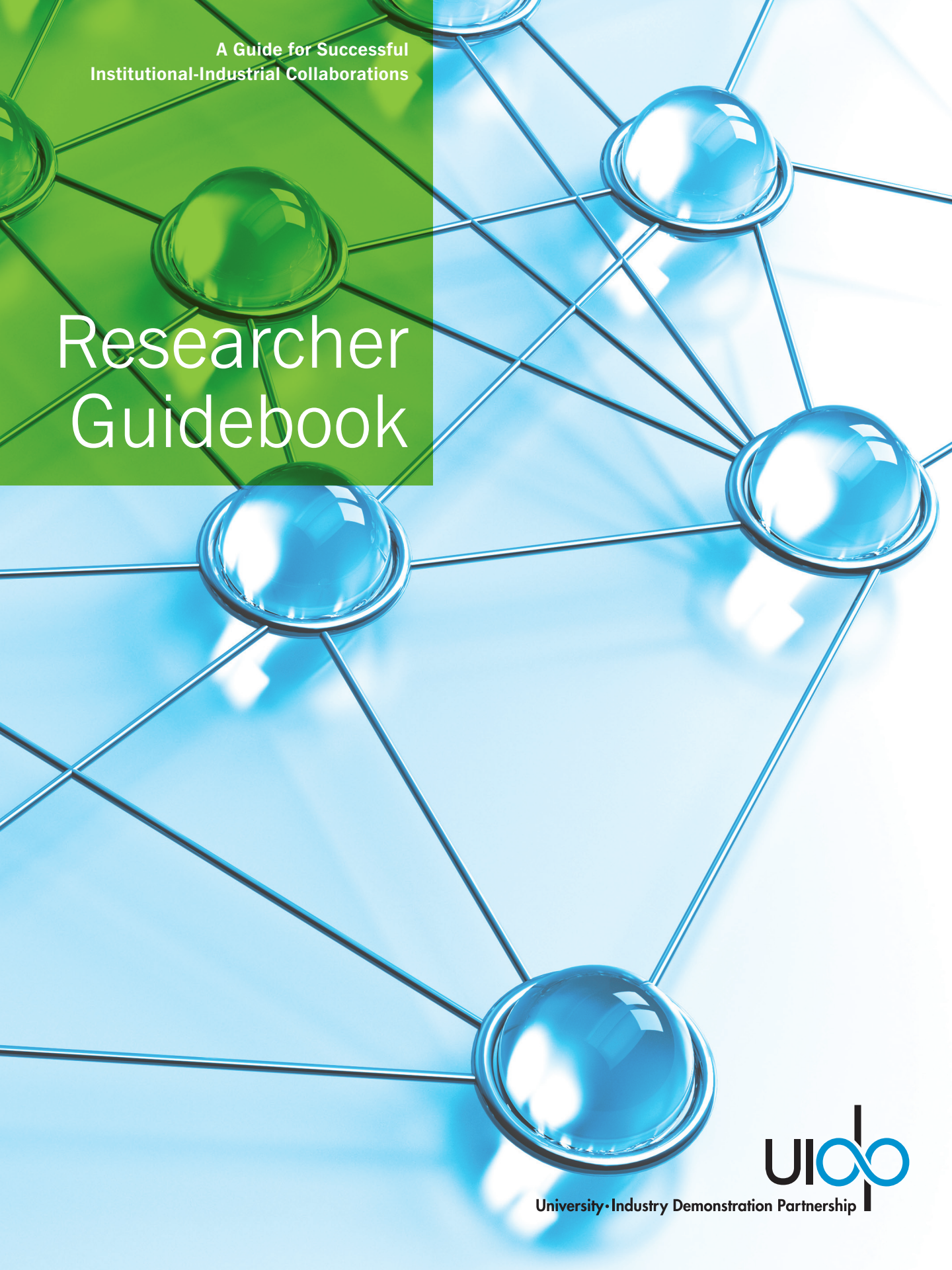
A Guide for Successful
Institutional-Industrial Collaborations

Researcher Guidebook



University·Industry Demonstration Partnership

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Researcher Guidebook

A Guide for Successful Institutional-Industrial Collaborations

About this book

At the spring 2009 University-Industry Demonstration Partnership (UIDP) meeting in Atlanta, a presentation was delivered by two representatives from the UIDP community; one was an untenured, assistant professor and the other was a technical team leader for a consumer products company. They had met at a scientific society meeting and after a presentation by the junior faculty member, they discussed (over the proverbial cup of coffee) a proposed project that the company was interested in sponsoring in the academic lab. The two UIDP session presenters described the long and convoluted process that took place over the next nine months – the numerous offices at both the university and company that were involved in negotiating the various aspects of the agreement, the periodic requests from the academic and corporate scientists as to the status of the negotiation, the lack of encouragement that the untenured researcher received from his academic department brethren and the ultimate outcome – an industry supported project that was conducted at one of America's finest institutions of higher education.

When queried as to why the company persevered during this lengthy process, the corporate lab leader simply stated: ***This academic researcher is the best in the world at what he does and I think he can help my company make money.***

As a project-oriented organization convened by the National Academies, the UIDP members' natural response to a problem impacting university-industry relations is to ask what the members can do to address this challenge. And so was born the Researcher Guidebook project.

This reference piece would not have been produced without the strong commitment of many UIDP member (as well as other non-UIDP member) representatives who met over a two-year period to develop and refine what is hoped to be a practical and dynamic tool for active researchers from academia, government labs and industry.

On behalf of the entire UIDP community, I wish to thank these academic and corporate research and commercialization practitioners who devoted a significant amount of time and energy to make this handbook a reality. The contributors' names are mentioned on subsequent pages but I would like to recognize certain individuals who worked behind the scenes to help craft this document.

Michelle Corrigan was a graduate student at the University of New Mexico at the time that the project was initiated and she ably served as the project manager during its creation and development. Laurena Mostella from the National Academies provided logistical and administrative support and was extremely helpful in moving the project forward. Susan Sauer Sloan from the National Academies provided candid insights on how best to disseminate this tool; Robert Starbuck, formerly with Wyeth Pharmaceuticals and UIDP Associate as well as Kathy Grzech from the University of Kentucky, reviewed and edited the document; and Denise Duane from the University of South Carolina was instrumental in getting the handbook published.

Finally, the project leads (Dudley Sharp who has recently retired from Arizona State University, John McEntire from Battelle and Pacific Northwest National Lab, and Rebecca Silveston-Keith from Lexmark) did an outstanding job in leading this effort which resulted in the release of this valuable resource.

We welcome your thoughts, comments, and perspectives on the handbook and encourage your active participation in the UIDP's activities.

— Anthony M. Boccanfuso,
Ph.D. UIDP Executive Director

This guide was prepared in 2010–12 by the University-Industry Demonstration Partnership (UIDP) Researcher Guidebook Working Group whose members were drawn from a range of universities, companies, non-profits, and the federal government. The guidebook is for the benefit of researchers from institutions such as universities, national laboratories, and other non-profit research organizations and researchers from industry who seek to gain experience working within institutional-industrial research collaboration. The content that follows is intended to guide the individual researcher in understanding the unique aspects of this relationship and to increase the likelihood of more successful institutional-industrial collaborations.

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Prelude

"I wish someone had told me this when I was just getting started . . . " – a senior researcher

The University-Industry Demonstration Project (UIDP) is an association of universities and non-profit research organizations (including national laboratories)—collectively denoted as institutions—and corporations or industrial entities convened by The National Academies. The UIDP provides a forum for academia, industry, government and non-profit sector representatives to meet and discuss various issues that arise around collaborative institutional-industrial research and research results commercialization efforts. The UIDP helps representatives of these respective groups better understand the culture and constraints of their research counterparts in these diverse organizations.

In 2010, the UIDP set out to develop a guidebook to address the opportunities and challenges unique to institution and industry collaborations. UIDP member representatives possess a wealth of experience in advancing institutional-industrial relationships. As a result, they are often responsible for facilitating such collaborations at their institutions. This guidebook, which specifically targets active researchers (at all career stages) in institutions and industry, is the product of the collective expertise of these member representatives. It presents the perspective of a senior researcher, i.e., one with extensive experience in this arena, whose insights may benefit a researcher who may have little experience in forging and maintaining institutional-industrial collaborative relationships.

The guidebook is divided into two parts: Part 1 is dedicated to the Institutional Researcher; Part 2 is dedicated to the Industrial Researcher. These two companion portions of the guidebook together create a strategic tool to promote greater understanding of the issues that face both parties in order to facilitate more effective collaborations for mutual benefit.

This guide contains answers to central questions that face researchers aiming to achieve healthy, productive collaborations, while at the same time identifying pitfalls and caveats that are unique to working in this diverse collaborative environment. Reading this guidebook should lead the researcher to ask the right questions, both of the organization and of the potential collaborator, to determine whether to proceed with a particular collaboration.

All organizations are set up differently, with varying research support infrastructure. This guidebook will help identify common service configurations among those offices whose mission is to assist researchers in these collaborations.

The Institutional Researcher section addresses the 10 key issues identified as critical to generating fruitful alliances, as put forth by the membership of UIDP. The Industrial Researcher section is organized to mirror these issues from the corporate point of view. Important differences—as well as similarities—in the processes, practices, and philosophies of both sides are highlighted. A list of key points concludes each section. A glossary and bibliography are also provided to assist with unfamiliar terms and provide additional resources to help advance the American research enterprise. More detailed information such as definitions is provided in the Appendices.

The topics covered are the result of deliberations from a variety of sources and are meant to provide a comprehensive overview with enough information to help identify the basic resources available within most organizations to obtain the needed support. The UIDP website (www.uidp.org) provides additional resources, such as the Contract Accords handbook. The objective of these Contract Accords is to allow each party to gain a greater understanding of procedures to adequately address these topics and to allow for mutual benefit during the negotiation of sponsored research agreements (SRAs).

In the group discussions that informed the development of this guidebook, key messages about institutional-industrial collaborations emerged, including the following:

- High-value, high-return institutional-industrial research is collaborative and, thus, requires management from both parties.
- Collaborative research programs involving small businesses are different than those with large corporations.
- Differences in approaches to legal policy and intellectual property (IP) policy in institutional-industrial research collaborations may be overwhelming to the researcher the first time and therefore require substantial discussions within and between the collaborating organizations to be handled successfully.
- A central office within each organization specifically dedicated to coordinating efforts to enhance research collaboration is a useful and necessary resource at both institutions and industrial organizations.
- Better results accumulate when partnering is structured for long-term relationships as opposed to short-term, one-time projects. The long-term benefits or local impacts of institutional-industrial collaborations usually supersede the specific goals of a project.
- Despite variations in the missions, cultures, and motivations of the parties engaged in collaborative research, collaborative projects provide a means to build new relationships and to share resources to foster new organizational capacity. Collaborations that cross traditional organizational boundaries allow the parties to accomplish together what may not be possible within a collaboration of similar organizations.
- Metrics for evaluating these collaborations should transcend the size of an award to an institution or the development of a new commercial product; rather, many other factors may contribute to success, such as workforce development, access to specialized equipment and other factors of importance to the parties.
- Very few institutional-industrial collaborations are identical and both parties need to recognize the inherent organizational qualities affecting any collaboration.
- Most research institutions have a history of working with industry and pursue approaches that mirror their institutions' value and culture. The same is true for industry, some companies have a long history of institutional engagement; others do not.

Research Collaborative Summary

INSTITUTIONAL PERSPECTIVE	KEY ISSUES	INDUSTRIAL PERSPECTIVE
	Managing Expectations	
Understand that Industry's mission is to provide goods and services, expand the state of the art and create value for investors.	**Collaborative research may accomplish what is not possible in any other way despite varied missions, cultures, and motivations.**	Understand that the Institution's mission is education, related creation and dissemination of knowledge, and outreach.
Utilize your institutional resources and ensure policies and procedures are in place to effectively manage industry-sponsored research projects.	**Most organizations have a centralized office dedicated to coordinate and navigate through the different approaches to legal and IP policy.**	Determine company's perspective on IP ownership, use restrictions, and publication sign-off authority by finding appropriate internal contacts.
Determine up-front whether you can and want to meet the sponsor's business needs while satisfying your core mission.	**A better chance of successful project outcomes results from correctly aligning industry with institutions based on needs and skills sets.**	To gain appropriate internal approvals, show that collaboration investment will provide compelling benefits.
Determine the type of project within the continuum of interaction.	**Project type affects the terms of a contract, which in turn affects the desirability of the relationship.**	Determine the expectation of intellectual property generation to help guide the project contract type.
	Benefits and Challenges	
Sponsors offer: alternative funding sources, product development expertise, insight into trends, valuable intellectual property, and special facilities.	**Both entities offer resources that the other can leverage for success and mutual benefit.**	Institutions offer: special facilities, expertise, new perspectives, new recruits, funding, and potentially valuable intellectual property.
Industry is timeline- and deliverable-driven with complex needs like publication delays and confidentiality. Smaller firms tend to be resource limited, have short-term vision and limited follow-on opportunities.	**Conflicting goals and timelines are the biggest cause of negative experiences yet can be aligned with management from both parties.**	Internal justification can be problematic, institutional contract negotiations can be lengthy, and project execution depends on researcher availability – plan early for budget cycle completion.
Work with your licensing office towards different solutions for different market segments and different-sized companies.	**Misalignment of expectations of licensing revenue versus cost of commercialization can kill deals. Up-front fees, royalties, and other costs must be reasonable.**	Have frank discussions internally and with institutional licensing office about the relative value of any potential IP in market segment in relation to commercialization costs.
	Establishing Contacts	
Leverage personal, institutional and business networks to find contacts. Market your expertise in various media as well as publishing and being active at conferences.	**The key challenge is getting to the right person with whom you can arrive at a mutual understanding of a technical problem and its plausible solution.**	Use multiple mechanisms for finding the right contact: internet searches, networking, requests for proposals, conference attendance and external matchmaking services.
Use initial discussions to determine if sponsor project expectations can be met in a mutually acceptable Statement of Work (SOW) with deliverables, timelines, and budgets.	**Minimize disputes and objective creep with careful evaluation and selection of a compatible partner and mutual agreement on project SOW.**	Establish mutual understanding of the research problem, proposed solution and SOW in order to develop internal ROI discussion and management approval.
Assist in developing appropriate documentation to protect the institution's interests based on SOW.	**Follow-on discussions will require confidentiality agreements and contracts.**	Contact your legal services to set up a confidentiality agreement to cover any in-depth conversations.
	Proposals	
Develop an executive summary that shows an efficient plan to resolve issues and has a SOW outlining the deliverables, timelines and communication plan. Craft fair and realistic budget with grants and contracts office.	**Proposal format depends on who initiated contact and where the funding is coming from. Regular, frequent communication is necessary to develop a successful proposal, SOW, and project.**	Set up a communications plan with institutional partner to develop the proposal (exec. summary and SOW), informal and formal updates and reports. Review the proposal with technical and financial management.

Research Collaborative Summary

INSTITUTIONAL PERSPECTIVE	KEY ISSUES	INDUSTRIAL PERSPECTIVE
	Budgeting	
Discuss research costs including overhead, travel, and tuition reimbursement with a sponsor new to Institutional collaboration. Craft budget with internal parties to avoid future problems later in the process.	**Federal agreements may require cost sharing and may include restrictions on Facilities and Administrative (F&A) rates that are unfamiliar to industry.**	Discuss cost effective ways for accomplishing the SOW. Structures include: sponsored research, consulting, or gift. Work venue affects costs, facilities and overhead charges.
	Compliance Issues	
Work with your compliance office to understand applicable aspects to the sponsored research project.	**Improper management of compliance may cause significant consequences to individuals and put the relationship and company's business at risk. Compliance issues to consider include export control, immigration law, and employment law.**	Determine who to contact in your company to see if there are any compliance issues that impact the project scope and deliverables.
	Confidential Proprietary Information	
Protect confidential and proprietary information, since this is extremely important to industry. It can impact your ability or the timeframe to publish results. Special consideration necessary when students will be involved in the project. If the fundamental research exclusion is used to avoid export control issues, then technical information must not be held as confidential and all project results must be published.	**Maintaining confidentiality is in everyone's best interest. Contractual breaches damage relationships and can lead to litigation. Document discussions in writing to clarify future IP matters.**	Self-censor information that is core to your company but not the project, even with a non-disclosure agreement (NDA). Discuss project segmentation and automatic press releases of projects and titles with your Institutional partner.
	Consulting/Outside Activity	
Confirm with appropriate office rules for consulting. Learn about IP rights, confidentiality requirements and agreements, and identify any potential conflicts of interest.	**Each Institution has unique policies on IP ownership related to consulting that can lead to uncertainty about the consultants' obligations and other conflicts of interest.**	Confirm who at the institution has authority to sign a consultancy agreement, can assign intellectual property, can set fee structures for the consultancy agreement, and other potential conflicts of interest.
	Intellectual Property Concerns	
Identify any background and potential foreground IP and who is responsible for IP protection, maintenance, and funding. Understand the impact of any confidential agreements on future publications, conference presentations, other funded agreements, or internal use of existing and new IP.	**Intellectual property ownership can be one of the more contentious issues in Institutional-Industrial projects. Issues are reduced by identifying IP owners and processes to handle IP before the project starts. Understand difference between assignments and rights.**	Discuss background IP for project with your technical and IP management. Patent before discussing commercialization or publishing project results. Define up front contract option terms to foreground IP license. Joint IP ownership does not prevent competitors from licensing the IP.
	Long-Term Relationships	
Consider the long-term benefits when structuring contracts with industrial partners that are a good fit for your research, department and/or institution.	**Long-term benefits and local impact of Institution-Industry collaboration often go beyond initial expectations when long term relationships that are built impact and outweigh the specific project goals. Effective collaborations hinge on building and maintaining trust, effective communication, and agreeable contributions from all parties.**	Develop long-term collaborations by carefully selecting a suitable partner, managing project progress, being an in-house champion, and creating metrics to evaluate the collaboration.

For the Institutional Researcher

This portion of the guidebook is designed for the institutional researcher or principal investigator (PI) who is new to collaborations with industry partners. The guidance in the Managing Expectations section lays the foundation for productive institutional-industrial collaboration by providing an overview of differing organizational environments and by discussing issues unique to such research collaborations.

I. MANAGING EXPECTATIONS

Each party comes into the collaboration with different expectations, organizational cultures, motivations, and experiences. Bridging the gap between the respective missions of institutional and industrial environments is essential to establishing a successful relationship. The core mission of the university is education, related creation and dissemination of knowledge, and outreach. National laboratories aim to provide fundamental science and scientific solutions to the nation's most pressing problems. Finally, industry's core mission includes creating value for investors, providing useful goods and services, and expanding the state of the art in a product or service. From the perspective of the corporate or industry partner, external collaborations are expected to satisfy this mission by providing compelling benefits and return on investment (ROI) in exchange for funding or other tangible considerations.

For the institutional researcher, initiating contacts with the right industry representative can be challenging and establishing contacts in private industry can be a lot of work. However, a solid relationship with a corporate partner can help you, as a principal investigator (PI), to diversify funding sources for your research and lead to unique opportunities for students.

It is critical to understand that industry is interested in funding research that meets a business need. In this regard, industry seeks a match between its research needs and the skills and resources that you can provide. Establishing that match successfully is complicated by the fact that policies and processes at most research institutions are designed to manage federal grants within a carefully defined framework.

Unlike the majority of federally funded research, industry-sponsored research does not follow a set pattern or process. Thus, you will be much more actively involved in the administration of your industrial research portfolio, both in its establishment and in its management. This is especially true for the first project that organizations initiate together, as your industry counterpart may or may not have had previous experience with collaborative research at a university or national laboratory.

For the industry sponsor, you, as the institutional researcher, are the face of your institution and will often have discussions about all aspects of the relationship well before anyone else at your institution. However, it is important to remember that while the technical discussions and scientific understanding of the effort are often between you and the industrial scientist, the contract that puts the project in place will be between your institution and the corporate partner. For these reasons, it is vital that you have a basic understanding of your institution's position on important issues like Intellectual Property (IP) and publication rights and that you know who handles these and other contractual matters.

In order to gain that knowledge, the following is a list of core understandings that you should review (1) before engaging with an industry sponsor in earnest; (2) when you have identified a potential industry sponsor; and (3) when you have moved to discussions of a specific project.

Preparing for Industry Engagement

It is important, at this stage, to gain a good understanding of the processes and policies that your institution has in place to manage industry-funded research.

