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Independent Research and Development (IR&D): The Challenges Continue

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Independent Research and Development (IR&D): The Challenges Continue[1]

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Before joining the Clinton administration, Dr. Gansler held a variety of positions in government and the private sector, including Deputy Assistant Secretary of Defense (Material Acquisition), Assistant Director of Defense Research and Engineering (Electronics), executive vice president at TASC, vice president of ITT, and engineering and management positions with Singer and Raytheon corporations.

Throughout his career, Dr. Gansler has written, published, and taught on subjects related to his work. Dr. Gansler recently served as the Chair of the Secretary of the Army's Commission on Contracting and Program Management for Army Expeditionary Forces. He is a member of the Defense Science Board and also a member of the National Academy of Engineering and a fellow of the National Academy of Public Administration. Additionally, he is the Glenn L. Martin Institute fellow of engineering at the A. James Clarke School of Engineering, an affiliate faculty member at the Robert H. Smith School of Business, and a senior fellow at the James MacGregor Burns Academy of Leadership (all at the University of Maryland). From 2003–2004, he served as interim dean of the School of Public Policy. From 2004–2006, Dr. Gansler served as the vice president for research at the University of Maryland.

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Introduction

The United States has the most advanced military in the world. As a result, the government's support for private research and development has become a crucial aspect of its efforts to maintain the military's technological superiority. Though the United States

[1] This is a summary of the full report, which will be available in July 2015.

remains ahead of most other advanced nations when it comes to military superiority, the technological gap is beginning to shrink as other countries find new ways to improve upon existing technology. Three major threats to the United States' technological superiority remain:

- **Adversary adaptation:** With adequate time to study American systems and tactics, adversary militaries have been able to successfully close in on the United States' technological superiority.
- **Short-term budget decisions:** Shrinking defense budgets have led to a decline in funding for R&D. Times of peace, however, are a prime opportunity to develop and build new technologies to prepare for future conflicts.
- **Potential loss of superior technological capabilities:** The high risks involved with new technologies, as well as a dependence on military contractors, may threaten the United States' ability to produce technologically superior goods.

Both the federal government and the science and engineering community can agree that investments in R&D are crucial to the United States' national and international policies (Shea, 2010). If and when potential adversaries are able to engineer systems that exploit U.S. systems, the United States' military advantage over that entity will erode, reducing our ultimate conflict-mitigation strategy of global power projection. With the technological gap between the United States and its adversaries rapidly narrowing, government investments in R&D are "key to maintaining [the] U.S.' scientific and technical [abilities], developing economic growth, continuing U.S. global industrial competiveness, and advancing national priorities" (Shea, 2010). Should a potential adversary engineer a capability designed to exploit the weaknesses of our technology, or engineer a game-changing system or warfighter, U.S. innovation can serve as a counterweight to its strategy and systems, reducing the adversary's potential advantage or incentive to engage in conflict.

With Congress "influencing both the federal and national investments in R&D," shrinking defense budgets are sure to have an impact on the level of R&D funding (Shea, 2010). However, with R&D's crucial role in "homeland and national security, public health and safety, environmental protection, and energy security" it is clear that such investments are necessary, and will provide long term benefits (Shea, 2010).

Funding new technology is not without its challenges, however. Information production is inherently unprofitable except under monopolistic conditions, meaning that firms are less likely to invest in producing new technological breakthroughs if they cannot maintain a monopoly. On the other hand, information is most useful when it is freely and widely shared and used to develop new information. This is because information is "not only the product of inventive activity, it is also an input" (Arrow, 1962). The nature of information is such that profits require an entity to retain it, but public good requires that information should be widely and freely distributed. Ultimately, at its maximum usefulness, information production is not profitable for a company. Moreover, since the success of research cannot be predicted, its value is "much more likely to be underestimated" (Arrow, 1962).

