



Driving Innovation and R&D through Industry-Academic-Government Collaborations

Industrial research models have shifted from major centralized labs to collaborations with academia. The Government also encourages collaborations between industry and academia, and sometimes with Government labs, for the projects it funds. Success in any of these collaborations requires business models and operating procedures and tools to be in place that provide a close fit for replacing the functions of a central industrial R&D lab, and technical professionals in each participating organization to provide the gatekeeper and liaison functions that are critical to success in collaborative R&D. This is a major barrier because of the reduction of technical professionals in larger organizations, and because small companies are very lean. Multi-organization collaborations also entail the additional challenges of differences of cultures and business process, and geographical separation. Collaborations that are formed do not always address these issues, but rather focused on contractual and mission-oriented issues such as meeting the Federal Acquisition Regulations (FARS) and balancing industry's need for proprietary R&D with academia's mission of teaching and societal contribution. The reality is that collaborative R&D requires all parties including the client (and funding agency if different) to be full partners throughout the collaboration.

SpotlightBC's formulation of its R&D collaboration and project management consulting business was strongly influenced by Northwestern University's Industrial Research Lab (BIRL) and Procter and Gamble's (P&G) "Connect and Develop" strategy.

Northwestern University's industrial research lab grew in a decade from zero funding to over \$10 million of funding annually from industry and Government sources that were non-traditional (i.e. truly new) funding sources for Northwestern. This experience demonstrated that a group of highly degreed and accomplished technical professionals with deep experience in academia, industry, and the Government provided the means for collaborative teams to overcome the cultural, organizational, bureaucratic, and geographic barriers to conduct goal-oriented, mission critical work and to perform the continuous networking and relationship building that is absolutely essential for obtaining sustained applied R&D funding and achieving success.



P&G's "Connect and Develop" R&D strategy grew out of P&G's goals for a continuous stream of new products, and its assessment that the funding required to sustain this level of internally developed innovation was not sustainable. P&G also concluded that for every P&G researcher there were over 200 researchers outside of P&G with relevant knowledge and experience. This led P&G to formulate the "Connect and Develop" strategy in which some of P&G's R&D budget was devoted to having P&G's staff collaborate with outside researchers. P&G also invested in developing the infrastructure and tools to do this, which led to a substantial increase in P&G's level of innovation and product introductions and allowed a decrease in R&D funding as a percentage of revenues.

Methodology

SpotlightBC packages Northwestern University's Industrial Research Lab model and P&G's "Connect and Develop" strategy to offer a strong, effective, and highly innovative approach for R&D collaborations, which includes effective techniques for organizing collaborations, project management procedures, and innovative, Internet-based project coordination and management tools.

Project Definition and Management

Project definition is the key to obtaining funding as well as to achieving the kind of success that leads to an increasingly good reputation, greater competitiveness, and additional funding. Proper project definition, especially in academia, but also in industry and sometimes the Government, is a classic example of technology push. Technical professionals have a defined experience base and an investment in facilities that are looking for a problem, and as with any other technology push, this is not a very effective way to identify and address a real need that can sustain the type of long-term funding required for developing and transferring technology into utilization. This situation is not surprising. Industry has lost the gatekeepers and liaison staff who can see how to harness an academic institution's capabilities, and the Government is increasingly demanding that applied R&D address a specific, well-defined need and have a quantitative outcome, which is foreign to academic research.

SpotlightBC's staff offers extensive experience with Government, industry, and academia R&D, so they know how each of these entities operates and how to



network, identify and quantify needs, and match capabilities to these needs. Equally important, SpotlightBC's staff have credentials and accomplishments that are respected by industrial, Governmental, and academic professionals, so as to achieve buy-in by the researchers and the client. SpotlightBC's goal is to have the researchers do those things in which they are experienced and interested while achieving an outcome that the client will recognize and appreciate. SpotlightBC's process also uses information research coupled with top-notch technical analysis early in technically related cases and *establishes the key MAKE OR BREAK technical issues and everything that is known about them*. This process results in defining the real problems the client needs to solve, and the deliverables and expected outcomes. SpotlightBC's process also ensures that the definition of the problem evolves as the research progresses because it is the nature of research that very few projects will produce exactly what was initially expected, so this process of continuous client involvement and evolution (but not watering down) of expectations is a hallmark of highly successful projects. SpotlightBC also provides leadership and managers with an independent, unbiased assessment of how projects are proceeding.

