
Office of Intellectual Property Counsel
Massachusetts Institute of Technology

Al Johnson
Senior Analyst
Corning Incorporated

Kathleen Larmett
Executive Director
National Council of University Research Administrators

Sally O'Neil
Manager, Industrial Contracts
Stanford University

Brian Stanton
Director, Division of Policy,
NIH Office of Technology Transfer (OTT)
Department of Health and Human Services

Marc Snir
Michael Faiman and Saburo Muroga Professor, Department of Computer Science
Siebel Center for Computer Science
University of Illinois at Urbana-Champaign

APPENDIX C

University-Industry Partnership Project

Team Membership, 2003-2005 inclusive

❖ Red Team

Bruce M. Kramer (Team Leader)
Division Director, Engineering Education and Centers
National Science Foundation

Shayan Bhattacharyya
Center for Evaluative Clinical Sciences
Dartmouth Medical School

James J. Casey, Jr.
Executive Director, Office of Sponsored Programs
Cardinal Stritch University

Chuck Concannon
Manager, University R&D Collaborations, Global R&D Strategy
The Boeing Company

Jadranka Curgus
Senior Manager,
Global R&D/University Collaborations
The Boeing Company

Kathleen S. Irwin
Senior University Legal Counsel
University of Wisconsin-Madison

Suzy Lebold
Divisional Vice President, Scientific Assessment and Technology, Licensing, Global Pharmaceutical Licensing and New Business Development
Abbott Laboratories

Richard Pearson
President
National Center for Manufacturing Sciences

Roberto Peccei
Vice Chancellor
University of California, Los Angeles

Larry Rhoades
Chief Executive Officer
The Ex-One Company

Sue Skemp
Fellow, Office of Science and Technology Policy
Executive Office of the President

Lou Witkin
Program Manager, University Relations
Hewlett-Packard Company

❖ Blue Team

Jilda Diehl Garton (Team Leader)
Associate Vice Provost for Research
and General Manager of GTRC
Georgia Institute of Technology

Roshell Athey
Associate Director, Office of
Sponsored Projects
University of Texas at Austin

Tara E. Bishop
Associate Executive Director
National Council of University
Research Administrators

Mike Champness
Senior Assistant for Air Dominance
Office of the Asst. Secretary of Defense,
Homeland Defense Force Planning and
Employment

Sharon Hays
Deputy Chief of Staff
Office of Science and Technology Policy

Carl Johnson
Chief Executive Officer
II-VI, Inc.

Bobby McQuiston
(ret.) Office of Sponsored Projects
Universtiy of Texas at Austin

Bob Norwood
Program Director, Division of Engineering
Education and Centers
National Science Foundation

Avron D. Spier
Director of Business Development
Genomics Institute of the Novartis Research
Foundation (GNF)

Kai E. Thomenius
Chief Technologist, Ultrasound & Biomedical
GE Global Research

❖ Black Team

Bill Guidera (Team Leader)
Policy Counsel
Microsoft Corporation

Connie M. Armentrout
Director, Technology Licensing
Monsanto Company
Technology Alliances Team

Ann M. Hammersla
Senior Intellectual Property Counsel,
Office of Intellectual Property Counsel
Massachusetts Institute of Technology

Jim Horning
Chief Scientist & Director of
West Coast Operations
Network Associates Laboratories

Al Johnson
Senior Analyst
Corning, Incorporated

Kathleen Larmett
Executive Director
National Council of University
Research Administrators

Sally O'Neil
Manager, Industrial Contracts
Stanford University

Frederic Quan (retired)
Manager, Technology Contracts
Corning, Incorporated

Ted Roumel
Office of Technology Transfer
National Institutes of Health

Brian Stanton
Director, Division of Policy
NIH Office of Technology Transfer
Department of Health and Human Services

Marc Snir
Michael Faiman and Saburo Muroga Professor,
Department of Computer Science
University of Illinois at Urbana-Champaign

❖ Green Team

James A. Severson (Team Leader)
Vice Provost Intellectual Property
and Technology Transfer
University of Washington

Joshua Green
Attorney,Venture Law Group
HellerEhrman, LLP

Mohamed Hashish
Senior Vice President, Technology
Flow International Corporation

Wayne Johnson
Executive Director
University Relations- Worldwide
Hewlett Packard Company

Michael A. Morrissey
Partner
Orrick, Herrington, & Sutcliffe, LLP

K. P. Rajurkar
Distinguished Professor of Engineering and
Director, Center for Nontraditional
Manufacturing Research
University of Nebraska-Lincoln

John H. Raubitschek
Patent Counsel
U.S. Department of Commerce

Richard P. Seligman
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Yvette White
Senior Program Associate, GUIRR
The National Academies

Laura M. Brockway
Christine Mizrayan Science & Technology
Policy Intern, GUIRR
The National Academies

Hsiu-Ming Saunders
Christine Mizrayan Science & Technology
Policy Intern, GUIRR
The National Academies

Bud Crouch
Principal Partner
Tecker Consultants