- *How does your institution manage sponsored research?*

Every institution is different, so it is important to find out what offices are involved with industry-sponsored research at your institution. Typical examples are the sponsored programs office, the office of research, and the technology transfer office (TTO). Over the past decade, there has been a growing trend to centralizing industry engagement into one-stop shops which can catalyze your institution's efforts of industry engagement. If possible, take the time to meet with key contacts in these groups at your organization. Find out what research support resources are available to you and what steps you must follow in order to get your project approved. Your institution's research support personnel want to help you succeed. When you succeed, the institution succeeds.

- *What is your institution's policy on intellectual property?*

IP issues are often a complicated point of negotiation between institutions and industry. Due to the significant investment each institutional research organization makes in research infrastructure and the fact that IP is often the result of many different projects and funding sources, most policies will require that the institution maintain ownership of IP. This is especially true if your institution is a public university. Universities and national laboratories, for example, will typically have standard licensing or option provisions. This topic will often come up in the early stages of discussions with an industry sponsor, so it is important to understand the position your institution will take. Recently, some institutions have made significant changes to how they handle IP emanating from industry-sponsored research.

- *What is your institution's policy on publication rights and dissemination of research results?*

Industrial sponsors will often want to control the release of information about a project they fund due to the proprietary nature of their business environment. Some institutions will allow for a reasonable delay (up to six months) in lifting an embargo on a publication, in order for a company to review the publication for potential patentable inventions or to identify confidential company information that may have been provided to the institutional researcher. Some institutions, however, will not accept any delay or sponsor control over academic publications. This issue is especially important when graduate students or postdoctoral associates are involved in the research. Find out early what position your institution takes on publication rights.

- *What position documents or contract templates does your institution prefer to use?*

Most institutions will have templates for a variety of industry engagements. These templates will present the institution's position on issues like IP and publications, but also on things you may not even think about, such as governing law, jurisdiction, and indemnification. Knowledge of these templates and the ability to share them early in the process with an industrial partner can have a positive impact on the initial stages of negotiations. Usually the institutional contracting office will be able to discuss the contract terms at or during the completion of the technical discussions. In order to do so, though, research support staff will need to know what you are proposing to do, so be prepared to share at least the draft Statement of Work (SOW) with them. It is highly likely that the final agreement will be an edited template document – whether from an institution or a company.

- *Have you reviewed your research portfolio with your technology transfer office to protect any pre-existing technology?*

A discussion with staff in the TTO should include strategies to document and, when necessary, protect your existing research and results. Staff can also discuss the possible market for your current research and institutional processes to manage such IP. By understanding the current value of what you bring to an industrial collaboration, both in existing technology and potential technology, you can hold productive discussions with potential sponsors.

- *What approaches can you adopt to keep your various projects separate?*

Establishing the boundaries of your industry-sponsored project is crucial. Just as federal grants require the grantee to report invention activity associated with each grant, so does industry. However, it becomes even more important when multiple industry sponsors are involved. The ability to articulate to your potential sponsors how you will keep their projects organized and separate in an academic setting is vital. Typically, contracts that institutions use for industrial work do not include warranty clauses with which industry is familiar, so the ultimate responsibility will fall on the PI to protect sponsored projects from access by the external community.

Engaging with a Potential Industry Sponsor

Understanding the existing relationship of the parties and the experience of the industry sponsor can help you anticipate shortcuts or stumbling blocks.

• *What experience has the company had with research institutions?*

If a company is experienced in collaborating with institutions, then IP, publication rights, and other contractual provisions sought by your institution are common practice. However, without prior institutional-industrial collaborative experience, company representatives are likely to be surprised by the fact that the institution will not be able to accept what they consider to be commercially reasonable terms. It is important to help your industry partner understand that institutions are not companies and, as such, are not set up to provide a commercial product. With an inexperienced sponsor, it may be helpful to have your institutional contracting office conduct preliminary discussions with your sponsor so the terms presented to them are clear. This can prevent derailment of negotiations after months of technical discussions. These issues can be even more pronounced when engaging small- and medium-sized firms.

• *What is your institution's experience with the sponsor?*

Knowing the existing institutional relationship between your institution and a particular sponsor can often save time and effort. Many institutions sign master agreements with sponsors with whom they frequently work, or they may have an agreement template that has already been negotiated with your sponsor. Your industrial counterpart may not be aware that many of the collaborative research issues have already been worked out in previous agreements, especially if this agreement was with another division or unit in the company. Your contracting office can provide you that information. Office staff may also be able to provide an indication of issues that arose in negotiations with that sponsor in the past or of issues of importance to the sponsor. Your awareness of such facets of the current relationship will help assure the sponsor that its funds will be well managed.

Discussing a Specific Project

Once you have moved to discussions of a specific project, it is imperative to discern the expectations of both parties to ensure a long-term relationship beyond the initial project boundaries.

• *What does your sponsor expect from the research?*

While it is plausible that a sponsor may be interested in the fundamental science in a particular area, in the majority of cases your sponsor has come to you to address a specific issue that is central to their business. Understanding what an industry partner expects from the project will help you determine whether you can meet the sponsor's expectations and will help you write an SOW and list of deliverables that form the basis for a good contract. Many industrially supported projects begin with the best of intentions, but disputes may arise because the project began without a clear understanding of the expectations of both parties. Once discussion of an agreement has taken place, commit the understanding to writing that includes a descriptive SOW with the agreed-upon deliverables and timeline. This will allow your institutional contracting office to negotiate a strong contract that protects the interests of both parties. Following this practice with industry-sponsored research will also help your TTO determine which party should get the rights to any IP in the event you develop a patentable product.

• *Does your sponsor need or want to assert some control over the dissemination of the results of the project?*

Industry sectors differ in their approach to dissemination of the project's results. Knowing your sponsor's

perspective is important, but knowing what your institution will allow in terms of publication rights or dissemination of research results is critical. If your institution has a policy that prevents it from accepting a publication delay or restriction on release of results, you and your sponsor need to be aware of it. Such restrictions may prevent you from working on a specific project or may impact the way the project is structured. Knowing the possible obstacles to an agreement at the onset of the relationship can save you and your sponsor frustration and time.

Many institutions are willing to accept some delay or restriction, but they must do so while maintaining and supporting their primary mission (e.g., to educate students or improve public understanding of science). When a sponsor negotiates control over dissemination of knowledge, such provisions can impact the makeup of your research team (e.g., graduate students working on their theses) or require that you secure additional administrative approvals before the contract is signed. Knowing the expectations of your institution in advance will allow you to discuss the issue with your institutional contracting office, which in turn may prevent unnecessary delays.

Key Points on Managing Expectations – for the Institutional Researcher:

- Industrial sponsorship can open new and interesting avenues for your research, help recruit technical personnel including undergraduate and graduate students to your lab and provide job opportunities for these individuals.
- Understanding the rules of engagement while anticipating the benefits and potential pitfalls can help you build a sustainable portfolio of industrial research.
- The broader your understanding of these issues, the more deftly you can navigate the process.

II. BENEFITS AND CHALLENGES OF WORKING WITH INDUSTRY

Businesses have historically relied on research institutions for access to fundamental science, continuing education programs, and specialized facilities and equipment. In the face of shrinking corporate research and development (R&D) budgets and increasing global competition, companies today are pushing beyond these traditional boundaries by engaging these institutions to help them solve complex problems, construct global strategies, and explore major opportunities early in development. They are also relying on such institutions more than ever before for the research part of their R&D formulas, to develop (or co-develop), license, and commercialize new technologies. In fact, collaborations with institutions (or other for-profit companies and contract research organizations) have become a common way for companies to outsource some of the research that might have been done in-house just a decade ago.

Both institutions and industry have much to gain from these collaborations since they promote the discovery of new synergies and models that promise mutual potential for ROI. For companies, partnering with institutions provides access to expertise and research that spurs innovation, extends their resources, and sharpens their competitive advantage. For non-profit institutions facing tightening federal budgets—which have created funding gaps in even the top laboratories, collaborations with industry offer promising revenue streams, effective ways to keep abreast of changing market and industry dynamics, and increased competitiveness in pursuing federal funding opportunities.

Types of Engagement

An institutional researcher can engage with a company in numerous ways. The spectrum of industry engagement ranges across support for:

- Work that is parallel, or complementary, to the laboratory's regular work, including federally funded work.
- A commercial application or extension of previously funded work.
- Fee-for-service work that the laboratory is technically suited to do.

Increasingly, institutions and their corporate counterparts are pursuing federal funding jointly to increase their competitiveness at winning these awards. As an investigator, it is critical to understand where in this continuum your engagement with industry lies because the terms of a contract will differ in many factors from one end of this continuum to the other. Those differences may make the relationship more or less palatable to you or your institution.

The UIDP has recently completed a project (The Partnership Continuum – please refer to the UIDP website for additional information) that can add substantial insights into the various ways that institutions can engage companies.

Institutional-Industrial collaborations typically occur within the following scenarios:

- In the course of pursuing fundamental research, an investigator publishes an observation that a company sees as an opportunity to inform or merge into its commercial objectives, leading to a collaboration based on strengths and common interests.

- An institutional investigator has an innovation with a potential commercial use. In partnering with a company working in that commercial space, the innovation can move into the marketplace, benefiting both parties.
- An investigator is working on a topic that is close to, but not exactly, what a company needs. Through sponsored research, the company can work with the investigator for mutual benefit. In an optimal scenario, this can be done while also advancing the academic interests of the investigator, creating synergy.
- A company has a near-term goal for a commercial product and seeks help on a tight timeline to get results through collaboration with the institution.
- An institutional laboratory has an innovation with a long and risky development timeline to commercialization and is seeking a commercial sponsor to support the cost of development and reduce the associated risks of commercial development.

Opportunities and Challenges

While relationships between businesses and institutions are desirable to both entities and, as a result, are expanding in number, scope, and scale, they are not easy to establish, manage, and nurture over time. The biggest source of opportunity, and at the same time, the greatest cause of negative experience in institutional-industrial collaborations stems from the conflicting goals and timelines of the institutional and corporate cultures. With few exceptions, company R&D has a short- to mid-term goal to create or improve an existing product or service. Institutions, on the other hand, generally prefer longer time frames with an interest in basic research to advance science and public benefits.

Because institutions and businesses have complementary missions, visions, operational approaches, and cultures, recognizing these differences is important to establishing and maintaining positive relationships. It is critical to be properly prepared to adapt to the motivators on both sides of the relationship to assure a positive experience for all.

With so many inherent challenges, why would an institutional researcher choose to engage in corporate-funded research? There are many good reasons:

- Companies may have physical resources that an institution cannot access any other way. Companies are typically interested in questions that require applied research, which can be difficult to fund through most federal or foundation funding sources. When an institutional laboratory is interested in pursuing applied research or experiments that lead to product development, non-industry funding sources may be limited.
- Companies can bring tacit knowledge of the product development process, which is otherwise proprietary and generally unattainable to the academic community. Corporate partners can bring experience to a collaboration that can provide the foresight to prevent a PI from committing mistakes already made in industry.
- Industry collaborations can provide access to additional sources of funding (e.g., SBIR [Small Business Innovation Research] and STTR [Small Business Technology]) that encourage collaboration with small businesses. More federal and state funding programs require collaborations for certain grant programs.

- Working with corporations can diversify the curriculum vitae (CV) of an institutional researcher, which serves to improve the competitiveness of future federal grant submissions.
- Research support, often referred to as Internal Research & Development (IRAD) funds, can come directly from a corporate entity.
- Close relationships with companies can provide insights on the direction a particular industry is heading. This can reveal potential market needs and opportunities that institutional researchers can address in their research and commercialization activities.
- Company funding can come quickly when a project is desirable to both parties, sometimes within weeks. By contrast, most federal and foundation sources require as much as a year from submission to award.
- Working with a company can provide valuable experience to students, particularly graduate students. The opportunity to participate at some level in a company-sponsored project allows students to assess potential industries and companies and build relationships that can lead to career development.
- Collaborative projects may create IP that may be immediately valuable to the corporate partner. For institutional researchers, such an outcome can reveal a more immediate application of one's work while potentially generating revenues for the institution.
- Institutional-industrial relationships can provide important economic development advantages for the community, leveraging the resources of the institution and putting them to work throughout the region and the state.
- Companies have access to proprietary materials that can help an institutional researcher advance the lab's current research endeavors or open doors to new areas of investigation.

Thus, institutional-industrial relationships provide a means to bridge scientific breakthroughs and the global marketplace. When a relationship is established between an institution and an industry partner, the relationship has the potential to expand along with corporate expansion to generate new research collaborations, improved capabilities, institutional linkages, philanthropic relationships, and more. There are distinct challenges to industry-funded research although most can be overcome. Obstacles to these relationships include:

- **Time:** Corporate partners are driven by timelines and deliverables, which can make the terms of a project difficult to negotiate and coordinate. In a world of graduate students and various competing obligations such as teaching or pursuing other avenues of research and/or funding, a PI may have difficulty aligning institutional research schedules with business cycles or corporate manufacturing and product development schedules.
- **Agreement:** Negotiating contract agreements between institutions and industry can be complex– particularly IP ownership, clarification of the SOW, indemnification, and publication rights.
- **Confidentiality:** Holding information confidential or delaying its public dissemination until the corporate partner has secured its advantage is expected by industry. However, a PI can use a variety of ways to achieve both the company's goals and the academic goals to disseminate knowledge. Part of this may come through discussions of what the corporate sponsor deems as important for IP purposes and what is not.

- **Classified Work:** Many corporations engage in classified research and will want to pass the secrecy and other obligations on to the institution. Since these represent real restrictions on the research, a contract in this situation must be carefully negotiated, and a proper (i.e., classified or restricted) work environment established.
- **Project Length:** Corporate projects need to be approximately a year in duration if graduate students are involved due to their contract status and educational pursuits at their institution. Longer time periods may be interrupted due to looming graduation. For national laboratories or other non-academic contract research organizations, this is not an issue.

Just as the nature and scope of collaborations between institutions and large corporate partners continue to evolve and develop, institutions are also expanding collaborations with small businesses and have much to gain from these important relationships. While such relationships with smaller entities share many similarities with those involving larger partners, challenges that are unique to small businesses can include:

- **Resource Limitations:** Smaller corporate partners are more likely to have resource limitations—financial, personnel, legal, etc. Resource availability needs to be discussed early on to establish realistic timelines, deliverables, and expectations.
- **Vision/Planning:** Not all small businesses have longer-term plans and visions for the future, so it can be difficult for faculty researchers to initially assess whether a prospective relationship may provide longer-term potential.
- **Limited Funding for Follow-On Research:** The small business may have a narrower scope of interest than the institutional researcher.

Key Points on Working with Industry – Benefits and Challenges for the Institutional Researcher:

- Recognize the timeline and goal-oriented perspective of your industry partner.
- Be aware of and utilize the resources that your institution offers.
- Familiarize yourself with institutional policies and procedures regarding confidentiality agreements, contracts, and IP.
- Understand the decision-making process, clarify details of the process, and identify the ultimate decision-maker for your industry partner for the project.
- Communicate proactively with periodic updates and reports throughout the project as milestones are achieved and/or as problems arise to facilitate research progress and eliminate costly or time-consuming missteps.

III. ESTABLISHING CONTACTS WITH INDUSTRY

There is no single or best way to go about making the contacts that will lead to industry-sponsored research. Unlike federal agencies and other funding sources, industry generally does not advertise its research needs or priorities (although it should be noted that more companies are issuing requests for proposals [RFPs]). This is because that information may be very sensitive—its release could compromise a corporate organization's competitive position. This reality makes it challenging for you to identify corporate contacts. Ideally, you need a scientist or engineer within the industry to champion the work you propose, and that champion needs access to a budget to support the proposed work.

You may need to initiate contact with a prospective corporate partner when you have an idea you believe the industry needs. Your key challenge is identifying a person within the company with whom you can achieve a mutual understanding of a technical problem and potential solution. In order to reach this person, you may need to take advantage of networks—either your own or those you can leverage. You may have access to more networks than you think. Consider the following:

- You may know several people with connections to a given corporation, including former advisors, colleagues, and students that may now work for a potential corporate partner. You may also know other researchers who are engaged in sponsored research for the corporation, and this may present opportunities for collaboration.
- Your institution has a number of networks that you can leverage:
    - Your peers within the institution may have experience with a corporate partner with which you are seeking to establish a relationship.
    - The office of development or advancement may be able to connect you with alumni in the corporate organization with which you want to work.
    - The sponsored programs office at your institution may be able to assist you in determining whether the prospective corporate partner has funded any research recently.
    - The career services office may be able to tell you which recent graduates work with the company.
    - Many institutions have dedicated economic development professionals that are well associated with local industry and can help you make connections.
- You may be able to make connections through participation in a variety of regional and national professional networks.
    - The relevant scientific society or professional association for your discipline may have an active local or regional chapter. These can be great places to meet people outside academia or other non-profit research institutions who are interested in your research area.
    - Contributing articles to the publications of the appropriate society or association can help establish industry contacts. Similarly, making presentations at local, regional, and national meetings and/or contributing to an organization's published proceedings can interest potential industry partners in your work.
    - Local or regional economic development organizations and business councils can present good networking opportunities.

However, personal or leveraged networks may not be sufficient. To get the most out of any network, you will need an appropriate degree of self-promotion. This can represent a culture shift for you if you are unaccustomed to marketing your individual expertise. Think and act more like an entrepreneur with any or all of the following steps:

- Publish and present in the most visible places, including the most prestigious journals.
- When you present at a conference—or just attend—prepare an agenda to make contacts. Pick up a list of participants as a source of potential contacts. Attend the presentations your potential sponsors may be making. Speak with them afterwards, and trade contact information.
- Create and continually update social networking sites such as LinkedIn.
- Revise and maintain your website to attract sponsors. Make sure you include the right tags and metadata so those looking for a problem solver find you.
- Embrace the media. Work with your university communications professionals. Let them know of interesting findings or recognitions. List your credentials with an appropriate expert network (e.g., UIDP) so the news media find you when a story breaks in your area of expertise.
- Take a survey of potential industry partners in your technical niche. Use your local business journal to identify prospective corporate partners in your area.
- Work with individuals in your institution who can help you, including those in research development and support or corporate relations offices.

Key Points on Establishing Contacts with Industry for Institutional Researchers:

- Identify the right person within a corporation to help you achieve a mutual understanding of the research problem and proposed solution.
- Use your access to a number of networks through your institution and professional organizations to help identify that person.
- Achieve visibility in your area of expertise to facilitate connections to potential corporate partners by allowing others (e.g., industry or media representatives) to identify you as an expert in a particular area.

IV. PREPARING PROPOSALS

Identifying and Approaching Funding Sources

You should spend time learning about your industrial partner and the potential for project fit with their specific, strategic objectives. The specific objectives may not be easy to find, as they are often not clearly defined in the content found on the organization's website. Determine who from the organization is publishing (or patenting) in the area of the research. Find a way to connect with individuals you identify. Consider proposing an initial collaboration with limited industry commitment (e.g., a letter of support, participation on an advisory board) to build the relationship.

Institutions collaborate with industry in many different ways. Some of the most common include collaborating with industry to develop a proposal for a third-party funding source, responding to a specific request from an industry funding source, and submitting an unsolicited or investigator-initiated proposal to the industry funding source. While each of these approaches may differ in scope, the proposal preparation process is similar. It is important to confirm how your institution processes proposals. The common components of industrial proposals are outlined below.

Proposal Elements

Each proposal will have essentially the same list of elements, but the degree of collaboration between the industry PI and the institutional PI will be based on the anticipated relationship. When you collaborate to develop a third-party proposal, it is imperative that the parties communicate about the following: who the lead will be for specific components of the proposal, what the submission deadlines are (e.g., for letter of intent, internal submission to institutional sponsored programs offices, proposal submission), and how communication will be facilitated. When you respond to a specific request from industry, you are clearly responsible for developing the elements of the proposal, but you will often be in close contact with the industry researcher to ensure that the proposal covers all necessary information and is responsive to the specific request. You can also develop an unsolicited or investigator-initiated proposal developed solely on your ideas to address a potential area of industry interest.

Industry proposals differ from federal agency proposals in many ways. For example, they may not include standard forms or submission package format requirements common among federal agencies. In its simplest form, an industry proposal may only require a cover letter and an executive summary or abstract to inform the decision-maker about the proposed research. Follow the specified format rather than modifying existing academic or federal agency proposals.