Team Coordination and Project Management

SpotlightBC can also provide a complete Internet-based team coordination and project management system if needed. This system instills and enforces processes that represent best-practices. The system has proven to fully meet the Federal Acquisition Regulations (FARS) and to be easily and effectively used by a variety of people with different computer skills and organizational bureaucracies because the system is project-oriented and serves as a front-end, data entry portal for existing business and accounting systems, based on custom templates of industry standard software, and scalable from small to large organizations.

Two types of website are created from templates so that all of the system's functionality is available within a couple of minutes. One type of website serves as an Intranet for collaborative teams so that all information is accessible from the Internet, thus supporting a geographically distributed team. This site, using password protection and secure socket layers, contains functionality and information that enforces best practices for the team, and provides policy and procedure materials, presentations, biographical sketches, organization and project descriptions, and tools to share information for proposal and business development. A wiki is provided to be used to capture best practices and insights about



procedures, project management, business development, and the scientific underpinnings of the technical work.

The other type of website supports team coordination and management for a specific project, so this type of website is created for each project. This type of site has all of the documents, images, reports, and information for the project, and version control ensures that everyone is using the latest version, but prior versions can be available for reference. Best practices are enforced with a statement of objectives and a statement of work (SOW) coupled to a work plan, as well as an innovative issues tracker for documenting technical issues and their status. Threaded discussions are used in an innovative way to (1) describe and authorize work to be performed, and (2) to allow the team to exchange information and insight on specific technical issues. Time and expenses are entered by internal staff members and external collaborators over the internet through the same list. Each person sees only their own entries, but clients and selected others such as management and project leaders can see all entries. Clients see a full invoice history and current data. Payments to collaborators are tracked through a payouts list with a full payment history by invoice and with views limited to their own payments. Collaborators know when payments are authorized, when they will be made, and what will be paid. Partial payments by clients are automatically handled with fractional payment of expenses, then labor. The preparation of invoices and distribution of payments are generated from the data in the Time and Expense list by a computer program that incorporates all rate information and special payment instructions, which has been demonstrated to allow for great efficiency and lean operation.

Case Studies

Government - Industry - Academia Collaboration for Composite Materials Technology

An early version of this approach and system was used to manage the collaboration of Northwestern University's federally funded Advanced Materials Intelligent Processing Center. The Center's collaboration was a multi-year, approximately \$15.5 million dollar program involving a geographically dispersed team of several manufacturers including McDonnell Douglas and a small defense supplier, Production Products (St. Louis), a small product design firm, a test laboratory and



equipment developer, several Navy labs, the Office of Naval Research, and the Special Operations Command (SOCOM). The approach and system won high acclaim from the Navy. The system was used to coordinate the team, define and resolve technical issues, manage the project, track time and expenses, and prepare extensive integrated reports and presentations. This allowed the team to hold detailed monthly status meetings with the sponsor, and to conduct highly successful and complicated work that included development of flow modeling software for a composites process, development and demonstration of 3-D printing for production of prototype tooling, development and demonstration of an innovative resin transfer molding processing system with sensor-based and model-based controls, and production of tooling and composite parts to demonstrate the technology, much of which was used by the involved parties and some of which was commercially purchased.

Government, Industry, Academia Collaboration for an SBIR Project

An early version of this system was used to manage a collaboration of a university, a small defense supplier, a small product design firm, and the Special Operations Command to conduct a Phase I and a Phase II SBIR project that developed a hybrid metal-composite canopy capable of withstanding very high-speed water impact. The new composite pilothouse also included bulletproof windows, radar absorbing technology, embedded antenna arrays, and a chem-bio entryway.

