

Understanding & Developing the Pathways
for Beneficial University-Industry
Engagement

Partnership Continuum



University • Industry Demonstration Partnership

This document describes The Partnership Continuum—a new way of thinking about the myriad ways in which academia, industry, and government can interact for mutual benefit, often in ways which contribute to national growth. The Partnership Continuum was developed by a strategically assembled and dedicated team of professionals from each of these three sectors with the goal of significantly adding to the current body of knowledge.

The University-Industry Demonstration Partnership (UIDP) Board of Directors would like to thank all of the Working Group members, who are listed in Appendix A of this booklet, as well as the UIDP members who reviewed The Partnership Continuum and provided feedback to the Working Group.

The Board gives special thanks and recognition to the Working Group leaders, Geanie Umberger (University of Kentucky, co-chair), Jeff Southerton (Pfizer Inc., co-chair), Goran Matijasevic (University of California, Irvine), Scott Steele (University of Rochester), and Wayne Johnson (California Institute of Technology) for their leadership of this initiative.

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**Understanding & Developing the Pathways for
Beneficial University-Industry Engagement**

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The Partnership Continuum

A Letter from the Authors

Convened by the National Academies, the University-Industry Demonstration Partnership (UIDP) was launched in 2006 with a singular focus—that is, to promote university-industry research partnerships in such a way that they provide significant benefits to both parties. Since its inception, UIDP has produced (and continues to develop) a number of useful outputs and tools to enable greater university-industry partnership. More information about UIDP itself can be found in Appendix C to this document and on the UIDP website, www.uidp.net.

At the UIDP's Spring Meeting in Irvine, California, in April 2009, we, as members of the Working Group, led a discussion regarding the drivers for interaction between academia and industry and the influence of these drivers on the form of the resulting partnerships. It was immediately apparent to those attending that academia and industry interact with each other in myriad ways—some simple, some complex, some easy to establish, some requiring many years of prior interaction to establish, some achieving their goals, and some failing to do so. Furthermore, we found that these modes of interaction could be grouped into various categories of partnership. Each form of partnership within these distinct categories is of clear value to the parties involved. Without such value, these partnerships would never develop or, once created, would quickly dissolve.

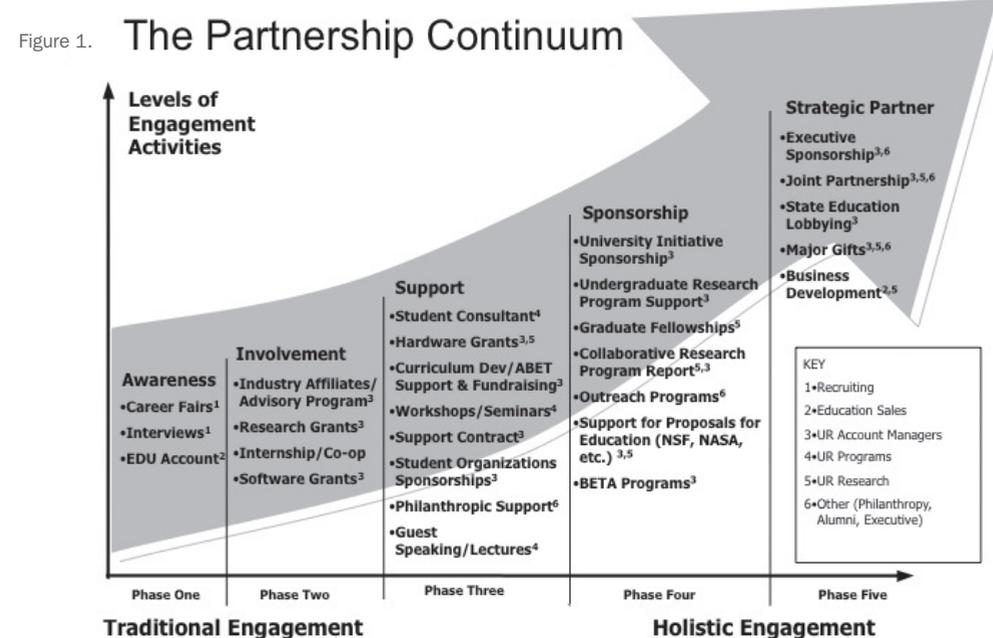
One of our members, Wayne Johnson, had previously considered the ways in which industry and academia partnered and his representation of these activities (Figure 1) provided a useful starting point for the present project. Through several teleconferences, email exchanges and face-to-face meetings of the Working Group members, in addition to presentations to and feedback from the broader UIDP community, the working group has refined and built upon the initial work of Wayne Johnson to develop The Partnership Continuum presented here.

Much of the substrate for the present work came from the dialogue referenced in Figure 1. As we collected the input of our Working Group and the UIDP membership, it quickly became apparent to us that while individually we could identify numerous ways in which academia and industry interact, it was only through combining our joint experiences that we could begin to see the whole spectrum of partnership opportunities. Too often we felt that individual universities and companies were biased toward a particular preferred form of partnership and sometimes blinded to valuable alternative partnership strategies, perhaps out of a lack of awareness of their existence and successful implementation by others. Consequently, we proposed to the UIDP that it initiate a project to examine, appraise, and communicate the partnership opportunities available to academia, industry, and government.

It is our hope that this work will stimulate those involved in the business of partnership among academia, industry, and government to re-evaluate the ways in which they conceive of doing business with others and in which they build partnerships among their institutions and others. We believe this to be especially valuable at this moment in time when many organizations are concerned about identifying approaches to partnership development against a backdrop of reduced funding and greater scrutiny on achieving the greatest returns (however defined) from their partnerships.

We would like to take this opportunity to thank UIDP for its support of this project and all members of the project working team (listed at the end of this document) for their commitment and invaluable input.