Industry project budgets typically do not contain salary caps and have fewer restrictions on budget items such as administrative support and supplies. However, keep in mind that industry sponsors are very interested in cost containment and will likely not fund proposals with overstated budgets. Make use of your company contacts that can provide suggestions for key elements of the proposals and request a copy of another funded proposal if available.

The Statement of Work and Deliverables

This is typically the most important part of the proposal, as it explains the tasks to be completed and the institutional resources committed in support of the project. When you prepare a Statement of Work (SOW) for an industry project, consider the following points. First, an SOW is often included in a direct solicitation from the industry sponsor. It is very important for you to carefully consider that document and to make the effort to work with the industry researcher to refine, elaborate, and clarify where necessary. You need to be very sure that the project requirements and procedures are clear, well stated, and most importantly, achievable within the proposed timeline and budget.

You should also be aware that industry often behaves differently from the federal government in that timetables can change quickly, priorities and research emphases change more often, and personnel may turn over several times during a project period. This means that the SOW needs to be well defined and continuously reviewed by PIs of both organizations. In order for an institutional-industrial relationship to be truly successful, there needs to be regular and frequent communication between the parties. Additionally, both the budget and the SOW should be developed with the idea that changes may occur, requiring some degree of flexibility on the part of the PI to make budgetary adjustments or to alter the SOW in response to those changes.

Deliverables and milestones are also often treated differently in industry projects than in those funded by the federal government. Industry typically has a specific problem to address, certain well-defined research priorities to pursue, and the profit motive; deliverables and milestones are more definite and specific. You should be aware that industry is less likely to grant no-cost extensions or to be forgiving of missed deadlines and milestones. Thus, it is imperative to be realistic with deliverable schedules and budget numbers. It is far better to deliver early and under budget than to be unable to fulfill the proposed deliverables or meet the milestones. Once you can demonstrate an understanding of the industry's timelines and needs, there is a greater likelihood that you will have subsequent proposals funded, develop a lasting relationship with the industry sponsor, and become a "go-to" researcher for the sponsor.

Key takeaway – Institutional researchers succeed when they underpromise and overdeliver

In addition, it may be helpful to include in the proposal prior successes with problems related to the industry's need in the form of previous publications or presentations. It is not necessary to include everything from your CV, but only that which is pertinent and relevant. This can provide the industry sponsor assurance regarding your capability and understanding of the problem at hand.

Finally, consult with your sponsored projects office regarding assurance and representation forms for industry projects. These are often different from the federal assurances and representations. Each institution has established policies on the assurances or representations it is able to make.

Preparing for Industry Reviews

An industry decision-maker is looking for a proposal that can solve an immediate problem, enhance an existing product, or further establish research priorities with a fair and realistic budget and delivery schedule. The corporate partner will want to see that you understand, as conveyed either through the

proposal or through conversations and meetings, what the expected results are, and can propose a thoughtful, efficient way to achieve them.

Key Points on Preparing Proposals for Institutional Researchers:

- Communicate regularly and frequently with your industry researcher to develop a successful proposal and lead to a successful project.
- Set realistic and achievable milestones and deliverables to increase the probability of a successful collaboration.

V. BUDGETING

Industry project budgets may differ from federal project budgets in a few important regards. For example, industry projects typically do not contain salary caps. They may also have fewer restrictions on budget items such as administrative support and supplies. Your institution may provide for different budgeting strategies, including requiring specific overhead rates on industry agreements, than those that apply to federal contracts. Federal agreements may require cost sharing and/or provide for restrictions on facilities and administrative (F&A) rates, typically making these arrangements unacceptable for industry agreements due to potential IP, compliance, and cost concerns, to mention a few.

In forecasting travel, include provisions for face-to-face meetings among the researchers. These meetings can facilitate communication and efficiently and effectively clear up misunderstandings and confusion.

You should anticipate that your industry counterparts may not understand your budget system. For example, Industry may not be familiar with the F&A rate structure, applied to indirect charges, that differs depending on the type of research, who is involved, and where it is performed. Also, you should be prepared to explain that there are direct charges that do not incur F&A charges. For example, tuition reimbursement is normally a direct charge and part of the institutional budget system.

You will also find that industry sponsors are more focused on the total cost of the project rather than the individual cost items in your budget. Be sure to be clear that the institution is a non-profit organization, and only budgets the costs expected to be incurred.

Key Points on Budgeting for the Institutional Researcher

- Be aware that institutional budgeting policies are different for industry and federal projects.
- Be prepared to share the restrictions of your budgeting system with your industrial partner.
- Unlike government sponsors, industry may not provide the entire award and only give funding in stages when deliverables are met; therefore, some institutional finance offices will only provide you access to funding in the same manner that the company approves funding.

VI. SOME COMPLIANCE ISSUES

Depending on the specific industry, you may or may not have been aware of the various compliance requirements to which a company adheres, including those that ensure that research will be conducted in accordance with strict ethical principles and federal, state, and collaborating research institution regulations and policies. There are several compliance issues of concern – two are included here and others will be added in later versions.

Standards

If you are working with a sponsor in the pharmaceutical or medical device fields, be careful of commitments to Good Manufacturing Practice (GMP) or Good Laboratory Practice (GLP) standards. These two compliance standards have very detailed requirements that many universities and non-profit research institutions do not meet. If these standards come up in discussions with an industry sponsor or in contract language suggested, before you commit to anything, contact the office at your institution that handles compliance issues.

Human and Animal Subjects

As faculty at a research institution or a scientist at a national laboratory or other research organization, you are probably already aware that there exist many federal, state, and institutional policies on research compliance to ensure that research is conducted in accordance with strict ethical principles. Industry supported research would be subject to the same policies that exist for federally supported research. Most institutions have research oversight committees that work with faculty and staff to promote ethical and responsible conduct of research involving human subjects, vertebrate animal subjects, and the use of recombinant DNA. While each institution may handle these types of research differently, they are based on some overarching federal regulations.

- If an institution conducts human subject research, it will have an Institutional Review Board (IRB) and that IRB will base most, if not all, of its protocols off of the "The Common Rule" found in the Code of Federal Regulations 45 CFR 46 ("Basic HHS Policy for Protection of Human Research Subjects," which can be found at http://www.hhs.gov/ohrp/humansubjects/commonrule/index.html
- If an institution conducts research with vertebrate animals, it will have an Institutional Animal Care and Use Committee (IACUC) and will follow the guidelines as set forth by the Office of Laboratory Animal Welfare (under DHHS) which can be found at http://grants.nih.gov/grants/olaw/olaw.htm
- If an institution conducts research using recombinant DNA, it will follow the rules as set forth by NIH which can be found at http://oba.od.nih.gov/oba/rac/Guidelines/NIH_Guidelines.htm

If your research, regardless of the sponsor, will involve any of these regulatory issues, it is essential that you know who at your institution handles these approvals and what you have to do before you begin the project.

Other specific areas of research compliance of which you should be cognizant are responsible conduct of research, conflict of interest, biosafety, and chemical and radiation safety. While you may be very familiar with these regulatory issues, your industry partner may not. You should never take for granted that your industry counterpart understands the way in which your organization responds to these requirements. In the interest

of managing expectations and preempting frustration, make sure your industry counterpart is aware of the process and possible delays, and consider the regulatory process when you discuss and agree to timelines and deliverables.

If you have worked only in the area of federally sponsored research, another area of regulatory compliance that you may not be as familiar with is export control laws and regulations. When university researchers conduct fundamental research with the intent to share freely the results of the projects, they are somewhat sheltered from the impact of the export control laws. However, when a researcher receives proprietary information under the protection of a non-disclosure agreement or enters into a contract that includes restrictions on the dissemination of results, or publication control on the part of the sponsor, the full weight of the export control laws must be considered. For this reason, we go into more detail about these regulations and how your institution may handle their implications.

Export Control

Export controls (and associated sanctions) can impact research especially when there is some form of proprietary or security restrictions impacting the open publication of or access to research results by foreign nationals. There are multiple agencies responsible for export controls but three are responsible for most controls. The International Traffic in Arms Regulations (ITAR), under the auspices of the U.S. Department of State Directorate of Defense Trade Controls (DDTC), control the export and access to articles, services, and related technical data related to military items contained in the U.S. Munitions List (USML); The Export Administration Regulations (EAR), under the auspices of the U.S. Department of Commerce Bureau of Industry and Security (BIS), control the export of goods and services identified on the Commodity Control List (CCL) which control "dual use" (commercial items with a potential military application); The U.S. Department of Treasury Office of Foreign Assets Control (OFAC) is responsible for economic and trade sanctions making it unlawful to provide anything of value to an individual and entity named on the Specially Designated Nationals list.

It can be unlawful to send or take export-controlled information out of the U.S., disclose (orally or visually) or transfer export-controlled information to a foreign person inside or outside the U.S. without proper authorization. Computers are not usually the problem; however, the software or technology on the computer can be controlled. It is important for researchers conducting controlled work or traveling to foreign countries and taking equipment, computers or technology abroad to consult with the office at their institution or company responsible for export controls.

In general, ITAR-controlled information means activities, items, and information related to the design, development, engineering, manufacturing, production, assembly, testing, repair, maintenance, operation, modification, demilitarization, destruction, processing, or use of items with a capacity for military application utility. EAR-controlled equipment and technology has a slightly more lenient definition that usually allows access to and operation of EAR-controlled equipment. Export-controlled information does not include basic marketing information on function or purpose; general system descriptions; or information concerning general scientific, mathematical, or engineering principles commonly taught in schools, colleges and universities or information in the public domain.

Researchers may be held personally responsible for violations of the ITAR and EAR. As a result, you should exercise care in using and sharing export-controlled information with others, even U.S. citizens and permanent residents who may not be aware of the controlled nature of the work. Technical information, data, materials, software, or hardware, i.e.; technology generated from a controlled project, must be secured from use and observation by unlicensed non-U.S. citizens.

Export control laws may apply when you are sharing proprietary information under the protection of a non-disclosure agreement or have a contract that restricts the dissemination of results, or publication control. Not all proprietary information is controlled but because it is not in the public domain, your export controls office should make a determination if it can be shared with foreign individuals or entities. Your employer may be performing functions or manufacturing items subject to export control requirements and you could put your university or company's entire business at risk if you fail to adhere to export control statutes. Laws have been in place since the 1940s to restrict export of goods, technologies, and related technical information that might harm U.S. interests or contribute to the military capabilities of countries whose policies conflict with the U.S. These laws also prohibit sharing of such items or information on U.S. soil (including institutional campuses) with foreign nationals without a license and with individuals from specifically embargoed countries. Export controls impact research administration; sharing of information; publishing of results; managing IP; processing visas; hiring of foreign nationals; purchasing, shipping, and utilizing scientific equipment; working with collaborators and colleagues within and outside of the U.S.; academic advancement for non-U.S. students; and traveling outside the U.S. for scientific and educational purposes. When export controlled technology is conveyed to a foreign national, even in the U.S., the transfer of technology or source code to a foreign national is "deemed" to be an export to the home country of that individual. Determining when an export license is needed is complex and should be made by the responsible official for export controls. In most cases, it is important to also consider who the end user will be. For example, transfer of an item or technology to a Canadian individual or entity might not be controlled but one must be concerned about whether that technology or item will be further transferred to a country of individual from a country for which a direct transfer would be controlled.

Fundamental research is basic and applied research in science and engineering conducted at an accredited institution of higher education or higher learning located in the United States where the resulting information is ordinarily published and shared broadly within the scientific community and not restricted for proprietary reasons or specific national security reasons or subject to specific U.S. government access and dissemination controls. The results of such research are generally excluded from export controls. The Fundamental Research Exclusion (FRE) applies to the flow of information associated with the performance of the research but not to the physical export of controlled items and controlled software and its associated source code. Executable code is controlled for software subject to the ITAR.

Researchers planning to conduct a project that may be subject to export controls should consult the responsible official at their university or company for interpretations of these complex laws and to learn how to carry out their research project and disseminate results lawfully.

For more information on export control regulations and the fundamental research exclusion, see UIDP's contract accord on this topic available online at http://sites.nationalacademies.org/PGA/uidp/PGA_058342.

Key Points on Compliance Issues for the Institutional Researcher:

- Know your institutional policies and the responsible offices for compliance.
- Share information with your industry counterpart about the regulatory environment that may impact timelines and deliverables.
- Be aware that the civil and criminal penalties for violating export control laws can be significant and personal.

VII. CONFIDENTIAL/PROPRIETARY INFORMATION (PUBLICATION ISSUES)

One of the most significant areas in which your perspective will differ from that of your industry counterpart is in how you treat information. The fundamental culture and behavioral imperatives are diametrically opposed between a university and a company. In an institution, the culture is one of openness and the free flow of information between people on campus and among campuses. In a company, certain information is only shared internally or under non-disclosure agreements (NDA) and in some circumstances, some information is sensitive and only shared on a need-to-know basis. Institutions see dissemination of information as a primary responsibility. Industry will see protection of proprietary information as critical to its economic success. This can take many forms – non-disclosure agreements (NDA), non-receipt agreement (NRA), and mutual confidential exchange agreement (CEA) – depending on whose information needs to be protected. This is commonly a prerequisite to your sponsored research agreement (SRA). The SRA will either reference the original confidential agreement or may have confidentiality included.

It is important that you establish clear communication as to the type of information you need to protect and your responsibility to publish the results of your work if applicable. The type of information that may need protection from public disclosure may include trade secrets; supplier lists; and methods of production, formulas, reports, and results. In most cases, these issues will only be a problem when the two parties do not take the time to adequately address the issue in advance. Check with your sponsored research office for further clarification.

When contract language is too broad, it can lead to potential conflict. You can assist your contract negotiators by identifying the information you need to use and the format in which you need it in order to publish your work. Even if you personally are willing to forego publication of the results of your work, most institutional policy prohibits the acceptance of terms in an SRA which restrict publication in any way. Breaches of the contractual agreement in this, or any, area may lead to litigation, loss of grant funds or, at the least, a damaged relationship. Despite the differences in missions, most SRAs incorporate a means for companies to satisfy their need to protect their information and the institution's need to publish. For example, most SRAs allow the industrial sponsor a period of review where they can excise any sensitive information prior to publication.

It is important to remember that the information you possess has value to your institution. Before you hold any discussions (including informal ones) with an outside party regarding your work and plans to advance the science, contact the individual(s) in your organization responsible for negotiating SRAs. Staff in the contracting office can assist by suggesting ways to protect information you disclose, such as completing an NDA. **Do not sign an NDA without organizational review and approval.** In some instances there may be agreements that can block you from publishing work already performed. The maintenance of confidential information is in the interest of all parties to an agreement, as it allows corporate partners the ability to obtain outside research assistance without compromising proprietary information, while allowing institutional researchers access to information that would not be otherwise obtainable.

Key Points on Confidential/Proprietary Information (Publication Issues) for the Institutional Researcher

- Be aware that Institutions see dissemination of information as a primary responsibility while Industry will see protection of proprietary information as critical to its economic success.
- Be prepared to execute some type of confidential agreement as a prerequisite to working with industry due to the importance to the industry to protect their competitive advantage.
- Insure that your publication rights are protected if applicable.

VIII. CONSULTING/OUTSIDE ACTIVITY

Overview

Consulting activities to meet the needs of your industrial partners can mutually benefit both your institution and your potential industrial sponsors. Many institutions encourage and support their employees consulting with corporate partners as a means to deepen and broaden their professional expertise, enhance their teaching skills, and promote economic growth and development in their states and communities. Conversely, consulting with institutional researchers benefits corporate partners and ensures access to a broad range of specialized expertise and problem-solving skills ready to be applied to industry-specific projects. Moreover, most institutions acknowledge that for corporate partners, consulting is an efficient and practical way to promote, establish, and sustain long-term collaborative relationships that may lead to new sources of industrial- and joint-industrial/federal-sponsored research funding. After sponsored projects are completed, consulting offers a way to maintain and nurture working relationships that might lead to future ideas for sponsored research and provide a pipeline for student transition into the workforce.

Because of their primary responsibility to their institutions and the differences inherent to institutions and industry, institutional researchers and their industry counterparts are often uncertain about their obligations to their respective organizations. This chapter provides guidelines to consider as faculty engage in contractual agreements with industrial partners.

Consulting for Outside Entities

You may be contracted by outside organizations to provide professional services as a consultant. When considering these opportunities, you should examine the consulting agreement and ensure that its terms and conditions do not interfere with your contractual obligations to your primary employer. In this regard, consider the following questions:

- Will consulting interfere with your performance of primary duties and/or responsibilities as an employee of a research institution?
- Is consulting compatible with the interests and mission of your institution?
- Will your consulting require any use of institutional resources and infrastructure (e.g., facilities, laboratories, equipment, students, or other employees)?

In most cases, you will need to obtain prior approval to participate in outside consulting activities from an appropriate administrative official. However, some professional activities such as lectures, talks, and presentations at other institutions and non-profit organizations; service on review panels for federal agencies; and service as reviewers for academic journals are not usually considered consulting activities and do not normally require prior approval.

Prior to engaging in consulting activities, you should familiarize yourself with the institutional policies governing engagement in outside activities such as those on:

- Engagement in outside activities, conflict of commitment, and conflict of interest
- IP and copyright
- Use of institutional resources and facilities
- Procurement of goods and services

Similarly, be aware of the federal and state regulations, such as those addressing:

- Research objectivity
- Financial conflict of interest
- Effort reporting
- Export control and Office of Foreign Assets Control (OFAC) sanctions (consulting for international organizations)
- Institutional conflict of interest

As consulting often involves sharing of confidential information with the corporate partner, you should keep in mind that states have adopted open records laws. Therefore, in your role as a consultant, you should be careful not to store a corporate partner's confidential and sensitive information on computers and servers owned by the institution.

Planning

Prior to engaging in consulting work, you and your industry partner should hold a conversation to determine the needs of the project and the scope of the work. A clearly defined SOW should ensure that the consulting project is well contained and does not overlap with other consulting work or sponsored projects that are conducted under the your supervision. The terms and conditions of the consulting agreements should be such that the work can be completed with your personal resources and not with institutional resources. In some cases, institutional resources may be used under separate research and testing agreements or through the use of recharge centers. In practice, it is always important to maintain a clear separation between institutional projects and consulting projects by having well-defined SOWs and lists of deliverables, and by maintaining separate notebooks and project records for each project.

As a general rule, you must never use undergraduate or graduate students, other trainees, and staff members under your supervision to fulfill consulting obligations. You should also consider the roles and responsibilities of all the people involved in the project, equipment needed, budgeting and billing, IP, restrictions on publications, security clearances, and storage of confidential information in the consulting agreement.

Consulting for an Employee-Owned Company

A special case of consulting for outside entities is the case when you consult or serve as an officer or agent for you own company or a company in which an ownership stake or other financial interest is a part of the consulting scenario. In these particular cases, the institution may determine that there is a

potential for a real or apparent financial conflict of interest. Under those circumstances, the institution may manage the conflict of interest by setting up a management plan, or, in cases when management is not possible, require that the conflict be eliminated. The management plan will include provisions that will help mitigate the impact of the outside activities on your institutional duties, IP, technology transfer and disclosure, research integrity and students/trainees, and the use of institutional facilities.

Responsibility for Private Professional Services

An institution is not responsible for private professional services performed by its employees. The name of the institution must not be connected with the services rendered or the results obtained by any employee acting as a private contractor. You must clearly indicate that your consulting work is personal and neither represents nor provides the institution's position or opinion in regards to the contracted services. In your role as a consultant, you should not use any official materials or services from the institution.

Intellectual Property (IP)

Consulting agreements may include contractual obligations regarding IP and copyrights resulting from services provided during the consulting period. The terms should be reviewed by appropriate administrators to make sure that they do not conflict with your institution's policy on IP. Issues to consider include:

- Your obligation to the institution with the provisions of institutional IP policy taking precedence over consulting arrangements with a third party;
- The need to maintain a detailed disclosure of discoveries and inventions that are the result of consulting activities and which may have commercial value and/or utility;
- Adherence to institutional policies/guidelines for the establishment and ownership of inventions, discoveries, and copyrighted materials.

Conflicts of Interest

You should avoid influencing or making use of institutional and administrative resources or influences in such a way that could lead to your personal financial gain or advantage, including benefit, financial or otherwise, accruing to your family members or your business.

In some instances, you may be required to disclose whether or not you have had any consulting activity with a company when accepting research funding at your institution. Federal regulations require that all investigators responsible for the design, conduct, or reporting on a project/program supported by funds from some agencies (e.g., Public Health Service, National Science Foundation) disclose financial interests over a certain threshold (currently more than 5% ownership interest in, and/or more than $10,000 in compensation from) an entity that might be in some way related to, or may lead to real or apparent bias in the design, conduct, or reporting of the work performed under the sponsored project/program.