In general, it has been the United States' "policy that government should foster the opening of new frontiers … [making them] accessible for development by all American citizens" (Bush, 1945). Investments in "the frontier of science" not only keep with the American tradition, but also encourage scientific progress, vital to our national interests and security and crucial in ensuring the United States' technological superiority (Bush, 1945). After all,

> without scientific progress the national health would deteriorate; without scientific progress we could not hope for improvements in our standard of living or for an increased number of jobs for our citizens; and without scientific progress we could not have maintained our liberties against tyranny. (Bush, 1945)

In addition, there are key differences "between private financial returns to R&D activities and the social benefits that arise from such work" (CBO, 2007). In general, private firms are interested in R&D investments that will reap the largest profits, and not necessarily investments that will produce the greatest benefits to society (CBO, 2007). For this reason, government investments in R&D are crucial in providing a counterbalance to private interests and maximizing benefits for the common good.

Further, we discuss the nature of the defense market and the need for R&D funding within the defense industry. Unlike the commercial market, the defense industry is not a free market, with only one major customer—the federal government. This creates a unique buyer-seller relationship characterized by high risks and minimal price competition. The high risks associated with developing new technology create an integral role for the government to encourage innovation through R&D funding.

In addition to directly funding research and development, the Department of Defense (DoD) provides industry with approximately $4 billion in independent research and development (IR&D) funding every year in order to promote private sector innovation (Pellerin, 2012).

IR&D is defined as that research and development initiated and conducted by contractors that is not specified under any contract or grant. Rather, the research is funded and managed at the contractor's discretion, with a portion of the costs later recovered in the overhead portion of DoD contracts. Title 10 U.S. Code § 2372 provides that "independent research and development and bid and proposal costs shall be allowable as indirect expenses on covered contracts to the extent that those costs are allocable, reasonable, and not otherwise unallowable by law or under the Federal Acquisition Regulation." One of the key objectives of the support for IR&D is to enable the continued superior performance of future weapon systems and components. The DoD recognizes that the commercial sector is the primary source of technological innovation, but there is continuous debate over how to best harness this innovation.

Consequently, the IR&D policy has been informed by two competing philosophies: (a) that truly remarkable innovation occurs in an unconstrained environment, and (b) that some constraints are necessary to focus innovation in order to derive practical applications, especially in times of significant DoD budget reductions.

For this reason, IR&D policy has been subject to a series of pendulum swings. Following World War II, research and development had to be related to specific programs of interest to the funding agency. "General research expenses" were not allowed unless specifically provided for in the contract (Alexander et al., 1989). After the Soviet launch of Sputnik in 1957, the U.S. government began to rethink its level of support for IR&D (Alexander et al., 1989). But with increases in funding came calls for greater accountability; by the 1980s, the reporting requirements had developed into a burden on both the contractors and the military evaluators (Lyons, Chait, & Willcox, 2009).

Beginning in the 1990s, the DoD reduced its technical exchanges with industry, not only to reduce this burden, but to ensure independence of IR&D. However, according to Defense Acquisition Regulations System 48 C.F.R. Part 231, propose rule announcement in the Federal Register, the result has been "a loss of linkage between funding and technological purpose." As a result, steps were taken to improve those linkages. However, there continue to be points of friction. These revolve around the following three principal points:

- **Independent vs. sponsored or required effort**

One particularly controversial aspect of IR&D costs is determining when an IR&D or B&P effort is 'required under performance of a contract' or 'sponsored by a grant or cooperative agreement.' In one specific case, General Dynamics developed two prototypes for the Divisional Air Defense System (DIVAD). General Dynamics was on a firm-fixed price (FFP; best efforts) contract, and the Army chose not to exercise the contract's options. General Dynamics voluntarily chose to continue working on the program and charged it to IR&D. The government brought a case against General Dynamics for unallowable cost overruns, however although the contract was FFP, it since the contract only required "best effort," the work was no longer required under the statement of work. General Dynamics was awarded $25 million in damages (Manos, 2003).