— Jeff Southerton, Geanie Umberger, Goran Matijasevic, Scott Steele & Wayne Johnson



Research Collaboration Summary

Having determined that a wide-ranging study of the various drivers and modes of partnership would benefit many academic and industry players, we proposed to the UIDP leadership that it sanction a specific demonstration project focused on what we initially called “non-traditional partnerships.” After formal adoption of the project by the UIDP, we subsequently recruited members of the UIDP community to the project team. It was clear from the outset that this was a subject that excited UIDP members and that this interest extended to a desire to participate actively in the project.

At the outset, we focused our efforts on cataloging the various ways in which universities and industry partnered and the extent to which government influenced or participated in these modes of partnership. It quickly became apparent that “non-traditional” meant different things to different people. For example, a form of partnership that one party views as atypical might be seen as merely routine by others. These diverging views could be due to differences arising from the perspectives of diverse disciplines or other factors. For example, colleagues in universities may have different perspectives on industry, depending on whether they work for the career center, deans’ offices in specific schools or colleges, extension programs, or technology transfer office. Likewise, colleagues in industry may view universities in different lights depending on whether they are human resources professionals looking for corporate training opportunities, researchers looking for collaborators, or business development officers looking to license technologies. As we considered the breadth of partnership possibilities, we elected to rename the project The Partnership Continuum, reflecting the way in which many of these forms of interaction are interconnected. The various modes of partnership along the continuum are described in the following sections. It should be noted that the examples that we give for each are not intended to be exhaustive. Instead, we hope that these examples will illustrate the variety of interactions that have been created by others within each of the broad areas of interaction and partnership.

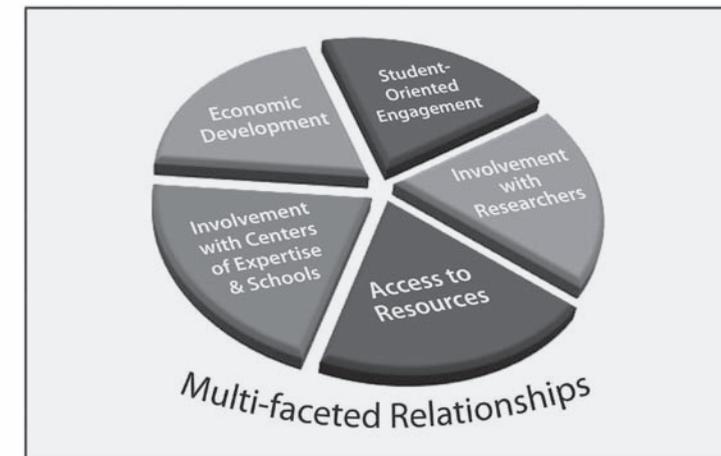
In this document, we present The Partnership Continuum as a model which can be used to explain how academia, industry, and government interact across the spectrum of partnership modes. It is our hope that consideration of The Partnership Continuum and the examples we reference will stimulate others to extend their current concepts regarding the meaning of “partnership” and identify new ways to partner with others to the maximum benefit of all involved.

Levels of Engagement

As one might anticipate, the ways in which universities and companies interact with each other are diverse. To some extent, the nature of the partnership is driven by the objectives of each party when forming the partnership and by the constraints under which each party might find itself at that time. Even when the drivers and constraints are similar in nature, the form of resulting partnership might not necessarily be the same—even when the interaction is between the same parties but at a different point in time. The factors that contribute to and drive the parties to any one form of partnership over another would be an interesting topic for further study but is not the subject of this particular analysis.

The Working Group evaluated all of the various forms of partnership between academic and industry parties could be categorized into one of several general areas, namely: **Student-Oriented Engagement, Involvement with Researchers, Access to Resources, Involvement with Centers of Expertise and Schools, or Economic Development.** Partnerships within these categories can be strategic, to some degree, and where there is a particularly deep relationship between parties, participation across all categories may occur concurrently, resulting in a construct we refer to as Multi-Faceted Relationships (as illustrated in Figure 2). It should be apparent that the extent to which a party is active within each of the categories of partnership will depend on that party’s goals and objectives and the means available to it at the time.

Figure 2. Multi-faceted relationships between universities and industry exhibit features from across the partnership categories



Beyond this, within each broad category, the observed forms of partnership can be further divided such that they fall into one of three levels according to the degree to which each form of partnership might be considered Transaction, Collaboration or Alliance. These “Levels of Engagement” are further described below:

LEVEL 1 interactions are tactical in nature. In a two-party interaction, for example, Party A may have something of value to Party B and is willing to provide it to Party B in return for some other form of consideration (tangible or otherwise). We have labeled this level of engagement as “Transaction.”

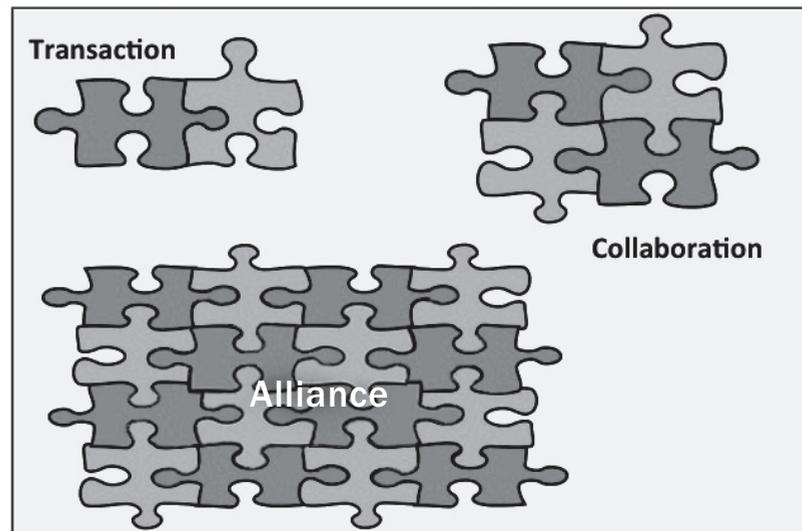
Student-Oriented Engagement

LEVEL 2 interactions are characterized by greater collaboration between the parties. In this case, both Party A and Party B are willing to share ideas in the expectation that by doing so each will benefit in some way. We have labeled this level of engagement as “Collaboration.”