You should disclose actual or potential conflicts of interest as soon as you become aware of the existence of those conflicts. Failure to disclose a conflict of interest/commitment, or failure to

eliminate or manage the conflict when directed, may be grounds for disciplinary action up to, and including, discharge or termination. Please consult your Office of Research for more information on your institution's conflict of interest (COI) policies and procedures.

Key Points on Consulting/Outside Activity for the Institutional Researcher

- Learn your institution's rules for outside consulting and conflict of interest.
- Establish a non-disclosure agreement before entering into discussions.
- Be aware of confidentiality requirements.
- Be familiar with your IP rights.
- Understand your publication rights.

IX. INTELLECTUAL PROPERTY CONCERNS

When entering into a sponsored research relationship, both parties should consider any existing related IP that may be owned by either party and how such is being protected (i.e., patents, copyrights, trade secret). This is typically referred to as background intellectual property (BIP). Engage your Technology Transfer Office (TTO) staff if any BIP is to be used. Staff in this office is best suited to determine the need to negotiate commercial or research licenses within an SRA.

During the course of the sponsored research project, entirely new IP (commonly referred to as foreground intellectual property) may be generated that will need to be protected. The SRA should contain provisions for who will have assignment for and own the IP, who will obtain protection for the IP and pay for the filing costs, and whether or not the industry sponsor will obtain any rights to the IP. Typically, IP follows the inventorship, i.e., if the institution invents it they own it, if the corporate PI invents it the corporation owns it, and if the IP is jointly invented then it is jointly owned. In sponsored research this can become complicated, so it is critical to work with the TTO prior to beginning work. TTO staff is familiar with standard practices. Moreover, they may have worked with the sponsor in the past and thus understand sponsor concerns and business practices.

Typically, the SRA will grant the sponsor an option to negotiate an exclusive or non-exclusive license agreement. In this case, the SRA should take care to define the terms of the option, i.e., length of time, method of exercising the option, and any fees associated with the option and/or license. It is also common to agree to grant the sponsor a non-exclusive license to the IP for their continued internal research use.

Key Points on Intellectual Property Concerns for the Institutional Researcher

- Coordinate with TTO staff to identify any BIP required for the research project.
- Specify within the SRA any BIP and any anticipated new IP (foreground IP) as a result of the research project.
- Make certain the SRA identifies which party is responsible for protecting new IP and the associated costs of protecting and maintaining it.
- Inform both TTO staff and your industry sponsor of your plans for the research results. Doing so early will help address any concerns or conflicts that may arise. Plans may include future publications, conference presentations, or internal use of the existing and new IP and any patent filings.

X. CREATING LONG-TERM RELATIONSHIPS

The Long-Term Perspective for Effective Institutional-Industrial Partnering

Developing a genuine collaborative relationship requires a strategic, long-term arrangement. In institutional-industrial collaborations, each party's output is critical to the success or failure of the mutual arrangement. As such, institutional administration can find itself applying very different criteria, financing mechanisms, and expected outcomes to such arrangements. Although one-time projects may be possible and at times desirable, they are disposed to take a similar amount of time as that in setting up a long-term relationship. Initial negotiations tend to take the same amount of time no matter what the arrangement.

Successful arrangements with industry require commitment and a long-term perspective concerned with building collaborations and infrastructure, not completing a one-time project. A long-term perspective means a continuum of commitment and involvement by each of the parties. It also means making hard choices about time, resources, and relationships.

Three key factors for successful institutional-industrial collaborative arrangements include:

- Longevity of the Collaboration: There is strong evidence that, over time, the benefits of institutional-industrial collaborations go beyond initial expectations, resulting in new initiatives, programs, and perhaps even spin-off companies. Thus, the long-term benefits or local impact of institutional-industrial collaboration can be more beneficial than the specific project goals set by the parties.
- Selecting the Right Partners: Evaluation and selection of an appropriate partner is a critical step towards creating successful institutional-industrial collaborations. Selecting the wrong partner can result in a lost opportunity after considerable time, effort, and funds have been used to support a collaboration that is not working. The right choice creates a success story; the wrong choice calls into question the decisions made and may result in negative publicity. Get to know your potential partner. Understand their business model. For example, what are their products and who are their customers and markets? Can you propose something of mutual value for the potential research project?

- Planning and Structuring Collaborative Arrangements: Both the collaborative research agreement and institutional policy must be consistent with each other with clearly defined roles and responsibilities of each of the parties. As discussed in the previous section, a reasonable agreement protects pre-existing knowledge while managing new knowledge arising from follow-on research. This activity prevents any misunderstandings that can jeopardize relationships, preventing future collaborations.

Key Points on Creating Long-Term Relationships for the Institutional Researcher

- Identify why you are collaborating with industry on the project. How does this project fit with current or future research plans within your department or institution? If you are pursuing a collaborative research project for funding only, you may find yourself with a one-time project that may require more time and effort than you expected. Conversely, if your institution has successfully worked with a company in the past, this may positively facilitate your deliberations.
- Take the time to select the appropriate industry partner, i.e., the right fit between your organization's research interests and plans and theirs. Determine whether the industry partner is financially stable, well managed, and/or has a plan to use the research results.

For the Industrial Researcher

This portion of the guidebook is designed for the industrial researcher, sometimes referred to as the industry PI (Primary Investigator), who is new to collaborating with institutions. We begin the discussion in the Industrial Researcher Guidebook with Managing Expectations. This section lays the foundation for productive institutional-industrial collaboration by providing an overview of differing organizational environments and by discussing issues unique to such research collaborations. Each party comes to the collaborative project with different expectations, organizational cultures, motivations, and experiences. The differences in the missions between the institutional and industry environments must be navigated in order to establish a successful relationship. The core mission of the university is education, related creation and dissemination of knowledge, and outreach. National laboratories provide fundamental science and scientific solutions to the nation's most pressing problems. On the other hand, the core mission of industry is to create value for investors, provide useful goods and services, and expand the state of the art in a product or service. Successful external collaborations are expected to satisfy this mission by providing compelling benefits and return of investment (ROI) for specific issues in exchange for funding.

I. MANAGING EXPECTATIONS

This section is focused on areas you should research (1) before engaging with an institutional colleague in earnest; (2) when you have identified a potential institutional colleague; and (3) when you have moved to discussions of a specific project.

Preparing for Institutional Engagement

It is important at this stage to gain a good understanding of the processes and policies that your corporation has in place to manage industry-sponsored research. Here are a few key questions to address.

- *What kind of information will you be sharing?*

Before you start engaging an institutional PI (Primary Investigator), consider whether you will be sharing confidential corporate information in the process of developing and implementing institutional-industrial collaboration. A confidentiality agreement between both parties is necessary to cover the discussions preceding the sponsored research project contract negotiations and during the project itself.

• *How does your organization handle sponsored research?*

Every corporation is different. Larger organizations tend to have departments that facilitate sponsored research projects while smaller ones may not. Determine what organizational resources are available to help you identify an appropriate institution to collaborate with and to work through the requisite confidentiality agreements and contracts. Contact your lab director or department manager to identify the individual or department responsible for this area. Staff in those departments should also indicate the steps to follow in order to get a project approved. If management personnel or colleagues do not know the individual or department responsible for this area, study your corporate organization, searching with key words such as university relations, external technology, external relations, partnerships, contracts, intellectual property, etc.

If no formal department within your organization coordinates institutional research, then you will need to find a key stakeholder from your technical management as well as the responsible people in your contracts and legal staff to assist you in the process. These internal stakeholders should have a strong interest in the project and the expertise to work through the differing organizational expectations of the parties to achieve concordance with staff in the institutional contracting office.

You will need to determine who can sign for a collaborative research project. Smaller corporate entities are typically more agile and quick in decision-making and have a shorter chain of command than larger ones. In larger organizations, it is typical to have multiple layers of sign-off authority depending on the amount of the contract, so it is important for you to understand whose signatures you will need to approve the contracts and to explain to your institutional partner that this multi-level process may need to take place.

• *Does your organization have strategic areas it wishes to pursue externally?*

Before approaching institutions as potential collaborators, you need to determine whether your project idea fits within the greater strategic mission of your organization. Your senior management, a technology review board, or the like, will help you determine the viability of your project. This preliminary planning will help ensure that the approval process proceeds smoothly later on.

• *Will your organization allow the project title and results to be published?*

The primary mission of institutional partners is to educate and disseminate information to improve scientific understanding or to provide fundamental science and scientific solutions. While your organization should be able to review a publication for potential patentable inventions or to identify and excise confidential information that may have been provided to the institutional researcher, you will not be able to control the ability to publish or not, since this is a core mission of the institution. This issue is especially important if graduate students (and sometimes undergraduates) or postdoctoral associates are involved in the research since their graduation will rely on disclosing information gathered during their studies. Institutions are increasingly willing to accept some kind of delay in or restriction on publication, but they must do so while maintaining and supporting their primary mission of educating students and improving scientific understanding. When you ask for this type of control over dissemination of knowledge, it can impact the makeup of the research team (e.g., should graduate students be working on your project, and when sensitive information is excised from a thesis without compromising the thesis) or require additional approvals before the contract is put in place.

Note also in the process of establishing a sponsored research project with an institution, the staff in the institution's contracting office may generate a report with your organization's name and the project title that circulates throughout the institution for informational purposes or promoted externally via annual reports or websites. In some cases, this may increase your exposure to your competitors since this information is now public. You may not want your competitors to know the exact nature of your proposed research with the institution, so you should consider an appropriately generic project title.

- *Does your organization have contract templates it prefers to use?*

Many corporations will have templates for work for hire at another industry or with commercial suppliers. However, these will be significantly different than contract templates for sponsored research with institutions. In most cases, the institutional partner will not be able to accept what you normally consider to be commercially reasonable terms. Adjustments will likely need to be made to your supplier template. On the other hand, if your organization is accustomed to dealing with institutions, your contract templates will most likely cover the IP (Intellectual Property), publication, and other contractual provisions that the institution will require. To get things moving, find the responsible individual in the contracting office at the institution and start a dialogue so that legal and contracts staff will not be surprised by the terms presented to them. You and your corporation's contracts office should begin these discussions while technical discussions are proceeding so as not to derail progress in contractual negotiations. If you do not have the contact with the institutional contracts group, try searching for the institutional technology development or transfer office, or ask your institutional PI who is responsible for contract negotiation in their institution. Be aware that typically the institutional PI does not have responsibility for negotiating contracts or budget terms. You can ask the institutional contracts department to provide the institution's template for industry-sponsored research as a starting point for negotiations or consider using the turbo negotiator developed by the UIDP (University-Industry Demonstration Partnership).

Once You Have Identified a Potential Institutional Researcher

At this stage, you should determine whether your corporation has an existing relationship with the institution. The contractual process is accelerated if your corporation has this, as well as experience with industry-sponsored research on the whole. Many institutions will sign master agreements with industries they frequently work with, or they may have an agreement template that has already been negotiated.

- *Does your organization have an existing relationship, master confidentiality agreement, or master contract with the institution?*

Your contracts office can provide that information; alternatively, you can ask your institutional contact if they have had agreements with your company in the past. They may also be able to indicate how negotiations with that institution have gone in the past or what issues are really important to them. Some corporations use the ease of negotiations in their metrics for evaluating the success of the collaboration. You can speed up negotiations, or pick an alternative institution, if you know how your corporation feels about the institution prior to detailed discussions with the institutional PI, and improve your time management.

When You Have Started Discussions on a Specific Project

Now is the time to have frank and detailed discussions about not only the science but also the expectations of both parties—at the institution and industry level and the individual level, (i.e., between you and your institutional counterpart).

- *What are the typical costs, and do you have a budget?*

Start discussions with your institutional counterpart on the typical costs of their time, graduate student time, tuition reimbursement, and any other factors related to working on the project. You will need to make sure funds have been budgeted in your organization for the project. Remember, institutional officials, not the PI, determine the actual cost of the project.

- *What is the potential to generate Intellectual Property (IP)?*

IP ownership is often a difficult point of negotiation between Institutions and Industry and can be a roadblock to agreement if not correctly understood and handled from the beginning. Every institution is different, but most institutions follow government and internal policies, dependent on the funding source, that require that the institution maintain assignment of IP. You will need to review the project for the potential to generate IP in order for your contracts and legal staff to create an agreement that protects your corporation. In some instances, a worldwide, royalty-free license in a specific field of use provides the sponsoring company the same benefits as assignment or ownership of IP emanating from a project.

- *Have you confirmed that your institutional researcher will keep your projects separate from other sponsored projects in the same laboratory?*

The sponsored research would not be undertaken if it were not important to your corporate mission. Maintaining the integrity of results is important, particularly if the research offers a competitive advantage and/or the potential to generate IP. The issue of separation becomes even more critical given the potential for multiple industry sponsors (either current or in the recent past) supporting research in the same laboratory. You will need to discuss the project boundaries your institutional colleague will establish to keep your projects distinct from others underway in the laboratory.

- *What will the institution be able to deliver?*

The respective missions of institutions and industry differ. Holding an open discussion with your institutional counterpart to discuss the expectations of both parties is vital to the research collaboration. In your project discussion you will need to assess whether the institution has the resources (personnel, equipment, etc.) to meet your expectations. For example, graduate students who may be assigned to the project will have a shorter tenure than the PI. Ensure your institutional researcher has a plan for project continuation should a student graduate mid-project. You will need to have agreement at this point on a Statement of Work (SOW) with a list of deliverables and timelines.

- *What is the return on investment (ROI)?*

As project discussions begin, it is imperative to ascertain how the mission of your organization will be satisfied and identify the key stakeholders (e.g., senior technical management and/or people of influence

like legal, contract, and finance staff). This exercise will help you gain support for the project, and its associated costs and benefits, which is critical for the success of the collaboration and relationship. It is especially important in small businesses where there may not be funds in the R&D budget to move beyond the core competencies of the organization. Each funding decision that is made within a small- to mid-size corporation will have an effect on the organization's overall financial well-being.

Specifically, be prepared to provide an assessment of the project's ROI to the stakeholders. There are many potential ways to estimate ROI. For example, ROI of the project can be based on the capacity to solve problems, to save money by getting products/solutions/services to market faster or with fewer defects, or to commercialize innovations. Other less tangible measures of ROI include the number and quality of employees hired from the institution, the depth of the research undertaken, or the use of corporate services and products in the institution. Your discussion of the value proposition will also need to show that the institution can meet your expectations regarding what they can deliver, when that will occur, and what your organization is willing to pay for that service.

Key Points on Managing Expectations for the Industry Researcher

- Understand that the missions of institutions and industry are fundamentally different.
- Establish a set of mutually acceptable expectations on the project deliverables, timeline, and financial commitment. You need to ensure project continuity, especially if work will be performed by students.
- Learn and utilize the processes and policies for your organization to develop SOWs and budgets, authorize projects, negotiate contracts using available contract templates, manage contracts, generate research results, secure data, manage publication rights, and protect and disseminate IP.
- Develop a discussion of ROI for your technical and financial management.

II. BENEFITS AND CHALLENGES OF WORKING WITH RESEARCH INSTITUTIONS

Traditionally, industry delivers new products and services to the market by hiring skilled people, working with trusted suppliers, innovating from within, and controlling IP. This model leads to creation of large, centralized, internal R&D departments that are increasingly difficult for industries to sustain. To stay competitive, industries establish global research facilities and supplier relationships, working around the clock across cultural differences. Even with these additional resources, industries are turning to open innovation and collaboration with research institutions to sustain profitable growth and innovation. Your organization may already be engaging with institutions in a spectrum of different ways along a continuum of interactions that range from undergraduate senior research projects to material transfers to strategic alliances. In each of these types of interactions, the project may be set up to fund research that is:

- Highly complementary to work that the institutional PI is already engaged in with federal/other funding
- Parallel to or a near neighbor to the PI's regular work but applied specifically to your industry
- A commercial application or extension of the PI's previously funded work
- A simple fee-for-service that a laboratory is technically suited to do, but does not bring with it the potential for advancing science or publication

In each of these cases, the engagement may be structured as a gift (for more information on this topic, visit http://dor.stanford.edu/overview/gift_grant.html), a sponsored research project, or as a consultancy project with an individual PI—each of which comes with differing expectations on IP ownership and licensing terms. In any case, the research must have mutual benefits for both the institutional and corporate missions to be successful. UIDP has instituted a partnership continuum project to assist in these matters.

BENEFITS

Access to Resources

Institutions can provide tangible and intangible resources to solve a problem industry may not currently have the time, expertise, or facilities to do in-house. Institutions provide access to specialized equipment, laboratories, and experts who are scientific leaders in a particular field of interest. Interacting with institutions brings industry access to new approaches, perspectives, and diverse ideas to solve the problem at hand. Successful relationships also provide a source of future recruits that are already familiar with the industry's issues and its culture. Furthermore, that experience means that these candidates can more quickly become contributing members of the industry R&D staff. Alternately, the sponsored research project is one way of accessing a potential recruit's skills over a limited period of time.

The collaboration with an institutional partner can also provide the industry partner access to a valuable IP portfolio. IP development consumes large amounts of investment capital. Time-to-market and capital efficiency may be enhanced by partnering with academic or government research groups that have developed a considerable body of IP, typically using government funding. This was the basic strategy that created the Silicon Valley in the 1960s. IP flow, principally from the University of California-Berkeley and Stanford University, provided the fundamental research engine that created thousands of companies and

huge economic gains, establishing the United States as the world technology leader. Such collaborations between early-stage enterprises and research institutions can create, with appropriate licensing mechanisms, access to initial pieces of IP plus follow-on filings from research that institutional laboratories may discover later. This collaborative model gives the early-stage enterprise access to R&D efforts that it could not afford to create on its own, effectively creating a much larger product development organization funded not only by your corporation, but also by government grants, or "other people's money." Follow-on research can frequently be accelerated directly via contracts with the research institution, which allows new enterprises to control IP generation in ways more directly aligned with their interests.

Finally, depending on the fields of research, there is the possibility for you, and your institutional counterpart, to access new, different, or additional types of government funding. Institutions provide access to skilled staff with knowledge of the funding sources and their requirements, application processes, and timelines. For example, the federal agencies that fund most research (e.g., National Institutes of Health, National Science Foundation, Department of Energy, Department of Defense, National Aeronautics and Space Administration, Department of Agriculture) encourage proposals that include collaborations with industry. Some federal programs require an industry partner to qualify for funding.

CHALLENGES

While the benefits noted in the earlier section can be compelling, both university and industry representatives must be vigilant that the process does not succumb to a number of issues that continue to derail this type of interaction.

Time Management

One of the first clashes may occur due to the goal- and timeline-oriented industrial culture versus the less structured but discovery-driven world of research institutions. Your organization probably has a mid- to short-term goal to create or improve an existing product or service. Institutions generally prefer longer time frames. Two main issues arise as a result of these differences in operating environment.

First is the time involved in setting up the contract agreement. Negotiating contracting agreements between institutions and corporate entities can be a complex, lengthy, and challenging process. Having a skilled liaison at your organization will help bridge the gap between the two cultures. Be prepared for contract negotiations to take months instead of weeks, and plan accordingly if you need to have the project fall in a certain budget cycle. Try to expedite the negotiations by following the guidelines presented in the Managing Expectations section. This is particularly important if you are in a small business where the time that such a process consumes can also shut down the momentum critical in launching new ventures.

Second, your expectations for the institution to deliver results according to an established timeline may not be fully appreciated by your institutional partner. In a world of graduate students and various competing obligations, institutional timelines have been known to slip. Be prepared to organize your project on milestones or deliverables instead of a certain time frame.

Erroneous Relationship Model

Institutional researchers are motivated to undertake research projects that expand the current body of knowledge and generate new ideas and discoveries. While some institutional researchers will accept funds to do rote studies in order to generate financial support for the lab, universities and their investigators do not typically do work-for-hire or simple service work; national labs may have a bit more flexibility to accept work-for-hire if consistent with their missions and lab developed background IP is not utilized. Companies that support research projects are not procuring services or acquiring a specific deliverable since institutions typically work under best effort.