Government, Industry, Academic Collaboration for a Not-for-Profit Research Institute for the Study of Friction and Wear (Tribology)

An advanced version of this system was used to operate a Not-for-Profit Research Institute, the Institute of Tribology and Coatings. The Institute was setup as a collaborative using an adaptation of P&G's "Connect and Develop" methodology. For the past eight years, the Institute has been a working example of the effectiveness of the "Connect and Develop" methodology as adapted for a Government - Industry - Academia collaboration, and of the effectiveness of the collaboration and project management system. Using this methodology and infrastructure, the Institute conducted an extensive survey of wear problems with military equipment operating in the dust of the mid-East. This survey resulted in definition of a research project to improve small arms that resulted in development of new test methods and instruments that were used to identify and demonstrate a coating that has provided



2.5 times the normal life in testing by an Army arsenal. The Institute also coordinated academic research projects that examined nano-particle containing lubricants and cutting fluids, and friction and wear measurement equipment. This project involved many collaborations, multi-million dollar history. This system has also been used in a for-profit subsidiary of the Institute to manage hundreds of projects totaling over \$6 million annually.

Spotlight Business Consulting

Spotlight Business Consulting was formed with a mission to provide businesses with consulting that is informed by a focus on execution. These service offerings address the fact that vision, strategic plans, staffing and people development, and operations and budgeting – the core processes of businesses – have to originate at the very top and travel like a wave through the entirety of the hierarchy of the organization. These service offerings also address the fact that what gets done on any given day is the result of a myriad of decisions that have been made throughout the organization, so superior execution requires superior decision-making. These service offerings also address the fact that ambiguity and insufficient information and insight are the norm even in businesses with superior performance. What distinguishes businesses with superior performance is the way they overcome ambiguity and insufficient information and insight. It used to be that we had access to far too little information, but ironically today, we have access to far too much. Finding and applying all of the relevant information is an important part of overcoming the ambiguity that we as business leaders face in every important decision we make. Rather than simply apply our extensive experience, we are unique in offering you a contemporary, information-driven consulting process, every aspect of which is informed by a focus on execution.

The Author and SpotlightBC leader: John Fildes, Ph.D. is uniquely qualified through experience and training to provide insight and consulting on establishing an execution environment to improve outcomes and cut costs in organizations, for which John has created Spotlight Business Consulting (SpotlightBC) as a vehicle to bring this experience to companies, academia, insurers and litigators, and industry. Like John, SpotlightBC provides consulting by people who have actually led organizations, made the decisions leaders have to make and faced the consequences they face. Our consulting is insightful, pragmatic, useful, and highly valued. John's credits involve creation and management of an extensive and impressive list of ventures, which include:

- *CEO of an engineering services firm of over 100 staff members and \$18 million in revenues.*



Spotlight Business Consulting
www.SpotlightBC.com
info@SpotlightBC.com

- *Start-up a science and engineering consulting firm that grew to over \$6 million of revenues and over 25 people that serves industry, litigators, and insurers; of a model-based product design firm that achieved a run-rate of \$3.5 million serving an impressive list of large companies and entrepreneurs, and that did this operating purely from cash flow; and of a 501(C)3 not-for-profit research institute that has led a multi-million dollar collaboration of academia, the Government, and the small arms industry, leading to a thrust to establish a Government Center of Excellence.*
- *Leader of a Northwestern University research group with more than 30 staff members. John's work led to establishing Northwestern University's federally funded Advanced Materials Intelligent Processing Center, which was a highly successful collaboration involving academia, industry, and the Government. John served as co-Director*
- *John has organized and conducted over \$27 million in funded projects including consulting, research, development, litigation expert witness investigations, and collaborations involving Government, companies, and universities. He has 50 published papers, reports and presentations, and 3 patents.*