LEVEL 3 interactions Party A and Party B will typically have shared aspirations and a strong desire to work as equal partners toward a goal or set of goals that both wish to achieve but cannot achieve alone. These engagements are usually long-term in nature and require substantial commitments (and sometimes sacrifices) to be made by each party. We consider this to be “Alliance.”

These levels are summarized in Figure 3 below, which illustrates how interaction occurs at each of the levels of engagement. As we discuss later, there is no prescriptive approach here — it is not necessary for the parties to start at Level One, proceed to Level Two, and so on. Sometimes parties will interact at several levels at the same time and may move among the levels in any direction.

Figure 3. The Levels of Engagement



The following sections examine the partnerships that we have observed within the categories of Student-Oriented Engagement, Involvement with Researchers, Access to Resources, Involvement with Centers of Expertise and Schools, and Economic Development, as well as the convergence of categories in Multi-Faceted Relationships. In each case, the partnerships activities are presented according to the level of engagement typically observed in such a partnership.

Industry and academia can and do engage in a number of ways, but one universal, long-standing area of partnership between the two centers around employment and building the next generation’s workforce. Universities are charged with the mission of educating and preparing their student bodies for gainful employment. Staff has a dedicated focus on attracting industry recruiters to their campus through a variety of means to interview and hire their graduates. Industry needs to recruit the quality graduates needed to advance its mission and to develop innovative technologies. Accordingly, it has staff dedicated to the recruitment of students and has a number of methods at its disposal (see Table 1) to gain access to those students that will enable it to expand its talent pool. This symbiotic relationship between industry and universities benefits both and can be the source of significant financial support and future innovations. However, not all universities are the beneficiaries of the full range of resources that a company has to offer, much as many companies are unaware of the tremendous talent available at a host of universities. This begs the question, how does one raise awareness and create relationships? There are a number of ways in which a university can engage with industry through student employment across the three levels introduced earlier.

As depicted in Table 1, a number of methods are at the disposal of a company and university for the purpose of creating relationships. When reviewing the table, one must keep in mind certain key points about the types and levels of engagement. Not all companies begin at Level 1 and work their way up to Level 3; many will work with universities on one, two, or even all three levels, starting at any one of the levels (e.g., beginning at Level 3 rather than Level 1). Indeed, within larger companies certain departments may interact with a university at different levels, according to the type of graduates they seek to hire. Some relationships never progress beyond their initial level, while others grow to moderate or extensive engagement.

The level of engagement also hinges on the experiences from each interaction between the two parties. The experiences of companies with the types of students they recruit; policies and procedures they must navigate for the relationship; or interactions with faculty, staff, and administration will impact whether or not the relationship expands. Additionally, not all companies begin their relationship through the hiring of students. Some relationships begin through research collaborations that spread into student-oriented engagement because the company wants to hire students who possess knowledge in target areas of future corporate development; these companies expand their interactions across levels based upon their initial experiences at the initial level. Companies target particular universities for the purposes of hiring their students for a variety of reasons. They are as follows:

- Strong ties between the company and professors conducting research of interest.
- Proximity to the company (recruiting within the region reduces relocation costs; students may have ties to the area.)
- Number of graduates (graduating few students, albeit from a quality program, may discourage a company from developing a deeper relationship due to the cost/benefit trade-offs of maintaining the relationship.)
- Quality of the students (training that prepares the students with essential skills to succeed in the target industry is critical.)

• Upper management ties to the company (allegiance to an institution based on the school's impact upon the manager during his/her postsecondary and/or professional education may facilitate relationships.)

These points are key to building successful relationships between companies and universities. However, equally important to remember is that management of the relationship is critical. Each experience builds upon the previous one, and a poor experience in one area can impact a relationship negatively or even destroy it. Once established, the relationship must be nurtured continuously, or it will wither and/or die.

Table 1. Levels of Student-Oriented Engagement	
LEVEL 1: Transaction – Shared Tactics and Introduction of Opportunities	
Career Fairs	Provide initial introduction between industry and students for pre-employment screening of potential job candidates, followed by additional private interviews (standard events hosted by universities to showcase their graduates; events periodically held by companies for recruitment of targeted skill-sets and positions).
Job Interviews	Provide opportunities for initial pre-employment interviews through university career center resources (e.g. dedicated private interview rooms).
Company Seminars on Career Options	Provide insight on possible job opportunities; allow speaker and students opportunity to network for future employment opportunities (university hosted events with company speakers invited to present).
Student Organizations/Club Sponsorships	Provide insight on future direction of field of interest and ongoing projects; provide opportunity for networking for both research collaborations and employment opportunities (multiple modes of initiation—by invitation to local, regional or national companies; through interactions with research professors; or by executive sponsorship or donor).
Student Poster Sessions	Provide insight on future direction of field of interest and ongoing projects; provide opportunity for networking for both research collaborations and employment opportunities (multiple venues—sessions at professional conferences or hosted by universities with industry representatives invited).
Innovation Challenge/Competition	Provides company an opportunity to connect with students and faculty through a call for ideas and projects that address an area of interest of the company concerned. Winning submissions typically receive a prize, funding or other recognition.
LEVEL 2: Collaboration – Shared Ideas and Interactions through Opportunities	
Senior/Capstone Design Projects, Master Theses	Provide company opportunities to interact directly with students for networking; provide opportunities for students to work on problems of interest to company (part of body of work to meet university graduate school educational requirements that may result from research relationship between university faculty and company, with company providing financial support for the work).
Course Teaching, Class Projects	Allow a university to tailor its curriculum to industry needs for student career success; provide company opportunities to interact directly with students for networking; provide opportunities for students to work on problems of interest to company (multiple formats—university-offered course; company representative-led course based upon expertise in subject matter; company mentorship on class projects).