Managing the Staffing

The institutional PI's timeline may not line up with your organization's business cycles and/or manufacturing or product development schedules. Plan your project to allow enough time for an institutional PI to find an appropriate graduate student for the fall or spring terms; otherwise your project may be without staff. Secondly, remember that students eventually graduate. Be prepared to discuss a continuity plan with the institutional PI to ensure project completion irrespective of who is working on it. Many seasoned institutional investigators employ highly qualified, full-time staff as research associates; these individuals are hired as permanent staff and are ideal candidates to work on industry-sponsored agreements.

Managing Confidential Information

Your organization may engage in classified research, which is contrary to the institutional mission to disseminate information. Be prepared for the fact that you will not be able to pass on the same level of secrecy restriction to the institution that is in place within your organization and that you require of your suppliers, nor will you be able to prevent or significantly delay publications to maintain a competitive advantage. A good contract should take into account both the corporation's and the institution's missions.

Approval

You may face resistance—even a tough battle—to information not invented in-house and/or to expenses directed to external resources, depending on the degree to which the proposed work fits within your corporation's strategic plan. Such opposition can make getting approval to sponsor external research difficult. You will need to make a compelling case to satisfy not only the technical management but also the contract staff and the legal staff. Large and small businesses can have resource limitations—financial, personnel, legal, etc. You will need approval for the budget, as well as the timelines, deliverables, and expectations. Contract staff will be concerned about payment terms, enrollment of the institutional partner into your supplier registry, and administrative procedures like billing processes. Legal staff will be concerned primarily with disclosure of confidential information, use restrictions, IP ownership, and the structure of potential licensing agreements.

Use restrictions can be problematic for industry, particularly when industry employees manage multiple projects at the same time and/or frequently change positions throughout the company. Most industries have extensive experience with IP ownership derived from projects they have funded under supplier relationships, but may not be aware of the laws governing IP ownership at research institutions. Most industries will start with the position of a non-exclusive royalty-free license to use the information generated

for internal research, and then proceed to a market-segmented royalty-based license. You must weigh the importance of the project against the risks of sharing information that could compromise your competitive advantage and impact your core mission if it were disclosed, published, or patented. Failure to arrive at an agreement with the research institution on IP and licensing is a nightmare scenario. Consequences may include inability to use the IP generated, or worse, release of potentially proprietary information to a competitor through licensing or other public disclosure.

Please keep in mind that the vast majority of industry-sponsored research agreements do not generate any IP that will result in any sales.

Technology Licensing

Institutional licensing organizations that are familiar with the boundary conditions necessary to create a successful early-stage venture are few and far between. One of the metrics used to gauge the success of institutional-industrial collaborations by institutional Technology Transfer Offices (TTOs) is the number of licenses issued and the associated revenue. Yet few institutions can support their own TTO activities by these revenues alone. Onerous licensing terms, applied indiscriminately, irrespective of what sector the industry is in, are major deal killers. The value of the initial IP, regardless of how compelling the technology is, ultimately represents a very small part of the effort needed to put commercially supported products into the market place. The investment to commercialize a given technology can be orders of magnitude more than what was spent on the original R&D. Numerous licensing organizations have attempted to assert that their IP is worth 20% of a product or service, when the correct value needs to accurately reflect the market segment in which the IP will be applied and its relative value with respect to the other components in the product or service; the real worth may be in the range of 2-4% of a product or service.

Several institutions have made dramatic changes to their industry-sponsored research and IP policies; these revised policies were adopted to reduce the complexity of negotiating IP terms in sponsored research agreements by pre-valuing any foreground IP that may result from such an agreement.

Key Features of Industry-Sponsored Research: Minnesota Innovation Partnerships (MN-IP)

- Involves pre-paid exclusive option fee amounting to 10% of sponsored research contract or $15,000, whichever is greater.
- Includes option to exclusive license with pre-set terms: no annual minimums or other fees; no time limits or milestones; sponsor is free to sublicense/cross-license technology; if annual sales involving licensed IP exceed $20 million, licensee pays 1% royalty fee; no cap on royalties unless invention improves on sponsor's pre-existing product or processes.
- Sponsor pays patent costs and has the benefit of driving prosecution while collaborating with the university on patent claims.

Source – University of Minnesota Office of Research

This misalignment of incentives is critical to any early-stage venture. If this reflects your situation, be prepared to have a frank discussion with your institutional licensing office, as a very different set of metrics than those in place within a typical research institution must be applied by the licensing organization to allow your company to raise necessary capital and to insure that the license terms do not unduly impact the ability of your organization to meet its financial objectives. Key issues that you will need to raise in this discussion include:

- Negotiating Strategies that Look Like Zero Sum Games (I win, you lose)

The basic terms of the license need to be negotiated between the institutional licensing professional and the industrial partner's licensing professional, who in some cases may be the chief executive officer (CEO). This measure will avoid literally hundreds of thousands of dollars in legal expenses to both organizations on contracts that may ultimately produce no workable agreement with the necessary conditions for success for either party. Involving third parties will dramatically compromise this process, e.g., bringing in lawyers and investors is a well-proven formula for derailing the process entirely.

- Other Licensing Terms

Up front fees, royalties, and other downstream costs to the new enterprise must be reasonable. Royalties, in particular, directly impact the cost of goods and thus impact the company's gross margin. The value of the new enterprise via merger and acquisition or by going public will be directly affected. Such values and costs must reflect industry norms that are understood and accepted.

- IP Verification

It is critical for the licensing organization to understand the provenance and ownership of the IP it is licensing and to do the work necessary to ensure that it knows what it is licensing and can confirm this to new enterprise stakeholders, particularly the investors. For early-stage or small businesses, you will also need to weigh the benefits of the collaboration against the relationship that your investment community plans to have with the institution that holds the IP.

- Investor Attitudes

Investors frequently prefer to fund early-stage ventures that are totally homegrown. This means that the IP is not encumbered by licensing from third parties, or that bringing institutional researchers into the new enterprise will never create an IP ownership issue. Investors may view institutional management with skepticism and treat them as enemies to commercialization rather than as partners. You will need to manage this problem with your CEO, the licensing professionals, and champions within the institution who can assist you in aligning interests between institutional PIs and your organization.

- Institution Attitudes

The attitude of the institutional partner is potentially the most serious problem faced by new enterprises attempting to work with those research institutions. For academic institutions, this is rarely a problem, but it does occur. Generally, it is straightforward to align interests because academic institutions like to commercialize technology, which ultimately may drive endowment growth. The number of stakeholders (e.g., IP

counsel, TTOs) within the academic institution is usually small so that managing the process is very workable. When the research institution is a federal laboratory, the problem is of a different nature. Government laboratories are concerned with securing and growing government research contracts. When a project that holds commercial potential is launched, many forces come into play that must be managed carefully. Research managers within a government laboratory may not believe that commercialization can increase their research business (despite data to the contrary). Sometimes this perspective can result in attempts by these managers to thwart a licensing organization from spinning out technology that they view as their exclusive purview. Furthermore, although the researchers may gain monetarily from such commercialization via distribution of royalties and equity gains, their managers are rewarded in different ways in their annual review. In order to create workable situations in this regard, the new enterprise must have support from federal laboratory management, or the commercialization effort is unlikely to succeed. Lack of well-aligned incentive structures for both can be a barrier to innovation. Therefore the new enterprise is at a disadvantage and must look elsewhere for technology it needs.

Key Points on Benefits and Challenges of Working with Research Institutions for the Industry Researcher

- Work with research institutions to have access to resources (personnel, equipment, knowledge, and new perspectives), IP, recruits, and even possibly other funding.
- Be aware of the challenges that can revolve around the differences in the missions of industry and research institutions. These can be simple things like differences in expectations, cultures, and time sensitivity. Or they can revolve around contract issues like licensing and IP ownership. Small businesses and new enterprises must pay special attention to issues that can hamper their ability to raise capital and attract key personnel.

III. ESTABLISHING CONTACTS WITH RESEARCH INSTITUTIONS

With limited time and resources, you will need to quickly identify the right contact at an institution—an individual with whom you can arrive at a mutual understanding of a technical problem and solution. You will most likely have to conduct your own search for appropriate researchers of interest, although in larger companies you may obtain valuable assistance from those within your company that are responsible for working with research institutions. See the Managing Expectations section for guidance on determining how your company handles sponsored research. In many cases, the resources named there will assist you in the initial contacts and early discussions with prospective institutional researchers.

Your challenge is finding the institutional PI and institution that have the highest probability of being successful in achieving your project goals.

First, conduct extensive research to find out who is working in the field of interest. You can look in the open literature to find institutional researchers who have done, or are presently doing, work in your field of interest. Professional searches using company resources or external companies can be very useful.

If left on your own, use key words to search publications of professional societies, industry magazines, and institutional press releases, or to perform less detailed Internet searches. Try searching grant award and statewide project databases.

Another avenue is to access institutional laboratory websites or reach out to the provost's or dean's office and technology transfer, business connect, research development, and corporate relations offices at an institution. Patent literature can be a great source to identify an institutional researcher who has prior work in the field or in a related field of interest and implicitly shows an interest in commercialization activities. Preliminary patent searches can be conducted on www.google/patents, www.uspto.gov, and other related sites. Institutions may have searchable IP databases. Conference proceedings and attendance can be a useful way to evaluate potential PIs through their abstracts, presentations, questions after their presentation, and level of participation in conferences, seminars, and professional organizations. For example, you may prefer a chair of a particular area of interest over those researchers who make presentations or posters themselves or via their undergraduate, graduate, or postdoctoral students. Usually you can make direct contact with prospective institutional researchers before, during, and after their presentations. You can also try searchable research databases of universities, professional societies, local and state government organizations, and foundations.

Another mechanism to identify potential collaborators is through networking. Try to make connections directly or indirectly by networking and leveraging existing networks, and through your participation in a variety of local, regional, national, or international networks. Examine your personal networks with people you know with institutional connections, including former academic advisors, current and former industry and university colleagues, etc. Consider networking in professional organizations or social networking platforms. Many local and state economic development organizations are potential sources of information on local and state academic research. Federal program officers at places such as NSF, NIH, DoD, DTRA, or DARPA are excellent resources and are knowledgeable about rising stars or new breakthroughs even before they are in the literature. You may find out that travel may be the most direct means of finding researchers of interest. Consider traveling to universities, institutes, and government laboratories, preferably utilizing appropriate leaders in the respective industrial relations, technology transfer, and/or business development offices, as an effective way for you to discuss your company, industry, and research interests.

Finally, if you do have a department in your organization that deals with institutional contracts, consult the staff in that department on the institutions with which they have had good working experiences.

You can also try advertising a request for proposals on websites and in trade journals, conference share sessions, "speed-dating" with institutional PIs, or avenues such as National Council of Entrepreneurial Tech Transfer (NCET2) [http://ncet2.org] or the UIDP [http://www.uidp.org].

It can be very time consuming to search for a potential collaborator through any of these mechanisms. The alternative is expensive, albeit faster, matchmaking services like NineSigma, Innocentive, YourEncore (for high-performing retired scientists and engineers), or Yet2.com, which can be used to broker IP exchange.

If you are successful in identifying an institutional researcher in your field of interest, you will need to send a request and make first contact. There is no road map for this, but the following principles may help:

- In the first conversation, be prepared to present your ideas to establish the broad parameters of your discussion. You will need to present some ideas to start the discussion and then listen.
- When listening to the institutional researcher, try to imagine how the research could serve your corporation's needs. Keep an open mind; in fact, it is acceptable not to have a preconceived solution in mind. It can be helpful for both parties to explore options. Consider what success would look like for you and how the project will fit into your broader program objectives.
- Provide as much general technical and business information regarding your needs and the market as possible, keeping the discussion very general until you have a confidentiality agreement in place. As mentioned earlier in the Managing Expectations section, you will ultimately need to establish a confidentiality agreement prior to any real specific technical or business discussion.
- After a problem or potential research project is identified, make sure that you document it and exchange written communications with the prospective institutional collaborator. This documentation will be important for any future IP ownership issues.
- Consider having the prospective institutional partner visit your organization to present a general perspective of his or her research interests, with an emphasis on qualifications to work on your project to your technical community. Use this visit as an initial screening to determine whether the institutional researcher understands your organization's needs. The visit can also garner support internally for your project.
- Consider scoping and collaborating initially on a small-scale project to establish whether you work well together and if there is sufficient trust and rapport to take on a more ambitious project.
- Request an initial SOW with a clear value proposition.
- General agreement on the technical scope of the work should precede any discussion of budgets or contract terms. At this point, you can get a general sense of the cost of doing business to confirm that you have adequate funds in your budget, but do not agree to any budget or contract terms. Work closely with your management and, if available, the appropriate manager or department responsible for contracting with research institutions to develop a fair budget and to negotiate acceptable contractual terms. Remember, institutional investigators cannot negotiate budgets; **the award is to the institution, not the individual.**
- Start preparing for a discussion of ROI with your management to expedite your internal approval process.

Key Points on Establishing Contacts with Research Institutions for the Industry Researcher

- Take advantage of the multiple mechanisms for identifying the right prospective institutional researchers and institutions, including various searches, networking, and requests for proposals and/or external matchmakers, when feasible, to expedite the search.
- Develop a mutual understanding of the research problem and proposed solution. Set up a confidentiality agreement to cover any in-depth conversations after your initial conversations.
- Assess whether the prospective collaboration is a good fit, whether the researcher understands your

projects, and what the probability is that the researcher will be able to deliver the results desired in order to develop the discussion of ROI and get approval from your management.

- Work closely with your management, contracts staff, legal staff, and if available, your company's individual or department responsible for working with institutions throughout the process to ensure project support internally.
- When considering the budget, remember to keep in mind the perceived value of the work and determine if the cost of the project is appropriate relative to its value.

IV. DEFINING THE SCOPE OF WORK AND PROJECT DELIVERABLES

Industries collaborate with institutions in various ways along a continuum of engagement – donations, recruiting, testing, and research, to name a few (see UIDP partnership continuum for additional information). You could also be collaborating with an institution to develop a proposal for a third-party funding source, issuing a specific request for proposal to an institution to meet an identified industry need, or considering an unsolicited or investigator-initiated proposal from the institution for industry funding. By definition, the different partners bring diverse perspectives and perceptions to the collaboration. Bridging this gap can lead to collaborative projects in which the total is greater than the sum of the parts, or exercises in frustration because of unarticulated assumptions and expectations. The challenge is not only to assemble a well-integrated research team—a cohesive set of collaborators from both the research institution and from industry—but also to coordinate the efforts of an array of supporting players, such as the institutional TTO, sponsored program offices, industry accounts payable, and legal departments. Therefore, it is crucial that all partners understand not only their own internal processes managing sponsored research projects, but also have a high level of understanding of the corresponding processes of the partner organizations.

Preparing a Proposal for Government Funding

If you are collaborating to develop a federal government-funded proposal, it is imperative that the parties communicate about the following: who is leading which component of the proposal; what the submission deadlines are (e.g., for letter of intent, internal submission to institutional sponsored programs office, final proposal submission); and how a communication plan will function (i.e., meeting format [in person, by phone, via teleconference] and meeting frequency and duration). If you have limited experience with developing government proposals, ask your institutional counterpart for help. They are likely to be experienced and have support resources within the institution that are familiar with the process. This may be the most efficient approach. Try a kick-off meeting with frequent, short follow-up meetings to monitor progress and re-adjust as necessary. The effectiveness of the proposal writing team can be a good indicator of the likely performance of the broader collaboration.

University Response to a Request for Proposal

In responding to your request for a proposal, the institutional researcher is clearly responsible for developing the elements of the proposal with support from institutional research development or sponsored programs offices. However, for a successful relationship, expect the institutional PI to be in close contact with you to ensure that the proposal covers all the necessary information and is responsive to the specific request.

Unsolicited Proposals

PIs at institutions may approach you with unsolicited proposals. The award rate for this type of proposal is low unless there is alignment with your corporation's objectives and there is an internal champion. The budget process in corporations is rigorous; only the highest executive levels have carte blanche authority, and they are unlikely to authorize funding of individual projects that do not fit within your corporation's mission.

Executive Summary

The objective of an institutional executive summary is twofold. First, it is a stand-alone document to probe whether the institution can solve an immediate problem; enhance an existing product, solution or service; or advance established research priorities through an innovative research concept supported by a fair and realistic budget and schedule of deliverables. The executive summary should be customized for your management and address the basic problem to be solved in the collaboration. It shows whether the institutional partner understands the expected results and can propose a thoughtful, efficient way to achieve them. The summary also provides the information that you, as the industry researcher, need to share with various management groups to gain support.

The executive summary should be brief, addressing each of the following points. The total length should be no more than a single page.

- What the project is.
- Why the project should be done.
- Why your company should support it (i.e., how it aligns with your corporate mission).
- What the current approach, nature, and scope of the services being provided is.
- What the novelty of the proposed approach and associated risks are.
- How much the project will cost and how long it will take.

You should work with your institutional collaborator to develop an executive summary worded acceptably to meet your corporate culture.

Statement of Work (SOW)

The SOW is probably the most important part of the proposal, as it explains the tasks to be completed by the institution and the commitments to be made by your organization, and it directly impacts IP rights resulting from discoveries made during the conduct of the project. The SOW must be clear and well

thought-out, yet flexible such that someone else could step in and take over in case your involvement with the project ceases. This means that the SOW needs to be continuously reviewed by **both** the institutional PI and the industry PI. The SOW will define roles and responsibilities, work performance sites, the nature and scope of services required, general methodology for accomplishing the project, realistic timelines, concrete milestones, go/no-go decisions points, equipment needed, costs and budget, invoicing and disbursement, the probability of patentability, trademark and IP, and, if necessary, vendor and subcontractor requirements, security clearances, and internal and external document routing procedures. For many institutional researchers, the importance of the SOW needs to be reinforced, especially for investigators without prior industry agreement experience.

Communication Plan

A communication plan is important to realize the full potential of the collaboration. The key aspects of a plan include: a kick-off meeting, regular informal progress meetings (weekly or monthly, by phone or in person, if possible), a formal update meeting, periodic reports for your technical management, and a final close-out meeting.

Key Points on Defining the Scope of Work and Project Deliverables for the Industry Researcher:

- Define the roles and expectations in your proposal. These will differ depending on whether it is a joint application for external funding, an institutional response to your request for proposal, or an unsolicited proposal from an institution.
- Be sure to include the standard elements in your proposal: executive summary, SOW, deliverables, timeline/milestones, communication plan, and budget.
- Develop a plan for regular and frequent communication between you and the institutional researcher in your proposal. This is key to a successful proposal—one that will satisfy your organization's needs and, as a result, has a strong likelihood of being approved.

V. BUDGETING

Budget discussions are one of the most contentious issues that can prolong the negotiations for a project. Some aspects of the budget have been touched upon previously in the Managing Expectations and Executive Summary sections; but, they warrant more detail here since you will need to justify the expenditures proposed to your technical and financial management. Your corporation will most likely be concerned with the total overall cost of the project. You may be alarmed when you see the breakdown of the total costs into the direct and indirect costs for sponsored research projects. Indirect costs refer to the overhead from facilities and administrative (F&A) charges, for example, that are applied to the modified total direct costs. The indirect costs rates for federal grants and projects are negotiated every few years with DHHS (the Department of Health and Human Services) or ONR (the Office of Naval Research) depending upon which is the cognizant audit agency for the institution, and are based upon real, objective costs in maintaining an institution's research enterprise. These rates are applied to Industry projects since the Cost Accounting Standards in these agreements with the government require that universities budget and charge like costs in like circumstances in a like manner. Government-funded research and industry-funded research are almost always considered like circumstances.

Be aware that your corporation also has indirect costs associated with your employment; they may just not be visible to you. Virtually every institution has calculated that their indirect costs are more than the negotiated rate, and as such they do not recover these costs in their contracts. For example, even though the university and the government calculate the rates by adding up all the indirect costs and dividing by the direct cost base, there are caps on certain components. Furthermore, a number of universities cannot recover full utility costs simply because their university was not included in the utility cost studies in 1993 when the current version of circular A-21 was released.

The indirect costs rates are typically between 35- 55% on top of the costs of doing the project. For your purposes, it is important to know that while the rates are usually not negotiable, there are different rates depending on the type of research (a gift, consultancy agreement, or a research project), the nature of the research (research or public service project), and where it is performed (on- or off-campus). For example, F&A is typically not applied to a gift, may or may not be applied to a consultancy arrangement, but will certainly be part of a sponsored research project. Another example: offsite research typically has lower F&A rates—down to 25% or even zero in some instances where no university resources are being employed. All Institutions publish their rates and you should consider what rate applies to your project and/or how to structure the project accordingly for the best return on investment and project results. Can some of the work be done in your facilities? If so, you will have a reduced rate, but what are the trade-offs? Are there implications with respect to security, access of your institutional PI to confidential materials even outside of your project and/or even insurance liabilities and indemnification? You will need to discuss these with your management, legal staff and/or administrative organization and get their approval.