- **Implicit requirements vs. explicit requirements**

Contract requirements for the development of new technology systems, can be explicitly stated in the contract, or implicit to the task. Although the government often interprets the implicit tasks as being required, and as a result excluded from being funded as IR&D, this is not always the case. The Federal Circuit ruled, in an appeal of a Court of Federal Claims decision in favor of a "parties' intent" rule, with a far more narrow interpretation, that it must be a "requirement of the contract" standard (ATK Thiokol, Inc. v. United States, 2010).

- **Intellectual property rights**

In most cases, IR&D are private expenses, and patentable inventions made outside of government contract are not automatically licensed to the government—allowing companies to keep the rights to their data. However, the law (which is constantly evolving) is not always clear on the data rights of companies and government-sponsored research. Furthermore, with fewer new business opportunities, the defense industry is highly competitive, leading contractors to be extremely protective of their intellectually property. As a result, companies may resist sharing data with the DoD. They also resist putting sensitive information in writing, and in some cases resist seeking patent protection for their products. Furthermore, even though IP rights from IR&D-sponsored innovations are protected for commercial application of technology, commercial rights to a technology can be blocked by the DoD at any time for national security reasons.

In addition to these, the IR&D program faces other challenges to IR&D implementation, including the following:

- **DoD focus and strategy**

The DoD's current focus is divided among various strategies and technologies, making it difficult to achieve a major breakthrough in any specific area. Furthermore, the apparent lack of clear strategy when it comes to the need for new technologies adds to the risk for the private-sector contractors.

- **Budget uncertainty**

Defense procurement is generally a cyclical business, with highs and lows, responding to congressional budgets and operational requirements. According to corporate executives, firms are reluctant to make investments for future DoD requirements because of the uncertainty in the forecasts of future requirements (Erwin, 2015). And, the recent sequester has led some firms to reconsider their investments in military technology altogether, for fear that funding will be cut before the firm is able to commercialize the technology in question.

- **lementing Filters to Identify an**In 1992, Bid and Proposal costs were

In 1992, Bid and Proposal costs were combined with Independent Research and Development costs, resulting in a category of "B&P/IR&D" costs. This categorization makes sense on some level, as companies may budget for both costs through the same internal business development mechanism. However, it is not clear whether bid and proposal costs have a negative impact on IR&D investments. Recent trends, specifically the trend toward the greater utilization of Indefinite Quantity/Indefinite Delivery (ID/IQ) contracts, require companies to prepare a proposal for the parent contract and then to prepare a proposal for the individual task orders. This has increased the amount companies spend on B&P per unit of business. This increased spending on B&P costs may reduce the incentive to spend on IR&D; understanding this interaction requires an in-depth study.

- **Communication between the government and contractors**

While contractors need a clear line of communication with the DoD, they have a strong motivation to maintain secrecy from their competitors. This of course creates communication challenges. Current policy attempts to capture the best of both worlds. On January 30, 2012, the DoD issued a final rule amending the DFARS to require contractors to submit IR&D project data to the DoD through a secure website if they wish to receive reimbursement in the form of an allowable indirect cost. According to the DoD (2012), "industry wanted information about Department investment priorities to better help them plan their IR&D investment projects and DoD planning was hampered by limited insight into industry IR&D projects" (Defense Innovation Marketplace, 2015). The website, known as the Defense Innovation Marketplace (DIM), was designed to facilitate this communication (McFarland, 2013).The problem with the DIM was that though it was created to increase transparency and encourage communication between the DoD and private contractors, the DIM has raised questions of security and been met with suspicion.

- **Metrics used to measure performance**

A lack of clear performance metrics have made it difficult to assess the effectiveness of IR&D investments. For example, without a tracking mechanism, it is difficult to say whether IR&D suffers due to changing levels of B&P costs in tighter fiscal environments.

With the challenges facing the IR&D program carefully examined, we will develop a series of recommendations to overcome these.

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