Table 1. Levels of Student-Oriented Engagement	
Curriculum Development / Accreditation Support	Provides company opportunity to interact directly with faculty on curriculum development; provides support for accreditation efforts by the school disciplines, validation of the curriculum and demonstration of employability of the graduates (industry assistance/participation through membership on departmental or school advisory boards, curriculum committees, or assistance with accreditation visits).
Student Fellowship Support	Provides company opportunities to interact directly with students for networking; provides opportunity for students to work on problem areas of interest to company (university request to company for specific criteria for qualified recipients based upon corporate mission and/or philanthropic focus or area of business interest).
Software / Hardware Grants	Provide company-sponsored software or hardware for instructional use, so that students can learn with career-specific tools (university-requested company donations to provide students the most current equipment and software tools).
Internships	Allow the company to interact with students before they graduate as a pre-screening tool for future permanent employment relationship (contract between company and student).
LEVEL 3: Alliance – Shared Aspirations and Building a Sustained Working Relationship	
Student Consultancy	Provide project-specific temporary expertise through company recruitment of advanced students with knowledge and skills targeted for future corporate development (company-acquired expertise to assist with specific areas of business interest).
Student Mentorships by Company Employees	Provide company-guided development of students with knowledge and skills targeted for future corporate development (company acquired expertise to assist with specific areas of business interest).
Co-ops	Provide student support for multiple years across broader experiences.
Research Topic Sponsorships	Provide company opportunities to interact directly with students for networking; provide opportunities for students to work on problem areas of interest to company (generally part of body of work to meet university educational requirements that may result from research relationship between university faculty and company, with company providing financial support for the work).

Involvement with Researchers

Partnership between universities and companies is typically viewed as desirable by all stakeholders, be they national, state, or regional governments that promote such partnerships to meet previously identified policy, development, or infrastructure goals or the participants themselves (individual universities and companies) that perceive value from entering into such partnerships. Often, partnership is conceived as collaboration on certain projects (e.g., research and development [R&D] projects). Such partnerships bring additional research dollars into academic laboratories, allow the partners to access pre-existing intellectual property (in various forms) that might otherwise be unavailable to them, promote the generation of new inventions that may result in significant publications, and generate new intellectual property. The latter may have tangible value in terms of public benefit, commercial application, or even in underwriting the generation of new companies and the creation of jobs.

However, while involvement with researchers is typically thought of in terms of R&D collaboration, the reality is that researchers in academia, government laboratories, and industry interact with each other at many levels—and realize value from such interactions. Many of these interactions occur with a minimum of bureaucratic overhead or other transaction costs.

These partnerships can be considered across all three levels of engagement.

LEVEL 1 interactions occur frequently, probably because the barriers to such interaction are very low—in some cases no form of contract or budget is required. The degree of real and open collaboration among researchers at this level is low, but such interactions are important in allowing the parties to build an initial relationship and explore the ways in which they may partner more deeply in the future (see Table 2).

LEVEL 2 interactions typically involve greater partnership between researchers and are usually established with sponsored research contracts, the terms of which are accepted by the parties as the norm for activities of the type concerned. While the bureaucratic overhead associated with such activities is relatively low, these activities do require a research budget, which limits their frequency. These interactions provide each party with an opportunity to gauge each other's capabilities firsthand.

LEVEL 3 interactions tend to be less frequent. They typically require significant budget and (sometimes lengthy) negotiation of contracts before they can commence. That said, these forms of partnership are highly valued by researchers and are usually viewed as most likely to result in new intellectual property. There is typically a level of prestige attached to these Level 3 interactions.

Table 2. Levels of Involvement with Researchers

LEVEL 1: Transaction – Shared Tactics, Minimum Financial Cost	
Material Transfer Agreements	Provide researchers with access to materials which can be used as tools to advance their research. Materials are often exchanged at no cost and with minimal contractual obligations.
Faculty Consulting Arrangements	Provide industry researchers (usually) the opportunity to receive critical appraisal of their projects from experts in the field. Most universities allow their faculty to consult 50 days per year. Note that industry researchers often provide (free) consultancy to academic research projects.
Software / Hardware Grants	Provide academic researchers with hardware and/or software—either directly or in the form of a grant for hardware/software acquisition.
Patent Grants	Provide academic researchers with rights to patents in an area that company has decided not to pursue further.
Guest Speaking / Lectures	Provide researchers (from industry or academia) opportunities to present their work to academic/industry researchers working in the same field at no or minimal cost.
Recruitment assistance	Provide industry with assistance to recruit for special initiatives.
Workshops / Seminars	Provide a targeted group of industry researchers training in the form of a seminar series or workshop from an academic research department; provide industry researchers opportunities to learn about new developments in a field of interest in a cost-effective manner.
LEVEL 2: Collaboration – Shared Ideas, budget required	
Sponsored Research	Provide funding for discipline-specific investigations in academic laboratories. Sponsored research, typically project-specific, may also be directed to research by a named individual (e.g., a graduate student, postgraduate student, or postdoctoral fellow). The project plan is directed by the industry and academic parties.
Sponsored Clinical Trials	Support academic researchers in the conduct of studies in human subjects of developmental-stage compounds intended for therapeutic use. (Analogous studies may be undertaken for potential veterinary medicines). The trial design is typically driven by the industry researchers.
Sabbaticals	Provide the opportunity for an academic or industry researcher to spend time working in an industrial or academic setting, respectively; allow the researcher to learn new techniques, participate in research of interest, and to introduce new perspectives into the recipient laboratory; may also provide the recipient laboratory project with a 'free' resource.
Non-tenured Faculty Appointments	Provide the opportunity for industry personnel to interact directly with academic counterparts through 'adjunct' teaching or research positions at a university.
Gifts / Philanthropy	Provide a sizeable financial gift to a named university, typically to fund research in a particular department, directed to a particular end, or both. While the amount of funding is significant, the contractual obligations may be minimal.
Level 3: Alliance – Shared Aspirations, complex and lengthy contract negotiations	
Collaborative Research Projects	Provide multi-year collaborations in a general area of research interest to both the academic and industry participants and typically involve extensive transfer of confidential information, materials, and intellectual property. Specific research plans may not be defined at the outset but are agreed to by the parties as the research progresses. Research activities under the general plan are likely to be undertaken by both industry and academia participants.
Joint Applications for Funding	Leverage the combined expertise available in the industry and academic laboratories to increase the probability of success of obtaining R&D funding from government or philanthropic sources.