In the budget, be sure to include travel expenses to visit the industrial partner and vice versa, including students when possible. There is no substitute for face-to-face interactions, especially for a kick-off meeting. These meetings can facilitate communication, quickly clear up misunderstandings and confusion, and help build a solid relationship.

Typically, sponsored research budgets using graduate students will also have a tuition line. It is important to ask how an institution handles this expense, as it will often be non-negotiable if students are involved in the project. A tuition expense would most likely be considered an indirect cost in your organization, but institutions treat tuition as a direct cost, separate from their benefit rate. You will also need to ensure that your budget spans the whole degree of the student. If a student graduates mid-project, this can delay or, worst case, derail a project from being completed and result in wasted monies unless a contingency plan is addressed in the budget. Consider also the length of the proposed research, as the timelines in industry-sponsored research can change much more quickly than those in government-funded research. You will want to make sure that the project cycle aligns with the period of stipend support; otherwise the project may end after graduation and the student has left the university.

Benefits, sometimes called fringe benefits, include health insurance and other employment benefit compensation and need to be accounted for.

Finally, if the project requires the purchase of equipment, the budget justification should clearly state which party will retain title to the equipment at the end of the project.

Key Points on Budgeting for the industry Researcher:

- Your budget will most likely include line items for direct costs such as salaries, equipment, materials, tuition, and travel.

- Be aware that the final cost of the project is dependent not only on the direct costs, but can also contain significant indirect costs and F&A costs, depending on how the collaboration is structured (gift, consultancy agreement, or sponsored research project), the nature of the project, and where the work is conducted.

- You will need to justify the costs of doing business with the institution to your senior management, with a discussion on the ROI including the uncapped F&A.

VI. SOME COMPLIANCE ISSUES

Depending on your industry, you may or may not have been aware of the various compliance requirements to which your company adheres, including those that ensure that research will be conducted in accordance with strict ethical principles and federal, state, and collaborating research institution regulations and policies. There are several compliance issues of concern – two are included here and others will be added in later versions.

Standards

Industry-supported research is subject to the same policies that exist for federally supported projects. For example, if you are in the pharmaceutical or medical device industry, be careful that your institutional collaborators can commit to Good Manufacturing Practice (GMP) or Good Laboratory Practice (GLP) standards. These two compliance standards have very detailed requirements that many universities and non-profit research institutions do not meet. If these standards come up in discussions or in contract language, confirm that the compliance office in the institution is involved before you commit to anything.

Human and Animal Subjects

Most organizations have staff that work to ensure ethical and responsible research involving human and vertebrate animal subjects, export control, responsible conduct of research, conflict of interest, biosafety, and chemical and radiological safety. Most organizations will also have an Institutional Review Board (IRB) and Institutional Animal Care and Use Committee (IACUC) as well as export control staff. You will need to understand what applies to your project. It is also essential that you know who at your institution (often staff at the sponsored program's office) understands what compliance issues are pertinent to your project, what approvals you need, and what you have to do before you begin the project. Check, for example, if your research involves any of the overarching regulatory issues outlined below.

- Human subject research. This is subject to an Institutional Review Board (IRB), and that IRB will base most, if not all, of its protocols off of the "The Common Rule" found in the Code of Federal Regulations 45 CFR 46 ("Basic HHS Policy for Protection of Human Research Subjects"), which can be found at http://www.hhs.gov/ohrp/humansubjects/commonrule/index.html
- Research with vertebrate animals. This is subject to an Institutional Animal Care and Use Committee (IACUC) and will follow the guidelines as set forth by the Office of Laboratory Animal Welfare (under DHHS), which can be found at http://grants.nih.gov/grants/olaw/olaw.htm
- Research using recombinant DNA. This will follow the rules as set forth by NIH, which can be found at http://oba.od.nih.gov/oba/rac/Guidelines/NIH_Guidelines.htm

Export Control

One of the most common areas for concern pertains to export control. However, export control laws will apply when you are sharing proprietary information under the protection of a non-disclosure agreement or have a contract that restricts the dissemination of results, or publication control. Your company may be performing functions or manufacturing items subject to export control requirements and you could put your company's entire business at risk with severe penalties if you fail to adhere to export control statutes.

The Bureau of Industry and Security is charged by the Department of Commerce with the development and interpretation of U.S. export control policy. Laws have been in place since the 1940s to restrict export of goods, technologies, and related technical information that might harm U.S. interests or contribute to the military capabilities of countries whose policies conflict with the U.S. These laws also prohibit sharing of such items or information on U.S. soil (including institutional campuses) with foreign nationals without a license, and with individuals from specifically embargoed countries. Export controls impact research administration; sharing of information; publishing of results; managing IP; processing visas; hiring of foreign nationals; purchasing, shipping, and utilizing scientific equipment; working with collaborators and colleagues within and outside of the U.S.; academic advancement for non-US students; and traveling outside the U.S. for scientific and educational purposes. The transfer of technology or source code to a foreign national is deemed to be an export to the home country of that individual. An export license must be obtained according to the deemed export rule when two conditions are met: (1) the U.S. person intends to transfer controlled technology to a foreign national in the United States; and (2) transfer of the same technology to the foreign national's home country would require an export license.

You should be aware that university researchers are somewhat sheltered from the impact of the export control law when they conduct fundamental research with the intent to freely share the results of the projects. The Fundamental Research Exclusion (FRE) applies information (but not to export controlled physical items or software) resulting from basic and applied research in science and engineering conducted at an accredited institution of higher education or higher learning located in the United States that is ordinarily published and shared broadly within the scientific community and that is not restricted for proprietary reasons or specific national security reasons or subject to specific U.S. government access and dissemination controls. The FRE avoids the need to secure a deemed export license. For more information on export control regulations and the fundamental research exclusion, see UIDP's contract accord on this topic available online at http://sites.nationalacademies.org/PGA/uidp/PGA_058342.

Principal export control areas include:

- Department of Commerce/Export Arms Regulations (EAR)
  - Dual-use items
  - Commercial and military security applications
  - Re-export of items
- State Department/Munitions/International Traffic in Arms Regulations (ITAR) regulating
  - Military items
  - Goods and technologies
  - Space-related technologies
- Treasury/Office of Foreign Assets Control (separate from ITAR/EAR regulations) controlling
  - U.S. economic actions focusing on the end user country and not the technology
  - Limitations on certain countries and restricted individuals

Key Points on Compliance Issues for the Industry Researcher

- Make sure you and your institutional counterpart are aware of the regulatory process and possible delays due to adherence to compliance issues when you discuss and agree to project scope, timelines, and deliverables.
- Make sure you know whom to contact in your organization for compliance issues.

VII. CONFIDENTIAL/PROPRIETARY INFORMATION (PUBLICATION ISSUES)

Another sensitive area you will need to navigate in your organization is the exposure risk incurred in sharing information with your institutional partner. You should always self-censor information that is not core to your project but core to your organization. One of the primary missions of institutions, to disseminate information, is in direct conflict with your ability to hold information confidential and thereby gain a competitive advantage. In keeping with their core mission, institutions have strict policies preventing them from accepting agreements that restrict their ability to publish results, so you should consider discussing publication delays or, at a minimum, the ability to excise any confidential information prior to publications with a reasonable advance warning (weeks or months). A confidentiality agreement will be respected by your institutional partner to the extent possible and should be designed to allow you to review and comment on information to be published, but there are still multiple ways information could be compromised. For example, a conflict of interest and/or poor segregation of results with highly sought-out PIs who are working with competitors in the same lab could lead to inadvertent sharing of sensitive information. Be direct—ask your institutional PI and other institutional officers how they plan to keep your information separate and whether they are working with any other corporations in a similar field as yours. You will need to present this information to your management to secure their acceptance of any exposure risk. Alternately, some institutions generate press releases or automatically disclose sponsored research project titles in research reviews or databases that could inadvertently expose your future plans to a direct competitor. Consider using a generic name for the project in the event that it gets published in an automatic press release to reduce exposure to your product roadmaps. With this in mind, it is important to ask what processes your partner institution typically employs when managing research award information.

Key Points on Confidential/Proprietary Information (Publication Issues) for the Industry Researcher

- You and your institutional partner will need to demonstrate that confidential information can be maintained in accordance with the agreement. It is in everyone's best interest. This allows collaborators to share access to solutions and information that could not otherwise be shared.
- Develop agreements with the necessary level of specificity in order to be mutually understood and enforceable, especially because there is continual fluctuation with student involvement.

VIII. CONSULTING/OUTSIDE ACTIVITY

You can engage with an institution in multiple ways to achieve a variety of project goals. The three most common are through a gift to the institution, a consultancy agreement (with the investigator), or a sponsored research project. There are distinct features with each of these arrangements with respect to indirect costs (see Budgeting section); IP ownership (see Intellectual Property Concerns section); and confidentiality (see Confidential/Proprietary Information section). The nature of the work to be conducted also differs significantly among these three pathways.

Consultants typically bring high-level expertise directly to your project. However, institutions typically maintain policies regarding consultant agreements to guide faculty accepting these roles. These policies typically cover the terms or conditions that a faculty member must follow when providing consulting services outside of the institution and the institution's legal rights to inventions created by faculty. Other common terms govern conflict of commitment/interest, use of institutional resources, and other issues. You should be aware that the consultant, as an institutional employee, may not use the institution's name in formal documentation, must use personal time to perform the work, and may not use institutional resources to complete the project. The consultant must not enter into an arrangement that constitutes a conflict of commitment or stand in competition with the interests and purposes of the institution.

However, the exact policies, terms, and conditions for consultancy differ depending on the institution; thus, do not assume that the prospective consultant is clear about his or her obligations. You will need to determine whether the expert you are planning to work with needs prior approval to engage with you. You also need to confirm whether the consultant can assign IP to your organization since policies of this type are not uniform across institutions. Often, the consultants' compensation can be negotiated between you and the consultant; however, some institutions have set daily fees for consultancy activities.

Key Points on Consulting/Outside Activity for the Industry Researcher

- Make sure you understand the guidelines defining the expectations around consulting activities, since they are not universal, and your prospective consultant may be equally unfamiliar with these guidelines.
- You are able to be much more prescriptive when engaging investigators as consultants since they are working on your company's behalf.
- Confirm the following:
    - Who has authority to sign non-disclosure and consultancy agreements related to the consulting work?
    - Can the consultant assign any IP generated to your company?
    - Is there a limit on how much time the consultant may spend on the project per week/month?
    - Who sets the fee structure for the consultancy agreement?

IX. INTELLECTUAL PROPERTY (IP) CONCERNS

Before initiating a collaborative relationship such as an SRA (Sponsored Research Agreement), cooperative research and development agreement (CRADA), or work for others (WFO) agreement with a research institution, it is imperative that you consider any existing related IP that they may be bringing to the relationship. This is typically referred to as the Background Intellectual Property (BIP). A list of related BIP should be included in the SOW. If any BIP is to be used, it is important to find and engage with those responsible for IP in your organization. They may be staff in the legal office or someone in upper management. These individuals can best determine your counterpart's use of your organization's BIP and help with negotiations on your use of the other party's BIP. These individuals will also most likely be responsible for negotiating any necessary commercial rights for the BIP and project-generated IP resulting from the collaboration (Foreground IP) that will need to be documented and potentially protected.

The collaboration agreement will contain provisions regarding who will own the resulting IP, who will file with the appropriate patent offices and obtain protection for the IP, who will pay for patent prosecution, and what rights each organization will obtain. Typically, IP follows the inventorship, i.e., if the institution invents it they own it, if the corporate PI invents it the corporation owns it, and if the IP is jointly invented then it is jointly owned. Joint ownership presents its own set of issues. You will not be able to restrict your counterpart from licensing a jointly owned patent to a direct competitor. So it is critical that the terms governing these issues are worked out between the parties before you start the project in the sponsored research agreement. The person responsible for IP in the corporate organization should be familiar with standard practices. Ideally your legal staff has previously worked with institutions and thus understands their concerns and practices.

Both the IP ownership and licensing options can be difficult discussions. Typically, the collaborative agreement will grant your corporation an option to negotiate a license agreement. It will be important to define the terms of the option, such as the length of time in which to exercise the option, how the option will be exercised, any associated fees, upfront payments, and who will cover other costs (like patenting the IP) associated with the license.

The institution will most likely want to limit the time frame for exercising the option as well as the scope of the license. It is common for the institution to grant your corporation a royalty-free, non-exclusive license to the IP for internal research use only. But because your corporation will most likely desire broader rights than this, it is common for the institution to ask how the BIP and foreground IP will be used. It can be useful to cover this aspect in a business plan, product development plan, or marketing plan. These plans will help set the stage for reasonable discussion and negotiation of the ultimate license cost in terms of license initiation fees, royalties, annual minimums, and milestone requirements. Such discussions will produce better results when both parties share openly any business sensitive plans within an established mutually protective Non-Disclosure Agreement (NDA).

You will also want to make sure that patent protection is in place before any public disclosure or discussions, because publishing research results is important to institutions. This will also need to be addressed in the agreement. See the Confidential/Proprietary Information (Publication Issues) section for more information.

Key Points on Intellectual Property Concerns for the Industry Researcher

- Work with those responsible in the corporate organization to deal with IP issues.
- Clearly identify in the collaboration agreement all BIP and any anticipated IP as a result of the collaboration.
- Make certain that the collaboration agreement identifies which party is responsible for protecting foreground IP and the associated costs of protecting and maintaining it as well as details of options for licensing IP.
- Work with your institutional counterpart regarding the right to publish research results to protect the IP appropriately.

X. CREATING LONG-TERM RELATIONSHIPS

What You Can Do to Create a Long-Term Collaborative Relationship?

In some situations, institutional-industrial collaborations may end after a single project because a special one-time need was filled. In other cases, it may be that the fit between the two parties was not a good one or technical issues arose that could not be corrected and so no further collaboration occurs. However, most organizations enter a relationship seeing the potential for long-term benefit. In the best cases, the results of the institutional and corporate collaboration are more valuable than either could have achieved alone.

The initial encounters between research institutions and corporations are much like dating. Each organization is sizing the other up to determine the prospects for a good match. Once organizations have actually worked with each other, a certain efficiency and effectiveness can come into play as each learns the other's goals and direction as well as sensitivities regarding IP, publication, and other matters of importance to a contract. Crossing the hurdles the first time usually proves to be harder than on the second and subsequent times. In fact, it often takes the same amount of time to negotiate one-time projects as long-term projects, and this efficiency can provide benefits to both sides on a long-term basis.

Key factors for successful institutional-industrial collaborative arrangements include:

- Compatible Partner Selection

Careful evaluation and selection of a partner are critical initial steps in creating successful institutional-industrial collaboration. Such inter-organizational relationships develop and continue in large part due to the individuals involved. Success requires that both you and your institutional counterpart act as champions for the project internally to help work out the details smoothly and efficiently. Compatibility is key. Do both organizations share a similar vision of what quality results include? Do the parties' skill sets complement each other?

Conversely, selecting the wrong partner can result in a lost opportunity after considerable time, effort, and funds have been expended in support of a collaboration that is not working, minimizing the ability to work with that institution or other institutions again. But, the right partner helps create not only one successful project, but also avenues for continued collaboration and success with this and other institutions. Finding a reliable, committed, institutional collaborator who understands your organization's needs will provide more opportunity for a successful collaboration. Doing so will ultimately save time and money while reducing the risk of exposing sensitive corporate information to an even wider audience as you seek other research collaborators. Consider the following in choosing your partner:

- Mutually Beneficial Purpose

You will have a higher potential for success when you share similar goals with your institutional counterpart and identify areas of mutual benefit from the collaboration. Furthermore, there is strong evidence that, over time, the benefits of institutional-industrial collaborations go beyond preliminary expectations, resulting in new opportunities, and sometimes even spin-off organizations. However, achieving mutually beneficial outcomes should not in any way infringe on the freedom of action of the institutional and industrial entities and their respective researchers.

- Initial Planning and Structuring of the Collaborative Arrangements

You will have a higher potential for success when you clearly define the roles and responsibilities of each of the parties as well as the use of background and foreground IP in the research agreement. Often these details are included in the SOW. A reasonable agreement protects pre-existing knowledge while implementing a management plan for new knowledge arising from follow-on research. Planning and implementing appropriate administrative structures and processes help prevent misunderstandings which can jeopardize relationships and prevent future collaboration. One other way to accomplish this is to develop an internal support mechanism—a team of champions—within the organization that recognizes the value of the collaboration and is willing to continue backing future projects specifically through this planning and structuring stage.

- Proper Implementation of the Project and its Deliverables

You will have a higher probability of success with a properly structured agreement and plan for execution. It is far better if you and your institutional counterpart underpromise and overproduce rather than overpromise and underproduce. In order to succeed in your initial project and to show potential for future ones for your corporate management chain, it is important to provide this first one with every opportunity for success. Your goal as the industry partner is to build a mutually trusting relationship with the institution and work together to complete all project plans and deliverables. Avoid slowing research progression by not following the research progress and thereby failing to deliver promised items to your corporation on time.

Key Points on Creating Long-Term Relationships for the Industry Researcher

- Take the time to select the appropriate compatible institutional partner. A mismatch of expertise and expectations can lead to costly unsuccessful projects and lower the ability to work with that specific institution or any institution in the future.

- Work toward goals with mutual benefit, and your collaborative relationship will endure longer.
- Plan and structure the deal in the proper manner with careful thought to timelines, expectations, and costs.
- Implement what was planned completely. Your corporation will be looking for results and return on investment that will come from the completed project.

Perspectives

The following section of the Guidebook contains perspectives from individuals who have successfully engaged in institutional-industrial collaborations. The perspectives highlight issues that are unique to specific fields.

The Andersons Perspective

The Andersons, a diversified company with interests in the grain, ethanol, and plant nutrient sectors of U.S. agriculture, as well as in railcar leasing and repair, turf products production, industrial products, and general merchandising, has learned the following from working with several institutions, notably The Ohio State University (OSU): "We are having an extremely positive experience working with universities, but it has required an ongoing discussion of what is of value to us from the university and what isn't," said Charlie Carr, Manager, Business Development for Plant Nutrients. "Some of this has been due to a lack of real-world experience from some university researchers; they have academic experience and knowledge, and that has to combine with our business experience to make the outcome of the relationship more positive."

And that's exactly what has happened as the company with approximately 3,000 employees has become involved in a series of ongoing projects with OSU, perhaps the largest single-campus university in the country. "We lean on universities for their knowledge and research and ability and then go out to the private sector for research and know-how. It is a combination of both skill sets that has advanced our product development so much," noted Carr.

Chuck Anderson, Director of Technical and Marketing Development for Turf and Specialty Group, added, "When we went into this relationship with OSU, we had never done anything of this magnitude with a university. Previously, we worked with many universities all over the country in very tactical, transactional ways, for example, to go to a west coast university to develop a fertilizer for west coast use."

"This was, by far, the first strategic effort in any of our industry-university relationships," Anderson said. "Instead of going out to develop this or that product or to solve a single problem, now we started looking at a complex set of related projects and products. OSU either had the expertise or put us in touch with people, inside and outside of the university, who were experts in both the technologies involved and in business development," he said.

Anderson further observed, "The people involved helped us think much bigger and more appropriately for the technology we had involved." He was referring to Stephen Myers and Denny Hall and the Ohio BioProducts Innovation Center (OBIC) at OSU. "They became a strategic partner."

As regards development of the collaboration, Carr noted, "There wasn't that much of a learning curve; we were involved with the right people at the right schools; communication channels were open and positive, and they were able to move the thinking, planning, and projects along." Anderson cautions that industry-university collaborations might take longer to attain full-speed progress, sometimes because no single person speaks for a university the way, for example, a company president does for a company. Anderson advises that the collaboration sometimes has first to build itself an infrastructure from which to work.

Anderson further advised that working toward a common goal from the outset is incredibly important and powerful. "The number one thing is be mentally prepared for culture differences – both organizations were a bit frustrated at first; we don't know how they work, they didn't know how we work – so the leaders of both organizations need to prepare their people for this difference (giving them background on here's how we make rules, here's how we operate) – this took almost a year."

Carr indicated that The Andersons "did not have to develop a different business model to work with universities. But sometimes they viewed things slightly differently than we did. What we needed to do and did do was discuss these differences, which were smoothed out easily with greater understanding in both directions."

Anderson added, “Now, with OSU, we get together and figure out how to proceed; our relationship has evolved. Both entities have a stake in the future model – and this is truly unique. What we have now is a true collaboration; it’s a partnership for a strategic common goal, which has to be thought of as a global goal.”

Carr added, “OBIC was instrumental in helping us find grant opportunities and obtain major funding through the Ohio Third Frontier. We were awarded a $5 million grant that is still active now. We probably would not have tried for this funding otherwise. Now that we have received this grant, we are actively looking for state and federal grants at every opportunity.”

Carr and Anderson offer these suggestions for a successful collaboration:

- Establish an open relationship.

“When they see potential opportunities for us, they contact us; when we see the need for their support, we contact them – then be open with each other and challenge each other with our thoughts; you might not always agree, but work together and support each other.”

- Develop a written common objective – an agreement with a defined mission or goal together at the beginning of a collaboration.
- Set completion dates and meet them to ensure timely responses and deliverables from institutions.
- Set up regularly scheduled meetings to review progress. Quarterly meetings worked well for The Andersons.
- Identify project managers both at the research institution and at the corporate organization. These individuals should conduct all shared discussions (OBIC served in that role for The Andersons.), confer every week, and share the essence of their dialog with their respective entities to reinforce buy-in on the project progress.
- Realize that graduate assistants, postdoctoral trainees, and interns can do some of the necessary work at a reduced rate and thus give the students the industry experience they need for their own work and future development.

“For companies new to wanting to work with an academic institution and not quite knowing how to do it, stay in touch with the latest in technology,” said Carr. Secure introductions to different stakeholders who can facilitate the relationship and perform matchmaker duties between academic talent, technology, and business needs and opportunities. “Universities want business opportunities as much as we want them,” Carr said. “It is a two-way street; we thrive by helping each other.”

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What began as a single grain elevator and one man’s dream has grown into a publicly traded company with diverse interests spanning multiple agribusiness sectors including nutrients, transport, industrial and turf products, and energy. The premise of the original organization, founded by Harold Anderson and his family, was to make it as easy as possible for regional farmers to take their corn to market. The business model of serving others, primarily the customer, is the foundation on which the company was built. Today, throughout all of The Andersons’ business endeavors, the company and its nearly 3,000 employees are committed to providing extraordinary service with the utmost integrity. The collaboration discussed here includes The Andersons, OSU, OBIC, Syngenta Corporation, National Lime & Stone Company (Findlay, OH), PSB Company (Columbus, OH).

The Ohio BioProducts Innovation Center is a Wright Center of Innovation funded by the Ohio Department of Development (ODOD). OBIC focuses on enhancing Ohio’s leadership position in bioproducts commercialization. A novel market pull model integrates academia in support of comprehensive supply chain collaborations across agriculture, specialty chemical and polymer industry sectors. For more information, go to bioproducts.osu.edu.

Links:

The Andersons	http://www.andersonsinc.com
Syngenta	http://www.syngenta-us.com/home.aspx
National Lime & Stone Co.	http://www.natlime.com
PSB	http://www.psbcompany.com
Ohio BioProducts Innovation Center	http://www.bioproducts.osu.edu

Arlington Products, LLC Perspective

For Jeff Schultheis, chief operating officer (COO) at Arlington Products, LLC, the road to industry-university collaboration has been one of increasingly larger steps. In an initial foray into these types of interactions, Arlington collaborated with PolymerOhio and the OBIC at OSU. That foundation led to expanded collaborations at OSU to proceed with product commercialization.

Arlington's product is a biopolyol made from waste products from biodiesel plants and farming wastes. Basically, the corporation has a biodegradable material that can be used in a wide variety of packaging, soft foam, and other foams, insulation, etc.

The original idea at Arlington was to go to one or more university environments and just explore whether there might be anything of interest there. Was there any other way to help the biodiesel industry? Schultheis said, "What we found out was that the university was already working on using some of the waste products of our industry; we found out that work was already going on. How amazing was that!"

"From the very beginning, everyone was so open. We met lots of people in the fields of polyols, plastics, polyurethanes, etc. and got to see how other companies have taken their products from early ideas through commercialization," Schultheis recalls. "That helped us get the lay of the land on exactly what would be required to take an idea at the Ohio Agricultural Research and Development Center (OARDC), an OSU facility in Wooster, OH, and take it to a commercialized product."

In working with OSU, Schultheis noted that a key to progress has been "a lot of communication." He added, "We found that there were differing opinions that came from the people involved in the project – in terms of what works, what does not work, etc. When you might think something is right, then see lots of opinions, look at them, see the positive, helpful attitudes coming along with the opinions, you need to have open communication to help sort it out and find the best path forward." He added, "The best thing was when someone didn't have an answer or another suggestion for you, they would be so gracious to refer to someone else and keep things rolling."

"As it turned out, there was no one person who has been the guru of the whole thing; everyone has a role; and we have been able to have great guidance on where to go to get answers when we needed them," Schultheis said. "For example, Dr. Yebo Li at the OSU Department of Food, Agricultural, and Biological Engineering (FABE) was so willing to try different things and evaluate comments from others on the team, look at our product, and try to make it better. With his help—what we learned through it, our open, mutual communication—we were able to avoid a 'This is impossible' situation and achieve a 'Let's see what else we can do.'" That approach was a huge step forward for the project.

"PolymerOhio's role was to get us more information on the market, sort through what's out there in the Ohio landscape that we could investigate or approach as partners, and get us face-to-face with other Ohio companies." "PolymerOhio folks relayed information from OBIC and got marketing information through OBIC, too." Schultheis noted that this sort of close connection with other Ohio companies during the development process was key to getting knowledgeable parties to try the products and work with Arlington on an ongoing basis to integrate their biomaterial into existing products and thus become part of a supply chain. As part of that testing effort, Arlington formed partnerships with Green Insulation

Technologies (Garrettsville, OH) and MLB Products (Swanton, OH). And all of these steps were accomplished in a few short months since Arlington set out on this path.

Shultheis has some advice for corporate entities just beginning to move toward institutional-industrial collaborations: "Go to a lot of these organizations (like PolymerOhio, OBIC, OSU) and get involved; there are lots of benefits. Be willing to listen to all parties and the different points of view; this sort of input helps shape your strategy and your product. Understand that all these guys are on your side, even if their comments are critical." And lastly, he adds, "Be willing to listen and participate."

For research institutions, Schultheis recommends: "Get out there into the commercial world and promote what you're doing—lots of great work people don't know about. Seek people with whom to partner."

"Remember the business model—a university is more into research, not so much worried about the associated costs. On the other hand, the commercial partner will help the university look at the costs and go through a learning curve. Companies are likely to provide a rhetorical reality check: Lab work is great, but how can we do this with a cheaper product so it could be used commercially?" Schultheis said. "Also, universities sometimes work in a vacuum captivated by the 'neatness' of something, its 'wow' factor." He says that wow factor helps get things invented, but then the challenge becomes how to refocus to a product that could be commercialized. "In businesses, it's the opposite; it's not all cost, sometimes you have to look at a wow and see how to move it out of an idea stage rather than getting stuck in what you are doing at this instant."

Overall, Schultheis rates his recent experiences with an industry-university collaboration as "eye-opening." He sums the experience up with the comment, "It has been very positive and very interesting to work with different groups to help move the product along. Now we think we can commercialize this. It was tough to work through it, but very worthwhile to get help from Tech Columbus, PolymerOhio, and OSU—to get them to work together has been invaluable."

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Arlington Products, LLC promotes the use of alternative fuels through the production of biodiesel and the education of local and state businesses on the benefits of alternative energy. Arlington supplies high quality biodiesel resulting in a cleaner environment with less waste and improved efficiency, while providing long-term economic growth in North Central Ohio.

PolymerOhio, Inc. is a polymer industry-specific Ohio Edison Technology Center, which is funded by the Ohio Department of Development. PolymerOhio focuses on enhancing the global competitiveness of the polymer industry, including that of corporations from the plastics, rubber, bioproducts, and advanced materials segments of industry. For more information, go to polymerohio.org

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Working with its partners across business, state and local governments, academia, and the non-profit sector, the Ohio Department of Development works to attract, create, grow, and retain businesses through competitive incentives and targeted investments. Engaged every day in marketing, innovating, investing, and collaborating, the ODOD works at the speed of business to accelerate and support the teamwork that is absolutely necessary for success by providing financial, informational, and technical assistance to those making an investment in Ohio's future.

Links:

Arlington Products/Energy	http://www.arlingtonenergy.net/products-services.html
OARDC	http://www.oardc.osu.edu
Ohio Department of Development	http://www.development.ohio.gov
The Ohio State University	http://www.osu.edu
Polymer Ohio	http://www.polymerohio.org
Ohio BioProducts Innovation Center	http://www.bioproducts.osu.edu

Natural Fiber Composites Perspective

Between the financial market drop-off in October 2008 and a tornado that destroyed manufacturing equipment in October 2010, it took more than just a bit of luck for the Natural Fiber Composites Corporation (NFCC) in Columbus, OH, to stay in business. It took the strength of an industry-university collaboration to weather these two potentially fatal setbacks and live to tell about them, according to Dr. Prabhat Krishnaswamy, NFCC President.

"The tornado hit the agricultural engineering building that housed part of the pilot plant at the OARDC in Wooster, OH, and this building was the hardest hit. There was a lot of material being processed there," Krishnaswamy explained. "But here was a great example of where and how our industry-university partnership paid off. Dr. Stephen Myers, Director of the OBIC headquartered at The Ohio State University, one of our key collaborators from the beginning, worked quickly with OARDC senior staff to identify another building where we could re-establish our operations in order to continue to move forward while decisions on reconstruction of our former building were being made."

Krishnaswamy said that NFCC, which is a spin-off of Engineering Mechanics Corporation of Columbus (Emc2), was originally introduced to OBIC by PolymerOhio, an Edison Center supported by the ODOD. "PolymerOhio linked us to OBIC through a cross-fertilization of industry support, where PolymerOhio and OBIC were on each other's planning boards and worked closely together," said Krishnaswamy.

"With the help of OBIC and ODOD Wright Center project funding, we were able to establish a pilot plant at OARDC to validate the technology concept, which involves using natural fibers to reinforce polymer composites." A strong consortium, led by OBIC, has integrated innovative bioprocess engineering, nanomaterials, and polymer processing technologies to help NFCC develop novel natural fiber technologies. "It was good to have a facilitator and champion like OBIC to help us understand how the university is structured and bring the various groups and departments at OSU together onto a common ground," observed Krishnaswamy.

"OBIC helped us set up an arrangement with OSU so that OSU owned the capital equipment in the pilot plant, which permitted us to deliver sample products that customers could see and test for their applications. This strategy has been successful in leading to our first product, a profile extrusion for outdoor building and construction applications," Krishnaswamy said.

"With OSU, ODOD, OBIC, PolymerOhio, and industry organizations behind us, we had the needed credibility when a large Fortune 500 company showed interest in our technology. Our industry-university collaboration definitely gave us a lot of stability, especially during the economic downturn," Krishnaswamy explained. "Now, our first product has met all building code requirements, and we have a product that can compete directly with materials that use aluminum or glass reinforcement for stiffness."

Extensive industry networking capabilities from organizations like PolymerOhio, the Ohio Corn Marketing Program, and the Ohio Soybean Council helped NFCC establish its supply chain, including a number of other Ohio companies that span the range between integration of innovative bioprocess engineering and composite engineering technologies.

"One of the strengths of our industry-university collaboration is the ability to leverage funds through a cost-share," said Krishnaswamy. " To do that, OSU wrote a SEEDS Grant with OARDC. NFCC, with OBIC's assistance, was able to interact with faculty in multiple disciplines. Additionally, OBIC helped to bring in direct involvement from the City of Wooster and Wayne County, which then provided leasehold improvements to the pilot plant site." Krishnaswamy said that the secret to making all this work smoothly was, "Communication, communication, communication; from the pre-proposal, during the proposal, during the defense, and especially after the project award."

"My advice for companies new to wanting to work with an academic institution and not quite knowing how to set up an industry-university collaboration is to seek a relationship with an ODOD Wright Center or Edison Center that will champion the technologies that cover the company's primary expertise and competence," Krishnaswamy said. "Then prepare a road map with expectations and commitments on both sides, so everything is clearly spelled out. Having patience and persistence makes the collaboration worthwhile for all partners. Gather all the pre-proposal intelligence available, attend the ODOD pre-RFP presentations (Bidder's Conferences), and line up collaborators early."

"The lessons we have learned include the necessity to find a champion within a Wright Center or Edison Center to help the university move at a pace more like that of a small business," Krishnaswamy commented. "Even though the financial markets put everything on hold for almost a year and forced us to move away from focusing on automotive as our primary market, we made the needed adjustments to our original plan and subsequently won a Wright Project in July 2009," he said. "If we had not won it, we probably would have had to call it quits."

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The NFCC was formed by the principals of Engineering Emc2 to commercialize a technology involving natural fibers as reinforcements for plastics and composites. Emc2 specializes in the experimental and analytical evaluation of the structural integrity of systems and components made of metals, plastics, composites, and other engineered materials and manufactured using various joining processes. NFCC is leading an effort to develop the next generation of composite materials for application in transportation, building and construction, and consumer and industrial products. NFCC is focused on essential research, piloting, and commercialization activities—all of which have the potential to help Ohio become the world leader in bio-based advanced natural fiber composite materials.

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Links:

OARDC	http://www.oardc.osu.edu
Ohio BioProducts Innovation Center (OBIC)	http://www.bioproducts.osu.edu
The Ohio State University	http://www.osu.edu
Ohio Department of Development	http://www.development.ohio.gov
Polymer Ohio	http://www.polymerohio.org

SPECIFIC ISSUES FOR COLLABORATIONS WITH BUSINESS SCHOOLS

Bradley J. Alge, Associate Professor, Krannert School of Management, Purdue University

Here at the Krannert School of Management, building collaborative partnerships with industry is critical to what we do. In fact, it is hard to imagine a business or management school not engaged with industry. The notion of the "ivory tower" professor is a misnomer at Krannert. Indeed, our professors are in the trenches conducting research, sharing knowledge, and engaging in outreach with organizations in virtually all industries (e.g., healthcare, manufacturing, public/non-profit, financial services).

Based on my own experience, the level of engagement between industry and academia can take several forms.

First, academic-industry partnerships are a tremendous benefit to teaching. By engaging with industry, we ensure that the nature and content of our courses are relevant and responsive to the needs of our students and their future employers. Every time I visit a company, I learn something new that I can take back to the classroom with me. Students frequently comment that they value the "war stories" from the field. The relationships that we build in industry create opportunities to invite corporate managers into the classroom to share their experiences with our students and have provided a conduit for our students to the corporate setting. For example, whether it is conducting a student team consulting project for an industry partner or securing opportunities for students to pursue internships or other experiential learning opportunities, the benefits of academia-industry collaboration are relevant and valuable to the educational mission of the university, and by extension, its students.

Second, there is a benefit to research. As a scholar in the organizational sciences, I find one of the best ways to advance knowledge is to study real organizations. Theories may work well in the lab, but do they work in the real world? That is, do our theories generalize to the real world, where knowledge can be applied? An affirmative answer to this question provides external validity to our scientific theories of organizations. University-Industry partnerships help ensure that the knowledge being created at the university is valid, interesting, timely, and relevant.

SPECIFIC ISSUES FOR COLLABORATIONS WITH SMALL BUSINESSES

David Kennedy, CEO and President, Ikotech

University-Industry Partnerships are often an essential component of the R&D plan for small technology businesses due to the nature of the both institutions. Small businesses generally have limited human, physical, and capital resources that can be supplemented through university partnerships. Universities are mandated to seek commercialization avenues for research funded by federal and state grants. Successful commercialization of university research also helps establish a reputation for academic research excellence. Most major universities recognize the importance of small business to their research reputation and have taken broad steps to help foster partnerships with small businesses by establishing co-located business incubators, technology parks, and special programs to encourage university interaction in small technology businesses. Besides, every university would love to have the press release associated with the next big tech transfer success story!

University-Industry (U-I) Partnerships with small business, while having incredible potential, can be extremely difficult to navigate. I have heard seasoned entrepreneurs lament about the complexities of working with universities, such as the bureaucracy, administrative red tape, protracted negotiations for licensing rights, and difficulty bridging the cultural divide between industry and academia. Investing time and money in a university relationship can be a lot like high-risk

angel investing: 40% of projects will be flaming failures, 30% will produce break-even value, 20% will produce mild success and return on investment, and, if you are lucky, 10% will be gangbuster successes.

When companies should consider a U-I Partnership

So given these long odds, why seek a University-Industry partnership? For the entrepreneur it is often not just the drive to be one of those top 10% success stories, but it is essential for the business. Corporate entities that have learned how to navigate the complexities involved in establishing University-Industry partnerships have been wildly successful at raising grant funding through the Small Business Innovative Research and Technology Transfer (SBIR/STTR) grant mechanisms, a $2.5 billion federal set-aside program to fund research by organizations with fewer than 500 employees.

Speaking from personal experience, I find that proposals that include a University-Industry partnership often stand a better chance of being selected for funding than proposals from an individual company. Having previously worked for over ten years at the single biggest recipient of SBIR/STTR funds in the state of Indiana, I found that 50% of Phase 1 SBIR and 60% of Phase 2 SBIR grant proposals that I helped develop that included a funded U-I Partnership were selected for funding, marks that are well above the national average. Universities can accelerate small business research by providing instant credibility, access to IP, world-class scientific credentials and expertise, and cutting-edge laboratory facilities that have been built over decades and with tens or hundreds of millions of dollars. These facts are obvious to the proposal reviewer and often strengthen the proposals substantially. However, beware the pitfalls of adding a University-Industry partnership solely for the purpose of getting the proposal funded and getting the research completed. A successful University-Industry Partnerships is like a marriage: it requires trust, patience, understanding, commitment, planning, and execution.

Specifically, universities can be essential to small businesses seeking SBIR funding by providing an appropriately skilled PI. The PI's publication history and research credentials can often make or break a grant proposal. A small business that has an official PI with weak credentials can boost the credibility and odds of selection by listing a co PI from an academic institution. For companies that do not have an appropriate PI on staff, university researchers can serve as the PI on STTR projects. Proposal reviewers typically look closely at the PI's academic degrees, publication history, track record of related research and grant funding, and awards and recognitions to determine the suitability of a PI. Companies are often staffed with engineers or scientists that may have been wildly successful in their previous positions but have not published widely or do not have a PhD. Accessing a credentialed PI through an academic partnership can help get small business research off the ground. The PI is essential not only to establishing the credibility of the grant application but also for the execution of the research, and herein lies the biggest potential for pitfalls.

In my history, I have seen numerous occasions where SBIR grants that include a U-I partnership are selected for funding, only to watch the project go down in flames. The key to success starts before the grant application is even written. If real attention to the U-I partnership is reserved for when the funds arrive, then the partnership is almost destined to fail. You wouldn't wait until you were married to discuss big issues like money, how many kids to have, and whether both spouses will work. Likewise, it is essential to discuss budgets, schedules, deliverables, publication rights, IP plans, and most importantly future expectations while you are still "dating"—before even writing the proposal.

Successful Small Business U-I Partnerships are a lot like Marriage

When engaging academia, you should plan for a dating period where you spend time getting to know the institution and the people. And much like dating, at some point you need to get to know the family. All too often small businesses focus on the targeted researcher. They visit the lab and ignore everything else. The most successful U-I Partnerships that I have participated in often started with our sitting down and spending introductory time with the

researcher, then visiting the technology transfer and the sponsored programs offices together with the researcher. This is an important step: the sponsored research group can help get the collaboration started off on the right foot by helping initiate trust and confidentiality through an NDA. You SHOULD NOT discuss the sensitive matters of your proposed research or delve too deeply into what the university researcher is doing without an NDA/CDA in place. This document protects both parties and creates an environment of trust. Do not just sign the agreement—make sure you understand the agreement and how to handle identification of confidential material. Not all institutions require that confidential material be identified in writing; however, it is an excellent idea to require such a clause for clarification, and if you have one in your agreement, then make sure that both you and the university researcher follow the guidelines for identifying and handling confidential material according to the agreement.