Access to Resources

Providing access to research capabilities, including unique technology and other resources, is a common way to initially develop and expand research collaborations. The private sector and academic institutions often possess specialized equipment, facilities, and training or knowledge that can provide a vital resource for a potential partner. These can be used to support a range of activities including education, research and development, product development, and entrepreneurial initiatives.

As with other themes, the access to resources can provide various levels of engagement based on the form of the relationship. Arrangements can vary from a provider-customer relationship to shared facilities that can lead to more intellectual exchanges.

LEVEL 1 interactions such as providing use of a fee-for-service core lab, access to libraries and use of information technology systems can provide an initial entrée. Increasing levels of interactions provide enhanced exchanges of ideas and subsequently greater commitments from each partner. This process of evolution moves the collective set of interactions from a service relationship to more of a partnership.

LEVEL 2 interactions include more personal engagement which may include, for example, formal or informal educational opportunities, limited use of laboratory space, access to unique resources or capabilities, and contract or sponsored research.

LEVEL 3 interactions may be characterized by physical co-location of research groups, with companies locating research facilities near or on a university campus, and can provide a more fully integrated collaboration.

Table 3. Access to Resources

LEVEL 1: Transaction – Shared Tactics	
Shared Resource Use	Provide access to equipment or other materials for use in research studies.
Core Laboratories, Cost Centers	Provide use of core facilities, expertise (often fee-for-service).
Library Access	Provide use of physical or electronic library collections that may not otherwise be available.
“.edu” E-Mail Accounts	Provide availability of e-mail accounts and systems, often for alumni who may be in industry.
Guest Speaking / Lectures	Provide researchers (from industry or academia) opportunities to present their work to academic/industry researchers working in the same field at no or minimal cost.
Recruitment assistance	Provide industry with assistance to recruit for special initiatives.
Workshops / Seminars	Provide a targeted group of industry researchers training in the form of a seminar series or workshop from an academic research department; provide industry researchers opportunities to learn about new developments in a field of interest in a cost-effective manner.
LEVEL 2: Collaboration – Shared Ideas	
Education Opportunities	Provide formal courses and degree programs.
Extension Programs (Certificate)	Provide certificate-granting programs in targeted fields that may even be jointly developed to meet specific requirements.
Distance Education (Masters, Open Courseware)	Provide informal training and course work that Provide flexibility based on schedules and distance.
Incubators	Provide use of specialized lab facilities that may also in an of themselves allow access to core facilities, expertise, and other resources.
Industry Space	Provide access to industry facilities.
Access to Industry Resources and Capabilities (e.g., Equipment, Animal Models, etc.)	Provide partners highly specialized resources and expertise.
Work-for-hire (specified research to be done)	Provide financial resources for targeted projects to be completed by the partner institution (additional engagement, but still primarily a service agreement).
LEVEL 3: Alliance – Shared Aspirations	
Resource Access for Shared Strategic Goal	Provide a pooling of resources for aligned projects and programs.
Sharing of Space	Provide for work to be performed in same location to enhance collaborations and optimize resources.
Customized Executive Education	Provide tailored programs to meet needs of the partner, potentially in a range of areas to address leadership skills, strategic planning, policy development, or other requirements.

Involvement with Centers of Expertise & Schools

Universities are complex structures, often challenging for industry to penetrate or understand. They are primarily structured around schools and departments, as this is related to their educational mission. On the other hand, the expertise of the faculty on a particular topic increasingly leads to interdisciplinary contacts and collaborations among faculty, ultimately resulting in centers of excellence around those topics. This creates a matrix-like structure, not unlike that seen in many companies. Opportunities for involvement by industry exist with both individual schools/departments and with centers of excellence.

With the schools and the departments, these interactions are driven by the desire of industry partners to have input into the curricula of a specific discipline, to support the education of that discipline (motivated by workforce development) as well as the general support of that school, through a dean’s advisory board or council. On the other hand, involvement with centers of excellence is motivated by the desire to connect with university experts in a very specific area or in an interdisciplinary area that brings faculty from different schools and departments.

At a higher level of partnership, industry can also provide cost-share on a proposal submitted to a federal agency that either requires matching funds or views the availability of these funding models favorably. In some cases, industry and universities create a consortium to address a particular issue which may in turn seek further funding from federal and other sources. Universities may also have regional, state, or national initiatives with a specific theme that may attract support from industry members interested in advancement of that theme, whether it is related to education at different levels, creation of regional clusters, fostering economic development, or other initiatives.

Table 4. Involvement with Centers of Expertise & Schools

LEVEL 1: Transaction – Shared Tactics	
Mailing List Memberships	Provide industry news from the school in the form of an electronic or hard copy newsletter or journal with the news and alerts to the industry partner of upcoming school events, departmental or center seminars, or other conferences that the school or center is organizing that might be of interest to industry (may function as initial point of involvement).
Guest Speakers	Provide industry-level expertise to center or department / school seminars or lecture series.
LEVEL 2: Collaboration – Shared Ideas	
Educational Activities	Provide formal courses and degree programs.
Conference Sponsorships	Provide funding to the school and visibility of the company through conference organized by the school or center; provides broader visibility if the conference has reach outside of the specific school.
Affiliation Arrangements with Departments or Schools	Provide organizational arrangements by which schools may organize specific networking events for the program members. Many of these include alumni from that school or program.
Research Center Memberships	Provide for direct affiliation with a center or school and opportunities to engage in special events and “first look” opportunities at some of the ongoing research; provides access to students.
Industry Associate Memberships	Provide industry a specific set of invitation-only benefits, not given to the community at large, through a formal member relationship.
Center or School Advisory Boards	Provide industry members insight into the current issues of the school or center through board membership; provide participating industries opportunities to provide feedback and other input and support for the educational efforts and programs of the center or school.
Support for Academic Proposals to Federal or State Government Sponsors	Provide industry opportunities to support academic proposals to federal agencies in areas of its own interests, for example, in the form of letters of support, offers of summer internships to students. In this way, industry demonstrates its commitment to the general subject matter as part of the funded program.
LEVEL 3: Alliance – Shared Aspirations	
Industry Cost-sharing on Proposals	Provide cost-share on a proposal submitted to a Federal agency that either requires non-Federal matching funds or views the availability of these as preferred. These financial commitments function at a higher level of engagement, with the motivation for the industry that it helps create a center of excellence in a topic of interest to industry.
University – Industry Consortia	Provide a more complex partnership arrangement viewed as necessary to address a particular issue long term and which may in turn seek further funding from Federal and other sources and may even pursue funding for the consortium parties.
University Initiative Sponsorships	Provide a means for universities to engage more directly in regional, state, or national initiatives with a specific theme that may attract support from and bring in industry members interested in advancement of that theme, whether it is related to education at different levels, creation of regional clusters or fostering economic development.

Economic Development

Universities often serve as the nexus for regional economic development. It is well known that creation of companies founded on so-called “new knowledge” is often dependent on the presence of one or more research universities in the geographical area. Clusters of companies in a specific field form and grow based on the activity of a university in that field, while universities will also, in turn, form programs and expand in disciplines that are related to the industry in their vicinity. Note that some of this activity may be done by the business school, by a special program within the university, by a research foundation created as an entity outside of the university for the purpose of engaging on this topic, or by a regional entity where the university is a co-founder with industry and other regional interests of a non-profit that focuses on economic development.

Table 5. Involvement with Centers of Expertise and Schools

LEVEL 1: Transaction – Shared Tactics	
Entrepreneur Classes Open to the Community	Business schools and extension programs can be a broader economic development catalyst by providing specific knowledge on the topic of starting and growing a business. Seminars and conferences organized by universities also attract the business community and serve as a neutral convener that allows for connection of businesses in a particular area.
Extension Courses	
Business Seminars and Conferences with industry participants and attendees	
LEVEL 2: Collaboration – Shared Ideas	
Start-up/Small Business Involvement <ul style="list-style-type: none"> • Business Assistance • SBIR/ STTR Support • Facilities for Start-ups • Angel/Venture/Corporate Capital Engagement • Entrepreneurs-in-residence • Investment in Start-up Companies • Kitchen Cabinet for Start-up (Advisory Board) 	Many universities get directly involved in providing economic development assistance for start-ups or growing companies and have these efforts funded by regional, state, or federal governments (e.g. SBA). Many of these also have active industry involvement, as these are correctly identified as strengthening the regional cluster formation. Some universities may provide support for proposal preparation for SBIR or STTR grants, as well as providing technical facilities support or being subcontractors on these proposals. Universities sometimes engage with the investment community to connect them with the regional entrepreneurship community or do matching with entrepreneurs-in-residence. The university may even provide some early stage funding of a start-up (especially if it is based on university technology) or help with providing professors or researchers to serve as advisors to the company, thereby also providing technical validation.
Established Company Involvement <ul style="list-style-type: none"> • Patent Licensing • Patent Donations • Engagement of University Start-ups • Technical Assistance • Manufacturing Extension Partnership and Agricultural Extension Program 	Established companies may find opportunities to license patents on technologies created by academic researchers or may choose to donate specific patents not of interest to the company to the university for further development. Existing companies may also choose to engage start-ups that are based on university technologies, since it may be easier for them to integrate a relationship with an existing company than it may be with university researchers. Universities can also provide a wide variety of technical assistance including the availability of faculty consultants that can help the companies. Some universities are also part of the National Institute of Standards and Technology (NIST)-funded Manufacturing Extension Partnership (MEP) by providing regional centers which provide services to manufacturers focused on everything from process improvements to strategies for growth.
LEVEL 3: Alliance – Shared Aspirations	
Support of Campus Incubators	Industry will often work together with universities to strengthen the regional cluster by supporting incubation activities, building and locating in research parks, as well as supporting other regional economic efforts.
Research Parks	
Regional Economic Development initiatives / Cluster Development	

Multi-faceted Relationships between University & Industry

The ultimate goal for most universities and companies is to develop deep, long-lived relationships. In reality, such relationships can be achieved in and focused upon any one of the previously discussed categories of partnership (i.e. Student-Oriented Engagement, Involvement with Researchers, Access to Resources, Involvement with Centers of Expertise and Schools, and Economic Development). However, when a university and company partner across many or all of these categories concurrently, they might be considered to have achieved a truly holistic strategic engagement, i.e., a Multi-Faceted Relationship. It is well known that individual universities and companies have different goals that vary over time as priorities change. For example, an institution may focus on access to resources at one stage and priorities then switch to economic development at another point. One critical element to achieving sustained, multi-faceted relationships is ensuring that each party has its priorities clearly defined and maintains the trust of the other through communicating these in a transparent and timely fashion.