Visiting the university offices will also let the outsiders from the company understand how proposals (including planned subcontracts) are assembled and approved, what the company can expect in terms of proposal development timetables, and how and when IP will be negotiated. You will likely gain an appreciation for the hurdles that a university professor must navigate in order to succeed, and that respect and appreciation will reap dividends down the road. You should make extra effort to at least meet the personnel that will assist the researcher with proposal development, including internal budget and paperwork approval.

Understanding the university process and hearing the steps that must be completed will help you plan accordingly for the proposal development phase. You should also meet the grant administrator whom you will need to work with in order to negotiate the actual contract. A good working relationship with the grant administrator will help provide collaborative win-win negotiations. Also be sure to meet the technology transfer officer that will handle negotiation of licensing arrangements and understand the institution's process for initiating patent disclosures; covering patent costs; and negotiating standstill agreements, interim licensing arrangements, and exclusive licenses.

Don't be afraid to ask questions. Understanding the full scope of the different offices can help put negotiations in perspective. How many people work in each of the offices? How much does the university receive annually in research grants? How many projects are active at any given time? What is the average size of the grants? How many patent disclosures are filed in a given year? What is the annual revenue from royalty-bearing license agreements? Ask for a copy of the typical university subcontract agreement early in the process to understand what the institutional expectation is regarding IP, confidentiality, publication rights, and termination clauses. Realize also that some and in many cases most of the research will be delegated to a graduate student and that the university and principal researcher has certain obligations to the student with regards to IP and publication rights – understand these early. It is like getting to know the kids of someone you are dating.

The answers to these questions can sometimes surprise people and usually will help provide perspective when the university doesn't fall over itself to sign up to a half-percent royalty-bearing license or a subcontract opportunity for $10,000. These meetings and questions should be addressed along with the researcher. In fact, it is often true that the academic researcher may not understand the university processes any better than you do at the outset, and he or she may learn a great deal that helps smooth the process at a later date. Never underestimate how important this process can be at forging a working partnership with your research partner.

Finally, a word about one of the biggest pitfalls in establishing a U-I partnership: don't sign up to a U-I Partnership just to use someone's university brand and credentials. This is like marrying someone for their money or their looks and is absolutely a formula for disaster! A successful U-I Partnership serves the needs of all parties, which includes salary support for the researcher, intellectual engagement by the researcher, and a feeling of ownership in the entire process. Too many companies enter into U-I relationships with the mindset that the researcher's credentials will get them funded, then the researcher will conduct their part of the project and at the end will hand the company a pretty package of data that includes all of the necessary solutions to make the technology a winner.

The reality is that researchers often require a lot of relationship maintenance, and need to feel ownership in and value of the work they are doing. All too often I have seen situations where the researcher is not being personally fulfilled, usually because of miscommunications and/or lack of respect, and the researcher "takes their ball and goes home." Know this: PIs have incredible amounts of control within university walls, even to the point that they can take grants with them if they leave the university, and tenured professors cannot be forced to do anything. As a small business you probably entered into the U-I Partnership for a substantial reason beyond just funding, and if the PI psychologically unplugs from the project, then you are right back at square one. Even worse: beware the situation where you as the small business are working under subcontract to the university. While universities can sometimes obtain larger grants and more funding, virtually any time the researcher controls the financial purse strings of a project, something goes awry. It is virtually cliché that researchers are lauded by their peers and worshipped by their graduate students, trotted out by the administration's public relations machine, all of which pumps up their ego, only to see it deflated when the company seeks to make a profit, the technology becomes more associated with the company brand than the researcher's name, and the university take their proportionately bigger cut of licensing revenue…all of which leaves the researcher feeling screwed over.

Commercialization is time-consuming and difficult. Do not expect the researcher to grind away, clinging to the altruistic mission of what the business will do with their research. Do not expect for one second that he or she will continue to allow the funds to go into your commercialization venture while the next big research idea, which will generate the laud and praise accompanied with a new discovery, goes unfunded. Nothing is more impossible than getting a disgruntled researcher to favor your profit motive over his or her personal ego. However, if you respect the researcher, seek ways to ensure that they find fulfillment in your research, and get them to take ownership of the mission, you may find yourself in that top 10 percent!

Scoping a project: budget, schedule, work scope, and deliverables

One of my mentors once told me that small business and university collaborations need to be handled according to the three F's: Firm, Fair, and Friendly. Start discussions early about the realities of the proposed work scope, budget, and schedule. To the best of your ability, plan for reasonable deliverables—and be prepared for them to change. Researchers may be willing to sign up to a certain budget, schedule, work scope, and deliverables only to see the entire plan denied by the university administration. Be reasonable and remember that the U-I Partnership MUST be a win-win situation. Both parties need to ensure that they have a reasonable budget to succeed. Know that the university is going to add a 50-60% "indirect rate" bump to whatever the researcher needs in his or her budget. In the grant world this is the equivalent of gross margin to a product. The indirect rate, often referred to as the Facilities and Administrative or F&A rate, covers the very real costs associated with the university setting including administrators that handle the contracts, computing support that manage information technology, facility administrators that keep the place running, and accountants that cut the researcher's paycheck. Be prepared for this in your budget, and likewise, ensure that you can cover your necessary costs (both direct research and indirect costs) through your portion of the budget. Negotiations often get tense when the university budget plus the industry budget exceeds the budget limit of the grant opportunity. In this instance, review the budget and work scope for items that can be cut, and if the budget is still over the limit, contact the federal office where you plan to submit the grant application and seek approval to exceed the limit. This is sometimes permitted by the Department of Defense and National Aeronautics and Space Administration and is frequently approved by the National Institutes of Health—if the budget and work scope are reasonable.

I cannot emphasize enough that one of the keys to getting a U-I Partnership funded by SBIR grants off on the right foot is to start working with the university early! Universities have processes that must be followed. It is routine for the paperwork alone to take up to a month. Also, spend time reviewing the grant application guidelines and enlist the support of outside help if you have never submitted an SBIR grant before. It is essential to understand what you must deliver and to clearly identify that to the university with ample time for them to fulfill the commitment. For example,

NIH proposals generally require a university-supplied formatted budget including budget justification write-up (which includes explanations of work scope and rates), a letter of support from the researcher, and a formatted standard letter that the university has considered the project and is prepared to go forward with the project if funded. Nothing gets a U-I Partnership off on the wrong foot like pressing the university for rapid paperwork turnaround because sufficient time was not allotted for the process.

Budget Distribution, a.k.a. Money is the Root of All Evil!

All too often, U-I Partnerships start off with great intentions and a willingness to accept whatever budget gets carved out in order to get the project underway. This is dangerous territory for the relationship, and if one party has been burned before, it is common for one party to execute a land-grab for the lion's share of the funding. In an SBIR grant it is easy for the company to try to rationalize giving a small subcontract—after all, it is their project, right? WRONG! If you are proposing a collaboration, then it is collectively everybody's responsibility to ensure that all parties have the resources necessary to execute the project. And remember my earlier warning: if the funds are not significant enough to attract the researcher's attention, boost his or her ego, and support a substantial proportion of his or her laboratory, then it is easy for the researcher to sideline your project.

Do not ask a university to support your proposal for little compensation. Talk about the dollars early in the discussion, and be open and frank about it. Once you commit to the university's portion of the budget, expect that to be a firm commitment since asking a university to go back and cut 10% of their budget to make the project, even if acceptable by the university, takes significantly more time.

- University researchers often perceive the company as "hogging" the budget
- Industry often perceives having to pay university indirects as an undesirable tax. University indirect rates are legitimate costs of operation that must be covered to provide sponsored research services. These include contracts management, added accounting, and other associated administration.
- Both institutions must respect the needs of the other. Small businesses often have to incur costs that university researchers never see (e.g., IP costs, R&D costs, sales and marketing efforts), and often small businesses are trying to build facilities and capabilities that the university researcher may take for granted at their facility.

The fuzzy grey line: company's technical need versus the academic curiosity inherent in universities. Businesses usually have firm issues to deal with: budgets, schedules, and specific data or technical results.

- Publication rights of professors, graduate students vis-à-vis the project.
- Grants Management.

Be sure to understand how the project is managed internally at the university and who is responsible for what. Often a subcontract will include a highly credentialed professor with a very small percentage of their time committed to the project and a substantial amount of graduate student support. Find out who to contact should issues arise between you and the PI—having the correct intermediary identified well in advance of the problems can help solve many issues, but do not expect them to ever overrule the professor.

Be sure to understand: the university PI on a grant is vested with an incredible amount of power.

Final thoughts:

If you can manage to get the researcher and/or graduate students working at your facility, this will greatly enhance your U-I experience by making them truly part of the team – almost like an internship. In fact, some universities have programs that can be used to develop a U-I partnership through internship-like mechanisms. If the work is to

be performed by a graduate student, this can also provide you a chance to "test-drive" the student in case he or she would make a strong addition to the team. Never discount the fact that your continual presence will probably push the student substantially more than any number of calls, emails, or badgering. Students are cognizant of the need to establish their reputation for future references and employment, especially in this economy and job market, so they will likely seek to impress. Also be cognizant, though, that unless you establish it as an internship, the student may still fall under university guidelines for publication and IP rights. Be sure to get these issues clarified up front.

GUIDANCE FOR PROSPECTIVE COLLABORATORS

Vic Lechtenberg, Purdue University

These perspectives are derived partly from my personal research experiences and partly from working with other faculty and staff to negotiate agreements and implement industry-sponsored research projects.

Most academic faculty with active research careers are intimately familiar with the federal peer-reviewed research proposal process. Major efforts are required to assemble a research team, prepare a competitive proposal, develop a detailed budget, navigate the peer review process, and finalize the contract or agreement. This process often spans months, sometimes almost a full year. Once funds are awarded and the project has commenced, much attention is required to satisfy federal accounting and audit expectations. Scientific findings are important, but the scientific reporting expectations are often less rigorous than fiscal reporting. The efforts expended to develop and prepare the original proposal are often greater than those required for the scientific reporting. The research plan (proposal) is paramount.

Industry-funded research projects are likely to emerge in a much different manner. The research proposal might be a relatively brief SOW. There is unlikely to be a formal peer review of the proposal once the work scope has been agreed to. Also, in my experience, corporate sponsors are most interested in the total cost of the research, but not particularly interested in budget details. Major emphasis will be on research findings and timelines. Quarterly, or even monthly, reports are likely to be expected. In my experience, most corporate sponsors do not expect detailed fiscal reports.

Another difference between industrially and federally funded research is the timeline with which funding decision can be made. Once an industrial project is approved programmatically, funds can flow very quickly, assuming issues with respect to IP have been resolved.

In summary, the primary effort in an industry-sponsored project is on the research findings and report of results, whereas with federal agency-funded projects major efforts are on the proposal process.

The primary justification for industrial research is the opportunity to capture discoveries or know-how that can be converted into products or services of commercial value. Thus, industry-funded research inevitably involves complex negotiations over IP, licenses, and opportunity to commercialize discoveries. University and industry relationships often work most smoothly when these issues are negotiated early in the relationship. In my experience, the most effective partnerships are those in which issues of IP and commercialization are addressed in a general, overarching agreement, independent of specific research projects. If this can be done, then specific research projects and work plans can be greatly expedited.

Most universities have well-developed IP polices and are able to reach reasonable agreements with corporate partners fairly readily. The goals of the university should be to get new technology commercialized as quickly and as widely

as possible. Normally, this is also the goal of the industrial sponsor. Sometimes, however, the business interest of a company might be disadvantaged by a new discovery or technology. These situations can lead to conflict. In my opinion, at least in a public university, superior technology should not be shelved. The research agreement should require good faith efforts to commercialize technology on the part of the industrial partner, or the university should be able to license to other commercial entities. Publication of research results is the life blood of academia. Reasonable publication delays may be necessary to file patents or otherwise protect IP. However, universities should not normally agree to keep research findings completely confidential or out of the public record. An exception might be research that is classified. In these cases, faculty need to be sensitive to the publication needs of students. These projects might not be appropriate for graduate students. In my experience, these publications can usually be addressed satisfactorily.

In my view, universities should protect the opportunity for their faculty to seek funding from multiple sponsors. Sometimes companies may want to have exclusive right to fund research of specific university faculty or scientists. These can be potentially problematic situations. If the company is willing to sufficiently fund novel ideas, then the issue can be resolved. However, if the company partner is not willing to fund a faculty member's new idea or project, then the faculty member should be able to seek other funding—and be free to commercialize discoveries.

Some academics might view industry-funded research as less prestigious than federally funded, peer-reviewed, and competitively funded research. This is not an indictment of the industry partner but reflects an academic bias that could be a risk for young academics. If this culture exists in the university department, the department leadership needs to aggressively challenge this thinking and work to create a positive environment for industry sponsorship. If this is not done effectively, then the careers of young faculty will be at risk, and it may not be wise to pursue industry funding.

My last thoughts relate to the impact that industry funding has on the nature of academic research in terms of the choice of problems that are pursued. Throughout my career as an administrator, I have always challenged faculty to pick "important" problems on which to work. There are many scientifically challenging problems, but not all are equally important, or have the same impact on society or the economy. Pick an important problem that has high impact.

The opportunity to partner with industry in research helps sharpen the focus of research. Faculty who work with industry and who have a focus on commercialization of their research findings are likely to be focused on highly important problems, problems that will have high impact if solved. Many faculty find that this focus is invigorating. It increases their scientific productivity. Furthermore, their students have highly relevant educational experiences.

One other observation regarding University-Industry partnerships stems from watching the changes in expectations by state governments with respect to university research. During the past decade, states have expected university research to help drive economic growth and development. Universities are expected to be the source of new technology and entrepreneurship, and these expectations can best be met though a robust research partnership between the university and industry.

Glossary

Background Intellectual Property (BIP): pre-existing intangible assets or intellectual property owned by organizations before entering into collaborative research agreements (See Intellectual Property.)

CEO: chief executive officer, typically the senior management official in an organization.

Clear Value Proposition: a well described plan which deriving of the clear, concise, and compelling reasons can demonstrate value in the result of a project.

Commercialization: the process of developing research results to the stage of producing and delivering products for sale.

Compliance: adherence to the many laws, regulations, and policies that impact institutional-industrial research, such as export controls – most organizations have a person or unit responsible for ensuring that compliance policies are followed.

Confidentiality Agreement (CDA): an agreement that permits the sharing of sensitive information between the parties in order to facilitate the research project by providing for specific information to be protected from disclosure to third parties.

Consultant: an individual possessing technical expertise on a subject matter who provides professional advice or services for a fee as an independent contractor.

Contract Accords: a set of recommendations developed by the University-Industry Demonstration Partnership to address commonly recognized issues in industry-sponsored research agreements that typically require additional time for resolution. (http://sites.nationalacademies.org/PGA/uidp/PGA_058342)

Contracting Office: the office in an institution that handles contract development and documentation.

Cooperative Research and Development Agreement (CRADA): a particular government contract format between a government agency and a non-governmental organization with shared responsibilities.

Cost Sharing: a requirement that the recipient of a sponsored research award contribute some portion of project costs.

Costs: at some institutions modified total direct costs are the total direct costs excluding capital expenditures (buildings, individual items of equipment (equipment means an article of nonexpendable tangible personal property having a useful life of more than one year, and an acquisition cost of $5,000 or more per unit). Also excluded is that portion of each sub-award in excess of $25,000 and flow-through funds apply.

Deliverables: A clearly defined explanation in the SOW of the expectations of the parties as to what each receives at the completion of the project.

Economic Development: the process of creating or maintaining local and regional capabilities that not only generate income but result in an increased quality of life today and in the future.

Export Control: laws enacted to restrict export of “sensitive” or “controlled” goods, technologies, and related technical information that might harm U.S. interests or contribute to the military capabilities of countries whose polices are in conflict with ours. Export control laws are enforced by the U.S. Department of Commerce, State Department, and Treasury Department.

Facilities and Administrative (F&A) Costs: a term reflecting a research institution’s overhead costs associated with sponsored projects; the off-campus rate will often apply to all activities performed in facilities not owned by the institution and to which rent is directly allocated to the project(s). Grants or contracts will not be subject to more than one F&A cost rate. If 50% or more of a project is performed off-campus (exclusive of any subcontract performance sites), the off-campus rate will apply to the entire project.

Federally Funded Research and Development Centers (FFRDC): an activity sponsored under a broad charter by a government agency (or agencies) for the purpose of performing, analyzing, integrating, supporting, and/or managing basic or applied research and/or development, and that receives 70% or more of its financial support from the government; and –

- A long-term relationship is contemplated;
- Most or all of the facilities are owned or funded by the government; and
- The FFRDC has access to government and supplier data, employees, and facilities beyond that common in a normal contractual relationship.

NSF maintains the Master Government List of FFRDCs and adds each FFRDC to the list when the head of the sponsoring agency notifies NSF in writing that he or she has approved a new FFRDC.

Foreground Intellectual Property: intangible assets or intellectual property developed during a collaborative research project. (See Intellectual Property.)

Full-time equivalent (FTE): amount of time expended on the project equal to one person.

Indirect costs (IDC): See **Facilities and Administrative (F&A) Costs** section.

Indemnification: the right of an injured party to shift the loss onto the party responsible for the loss.

Innovation: the process of developing anything that leads to a new or improved way of doing things or an entirely new technology or device.

Institution: a category of organizations including universities, national laboratories, and other non-profit research institutions. (See Research Institution.)

Intangible Assets: assets that do not have physical characteristics but have economic properties such as rights and privileges that can generate income for their owner.

Intellectual Property (IP): intangible property that includes but is not limited to: patents, trademarks, copyrights, trade secrets, technical data, ideas, designs, know-how, business knowledge, technical and research methods, and other types of intangible business assets.

Investigator-initiated Proposal: a proposal started by a researcher that was not actively requested by a sponsor.

Negotiator: one who leads the negotiation and discussions for an organization to complete a contract.

Non-disclosure Agreement (NDA): See Confidentiality Agreement.

OMB Circular A-21: Principles for Determining Costs Applicable to Grants, Contracts, and Other Agreements with Educational Institutions. The cost principles in this circular provide the general accounting standards used by colleges and universities. These principles define those costs that are allowable and allocable to the federal government.

Partner: parties in mutual agreement to work together to share common interests or accomplish common goals. As used in this guidebook, the term means collaborator, not intended to be used in the legal context of the term partner. Alternative terms could be strategic partners, collaborators, and team members.

Principal investigator (PI): the key individual designated to direct a research project. The research project is critically dependent on the qualifications of the PI. Synonyms include project manager and researcher.

Proprietary: confidential information which if disclosed may harm or violate the rights of the inventor or owner.

Public-private partnerships: a mutually beneficial activity undertaken by public institutions and industry to solve problems or increase knowledge.

Research or Research and Development (R&D): creative work undertaken to devise new applications or improve existing applications.

Research Institution: As identified in the Stevenson-Wydler Technology Innovation Act (Section 4. Definitions), a research institution is a U.S. non-profit organization owned and operated exclusively for scientific or educational purposes. This can include the following: a non-profit college or university, a non-profit medical or surgical hospital,

a contractor-operated federally funded research and development center (FFRDC), or a government-owned, government-operated facility.

Researcher: one who performs research or searches for knowledge through any systematic investigation to establish facts. Researchers work in academic, industrial, government, or private institutions. (See Principal Investigator.)

Return on Investment (ROI): a performance measure used to evaluate gains on value from an original investment.

Small Business: any for-profit entity with fewer than 500 employees according to the Small Business Administration.

Small Business Innovation Research (SBIR) program: a federal program that awards research and development funds to small businesses to encourage them to explore their technological potential and innovate new technologies that will be made commercially available to the public.

Small Business Technology Transfer (STTR) program: a federal program of more limited scope than SBIR that also awards research and development funds only to small businesses that have a partnership arrangement with a non-profit research institution such as universities, federal research laboratories, and FFRDCs. In this program an innovation originally uses STTR funds in cooperation with a small business to further develop the technology to a commercially available technology.

Sponsored Program Office: the office in a research institution that handles relationships and contracting for sponsored projects.

Sponsored Research Agreement (SRA): the agreement that captures the terms and conditions of the sponsored project including SOW, budget, IP and management of the project.

Sponsored Research Project: an externally funded activity in which a formal written agreement (i.e., a grant, contract, or cooperative agreement) is entered into by an institution and a sponsor. A sponsored project may be thought of as a transaction in which there is a specified statement of work with a related, reciprocal transfer of something of value.

Statement of Work (SOW): a definition of the types of work and technical objectives to be met under a proposed research project agreement.

Work for Others (WFO): a program that allows the performance of work for non-federal entities at federal facilities when the work is not directly funded by the federal government.

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