Multi-Faceted Relationships are characterized by interactions that cut across several of the categories of partnership. Given the high degree of complexity and sophistication of these relationships, many of the observed interactions fall into the third level of engagement.

LEVEL 3: Alliance – Shared Aspirations	
State / Federal / Private Foundation Education Lobbying	Provide for approaches to outside entities through combined efforts to support the development of programs or access to resources that benefit all parties (e.g. science, technology, engineering, and mathematics (STEM) education and economic development initiatives).
Industry Matching of State Funds for Research	Provide industry-derived co-funding commitments at a significant level for sponsored research awards to a university. Funds support private sector, government, and academic goals.
Industry Roundtables	Provide a forum in which university and private sector leaders engage each other in a formal way to solicit feedback and insight in an open forum.
Major Gifts (Endowed Chairs, Buildings, Prototype Funds, Faculty Centers)	Provide significant resources to support development of expertise, personnel, infrastructure, or other priority programs.
Joint Partnerships (Joint Ventures, Exclusive First Rights to Inventions)	Provide expertise and resources from both university and industry partners to support shared risk approaches in research and/or technology development.
Joint Communications and Marketing	Provide coherent co-developed strategies to publicize and support shared programs and priorities.
Support of National Organizations- University-industry Consortia	Provide support to enhance collaborations and policy development through organizations such as UIDP, GUIRR, The National Academies, American Association for Advancement of Science concerned with national science and education policy
	Association for Advancement of Science concerned with national science and education policy
Employee Matching Programs for Alumni & Organization of Employee Alumni groups	Company programs provide incentives for industry employees to contribute to institutions. Some companies organize university alumni groups within their organizations.
University-Industry-Government Interactions – Exploring Mutual Opportunities for Federal Programs	University and private sector entities partnering to participate in government programs that aligns with their interests and priorities.

It should be noted that Multi-Faceted Relationships may occur at a national level between a corporation (corporate headquarters) and a university or at a geographic level between a local division or subsidiary and the university. For partners focused on regional economic development a closely linked geographical partner may present an even higher priority than one at a national level.

The Path Forward

This UIDP project has considered the ways in which universities and industry form partnerships, with or without government participation. At the outset, we intuitively believed that the approaches to partnership would be several-fold. However, it has only been through the cataloging of examples of partnership that we have established the diversity and breadth of partnerships that universities and industry have established to date. We hope that by considering these examples, universities and companies will discover ways in which to partner with each other that they have perhaps not considered previously.

In addition, we discovered that each of the partnerships described could be assigned to one of a small number of distinct categories of interaction, within each of which further sub-categories were assigned according to the extent of the interaction, namely, Transaction (Level 1), Collaboration (Level 2) and Alliance (Level 3). Thus, one can map the partnerships to cells within a two dimensional matrix of “category of partnership” and “level of engagement.”

While it has not been the goal of this project, during our work we identified a number of ways in which this project could be extended to the benefit of all those interested in university-industry partnerships. For example, it would be interesting to consider the following:

- To what extent do different universities and companies employ certain partnership forms?
 - How does this differ by operating sector?
 - What leads to bias or preference for certain partnership forms?
- What drives partnering organizations to one form of interaction vs. another form?
 - What barriers do organizations face when forming particular forms of partnership?
- How can each type of partnership be marketed to the other party?
- What are some of the metrics that are or could be employed to measure the success of each type of relationship?

These and several other questions of interest are captured in Appendix B and could potentially be explored further through a well-structured survey, a rigorous academic analysis of which would surely reveal information that would benefit anyone interested in forming or promoting the formation of partnerships between universities, industry, and government agencies. Alternatively, or in addition, the collection of real-life examples from specific universities and companies would also be beneficial in identifying best practices.

Appendix A: Project Working Group

WORKING GROUP LEADERSHIP:

Geanie Umberger, University of Kentucky (Co-Chair)
Jeff Southerton, Pfizer, Inc. (Co-Chair)
Goran Matijasevic, University of California, Irvine
Scott Steele, University of Rochester
Wayne Johnson, Hewlett-Packard (retired)

WORKING GROUP MEMBERSHIP (ALL AFFILIATIONS AT TIME OF DRAFTING):

Ryan Anderson, University of Nebraska-Lincoln
Dennis Atkinson, University of Southern California
James Baxendale, University of Kansas
Elaine Brock, University of Michigan
Jerry Duncan, John Deere
Lou Graziano, The Dow Chemical Company
Caren Heller, Weill Cornell Medical College
Jack Hurley, Siemens Corporate Research, Inc.
Lisa Jones, Ohio State University
Patrick Jones, University of Arizona
Eugene Krentsel, Binghamton University
Carl Mahler, University of North Carolina, Charlotte
Virginia Meade, Intel, Inc.
Ivelina Metcheva, Virginia Commonwealth University
Tom Mildenhall, Kimberly-Clark Corporation
Marcia Molina, Kansas State University
Randolph Moses, Ohio State University
Ernie Mueller, Sigma-Aldrich Biotechnology LP
Tim Mulcahy, University of Minnesota
Jennifer Murphy, George Mason University
Carey Novak, University of Kansas
Katie Petersen, Kauffman Innovation Network, Inc.
Rebecca Poon, Sigma-Aldrich Corporation
Norma Rubio, New Jersey Institute of Technology
Robert Samors, Association of Public and Land-grant Universities
Dawn Sanchez, University of Texas, Austin
John Schneider, Purdue University
Suzanne Schwartz, Weill Cornell Medical College
Judith Sheft, New Jersey Institute of Technology
Rebecca Silveston-Keith, Lexmark International, Inc.
Jennings Taylor, Faraday Technology Corporation
Jill Thayer, University of Nebraska-Lincoln
Russell Thomas, North Carolina State University

Appendix B: Potential Extension of the Project

KEY (TOP-LEVEL) OBJECTIVES:

- Usage of partnership modes
- Drivers for partnership modes
- Hurdles to partnership modes
- Misaligned industry/academia perspectives and/or bias
- Best practices
- Ways in which each type of partnership can be marketed to the other party?
- Metrics that are or could be employed to measure the success of each type of relationship

SPECIFIC SUB-OBJECTIVES:

Use of partnership modes:

- Modes being used
- Frequency of use of each mode
- Identification of additional partnership forms
- Trends

Drivers for one partnership mode over another:

- Anticipated impact of relationship on business?
- Extent to which partnership mode depends on knowledge and experience of partner?
- Extent to which it depends on type of university/company, size of university/company, geographic region or other aspect?
- Internal and external factors that drive toward certain partnership forms over others?
- Needed change to make higher value (however defined) partnership forms more accessible?

Hurdles/Enablers to partnership modes:

- Influence of size on the type of partnership that takes place?
- Experience of company/university concerned?
- Most common issues (e.g., money, intellectual property, time)?

Misaligned industry/academia perspectives and or bias:

- Differences between industry and academia?
- Drivers for different attitudes?
- Factors behind failure to establish so-called higher value partnerships?
- Industry partnership objectives?
- Academia partnership objectives?
- Perceptions of value for companies and universities?
- Academia misunderstandings of Industry?
- Industry misunderstandings of Academia?

Best practices:

- Extent to which partnership occurs within the university/company?
- Feasibility of particular forms of partnership in certain sectors or for certain companies and universities?
- Factors that increase the likelihood of a successful partnership?
- Mechanisms used by individual companies and universities to identify future partnerships and approaches taken to position themselves in this respect?

Ways in which each type of partnership could be marketed to the other party:

- How can each of the partnership opportunities be marketed to academia and industry?
- What media formats might be appropriate?

Metrics that are or could be employed to measure the success of each type of relationship:

- What are the approaches taken universities and companies to measure the success of their corporate and academic relationship, respectively?
- What does each actually track and measure?

Appendix C: About UIDP

MISSION

Convened by the National Academies, the University-Industry Demonstration Partnership (UIDP – www.uidp.org) is an organization of universities and companies committed to increasing the number and breadth of university-industry collaborative partnerships in the United States.

The UIDP accomplishes its mission via a coalition of universities and companies who engage in voluntary collaborative experiments on new approaches to sponsored research, licensing arrangements, and the broader strategic elements of a healthy, long-term university-industry relationship. Institutional experiments are chosen and jointly pursued by willing members when they have the potential to increase the level, degree, or ease of university-industry collaboration.

VALUES

The UIDP operates based on the following values:

- Innovation for the public good; maximizing – to the greatest extent possible – the information and products that will ultimately be available to the public through collaborative private and public enterprise.
- Cooperative, multi-dimensional, long-term partnerships leading to accelerated collaborative efforts.
- The development of a deep understanding and respect of the diverse goals, missions, and cultures among our universities and companies, and appreciate the synergy that they can afford.
- Each partner's depth of expertise and strive to provide an equal opportunity for voicing that perspective.
- An honest dialogue which is open to alternative and novel ideas, acknowledges differences, and manages conflict.
- A mutual commitment to shared scholarship and expertise, training and professional development.
- Strategic, result-oriented thinking and the development of practical, active demonstrations.
- The pursuit of efficiency and effectiveness, seeking to streamline transactions.
- A commitment to principled and transparent negotiations
- We recognize the value of university-industry collaborations and the lost opportunity when successful agreements cannot be reached.

MEMBER ORGANIZATIONS DURING FISCAL YEAR 2012

Arizona State University	Oregon State University
BASF – The Chemical Company	Pacific Northwest National Laboratory
Binghamton University	Pennsylvania State University
Boeing Company	Pfizer
California Institute of Technology	Procter & Gamble
Carnegie Mellon University	Purdue University
Colgate-Palmolive Company	QB3, UCSF
Colorado State University	Rensselaer Polytechnic Institute
Cornell University	Rutgers, The State University of NJ
Covidien	SEMATECH
Deere & Company (John Deere)	Semiconductor Research Corporation
Dow Chemical Company	Siemens Corporate Research, Inc.
Drexel University	Stanford University
DuPont	Syracuse University
Emory University	Texas A&M University
Essilor of America, Inc.	Texas State University, San Marcos
Faraday Technology Inc.	University of Akron
General Motors	University of Alabama, Birmingham
Georgia Health Sciences University	University of Alabama, Tuscaloosa
Georgia Institute of Technology	University of Arizona
Georgia State University	University of California
Hershey Company	University of California, Davis
Hewlett Packard Company	University of California, Irvine
IBM	University of Cincinnati
Intel Corporation	University of Connecticut
Iowa State University	University of Illinois, Urbana-Champaign
Kansas State University	University of Iowa
Kimberly-Clark Corporation	University of Kansas
Lexmark International	University of Kentucky
Lockheed Martin Corporation	University of Maryland
Massachusetts Institute of Technology	University of Michigan
Michelin North America	University of Minnesota
Michigan State University	University of Missouri
Mississippi State	University of Nebraska – Lincoln
Monsanto Company	University of New Mexico
New Jersey Institute of Technology	University of North Carolina – Chapel Hill
North Carolina State University	University of North Carolina – Charlotte
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Novartis Vaccines & Diagnostics, Inc.	University of Oregon
Novo Nordisk	University of Pittsburgh
Ohio State University	University of Rochester

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Washington University in St. Louis
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