



Bridging the “Communications Gap” between the Public and Private Sector – Making it Easier to do Business with DHS

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If you think about it, there are numerous examples in our professional and private lives where the lack of communication or unclear terminology has created misunderstandings, problems and myriad other issues. As in any worthwhile pursuit, effective communication is critical in the cost-effective and efficient interactions between various parties seeking a mutually beneficial partnership. The U.S. Department of Homeland Security (DHS) is putting into practice the necessary rigor to improve communication that will allow the public and private sectors to work jointly to meet the unsatisfied needs of the DHS in order to protect the Nation.

To this end, the DHS Commercialization Office has developed a number of processes, programs and tools to facilitate the clear articulation of DHS needs (See Figure 1). In that same spirit of working together with the private sector, we recently developed a “Product Realization Chart” (see http://www.dhs.gov/xres/programs/gc_1211996620526.shtm to download the chart) which is a useful guide to relate concepts and correlate terminology used by both the public and private sector to clearly delineate how science, technology development and product development (terms used in the private sector) are related to basic research, innovation and transition using a Technology Readiness Level (TRL) “backbone” (terms used in the public sector).

Further examination of the Product Realization Chart shows that this resource also provides a stage-gated approach for cost-effective and efficient product development to provide a “discussion framework” useful in private-public sector discussions as well as a template for utilization to develop and communicate agreements. The chart describes the objectives, deliverables and the type of management review necessary to develop and deliver technologies/products/services that meet the specific requirements of the DHS’ operating components (U.S. Coast Guard, FEMA, TSA, CBP, USCIS, U.S. Secret Service and ICE) and its end users such as first responders.

Stage One: Needs Assessment

Needs assessment is the critical first stage of product realization (accomplished via acquisition or commercialization processes) that enables DHS to identify capability gaps and investigate new product/technology/service capabilities. By understanding the specific and detailed requirements of its customers, the DHS Science & Technology Directorate (DHS S&T) conducts market research and technology scans to find and

assess technology-based solutions that could potentially be developed, matured and delivered to DHS end users.

Commercialization programs, processes and tools...

- 1) "Developing Operational Requirements" Guide
- 2) "DHS Implements Commercialization Process" Article
- 3) "Partnership Program Benefits Taxpayers as well as Private and Public Sectors" Article
- 4) SECURE Program and website
- 5) DHS online
- 6) Invited talks to trade conventions, reaching small, medium and large businesses. Efforts also extend to meet with minority, disadvantaged and HUB Zone groups on a regular basis.

Figure 1: Outreach efforts to inform the public on "How to do Business with DHS" is receiving positive feedback from the private sector and media. See the following website for additional information: <https://dhsonline.dhs.gov/portal/jhtml/community.jhtml?index=15&community=S%26T&id=2041380003>

Please note that management reviews for both the public and private sector are required to ensure that exit criteria and deliverables are met when discussing public-private programs like the SECURE Program.

The remainder of the chart shows the various key objectives and deliverables for each major phase of product realization. Entrance at any point of the chart is possible and certainly, the overall objective of many projects currently underway at DHS is to obtain widely distributed products or services (where commercialization is key). DHS also sometimes has unique "custom-like" requirements with lower unit-volume potential (normally using the Acquisition model as shown in Figure 2). It also should be noted that in a basic research program, it may certainly not be possible to generate an ORD, as the objective may be the "exploring uncharted territory" rather than the development of products or services for sale to a particular market. For this reason, a dark box is drawn around Stage 1 to indicate that the Product Realization Chart is a multiple-use chart, rather than a concrete process because it simply offers a framework to visualize several processes, some of which (developing custom or widely distributed products/services) require a Needs Assessment.

Stage Two: Science

At the beginning of the second stage, basic principles are observed and reported, and scientific research begins to be translated into applied research and development (R&D). At this stage, a program sponsor and end user/customer have been identified and the mission needs statement, feasibility study and program management vision have been developed.

Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. In the case of developing products/services, operational requirements analysis has been conducted and operational requirements are applied to functional

requirements. A risk management plan has been developed, a program cost analysis has been completed and a preliminary security assessment has been conducted.

As the technology concept and/or application is formulated, active R&D is initiated that results in an analytical and experimental critical function and/or characteristic proof of concept. This includes analytical studies to physically validate the analytical predictions of separate elements of the technology. A Systems Engineering Management Plan (SEMP), Program Management Plan (PMP) and proof of concept plan are key deliverables and serve as exit criteria for the next stage of product realization.

During the second stage, the private sector normally produces a complete product plan during commercialization that addresses marketing opportunities, financial considerations, design concept and many additional analyses. Sales/Marketing team performs a SWOT (strengths, weaknesses, opportunities, and threats), a scenario analysis and a sales forecast estimate. Research assembles the key IP disclosure submissions. Quality Assurance (QA) generates all safety/standards compliance items, calibration requirements and other quality control specifications.

Management reviews for both the public and private sector are required (in partnership projects or programs) to ensure that exit criteria and deliverables are met.

Stage Three: Technology Development

The third stage of product realization ensues when basic technological components are integrated to establish that they will work together, which is a relatively “low fidelity” analysis when compared with the eventual system. The proof of concept report and functional requirements document have been finalized. The SEMP, Test and Evaluation Master Plan (TEMP), quality assurance plan and other deliverables are revised and updated on a continuous basis.

The basic technological components are then integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. The fidelity of the breadboard technology increases significantly in this case. The Operational Requirements Document (ORD) and CONOPS are better developed. The technology scan and market survey are ongoing during the third stage, and an analysis of alternatives is provided.

Once the component is validated in a relevant environment, the system/subsystem model or prototype is demonstrated in a relevant environment. After successful T&E in a simulated operational environment, a preliminary Technology Transition Agreement (TTA) or a Technology Commercialization Agreement (TCA) is executed as applicable. A program manager is identified and an interoperability assessment is performed.

During this stage, the private sector uses its product plan to conduct a beta design review, produce a detailed supplier list and supplier benchmark, begin writing the user’s manual, develop a service strategy, confirm the risk analysis and review engineering change orders. Manufacturing creates a preliminary manufacturing plan and works with Marketing/Sales to finalize product packaging. Quality Assurance defines regulatory

requirements, prepares a preliminary quality plan and procedure for first prototype testing and designs the inspection tooling.

Management reviews for both the public and private sector are required to ensure that exit criteria and deliverables are met.

Acquisition versus Commercialization

Once a representative model or prototype system, which beyond TRL 5, is tested in a relevant environment, the product realization process splits into two paths that are extraordinarily different as evidenced in Figure 2: Acquisition and Commercialization. Acquisition occurs when a government contractor executes design, development and production, driven by DHS requirements, using DHS funding and under contract to DHS. In this case, the product is then deployed to captive users and the product unit price is determined by cost-based pricing. The contractor's customer is DHS and not the end-user community.

Commercialization, on the other hand, is a private-sector driven activity enterprise that executes design, development and production, driven by market requirements, using private funding and perhaps assisted by DHS technology licenses, standards and grants. The product is then sold as commercial-of-the-shelf (COTS) directly to end users and the product unit price is determined by market-based pricing. The vendor's major customer is the end-user community (e.g. first responders) as well as various private sector markets.

Why is there a need for commercialization? As previously mentioned, DHS requirements, in most instances are characterized by the need for widely distributed COTS products. Oftentimes, the need is for thousands, if not millions of products for DHS' seven operating components and the fragmented, yet substantial first responder end-user market. Figure 2 shows the major differences between a "pure" Acquisition versus "pure" commercialization processes, along with the recently developed and implemented DHS "hybrid" commercialization process.

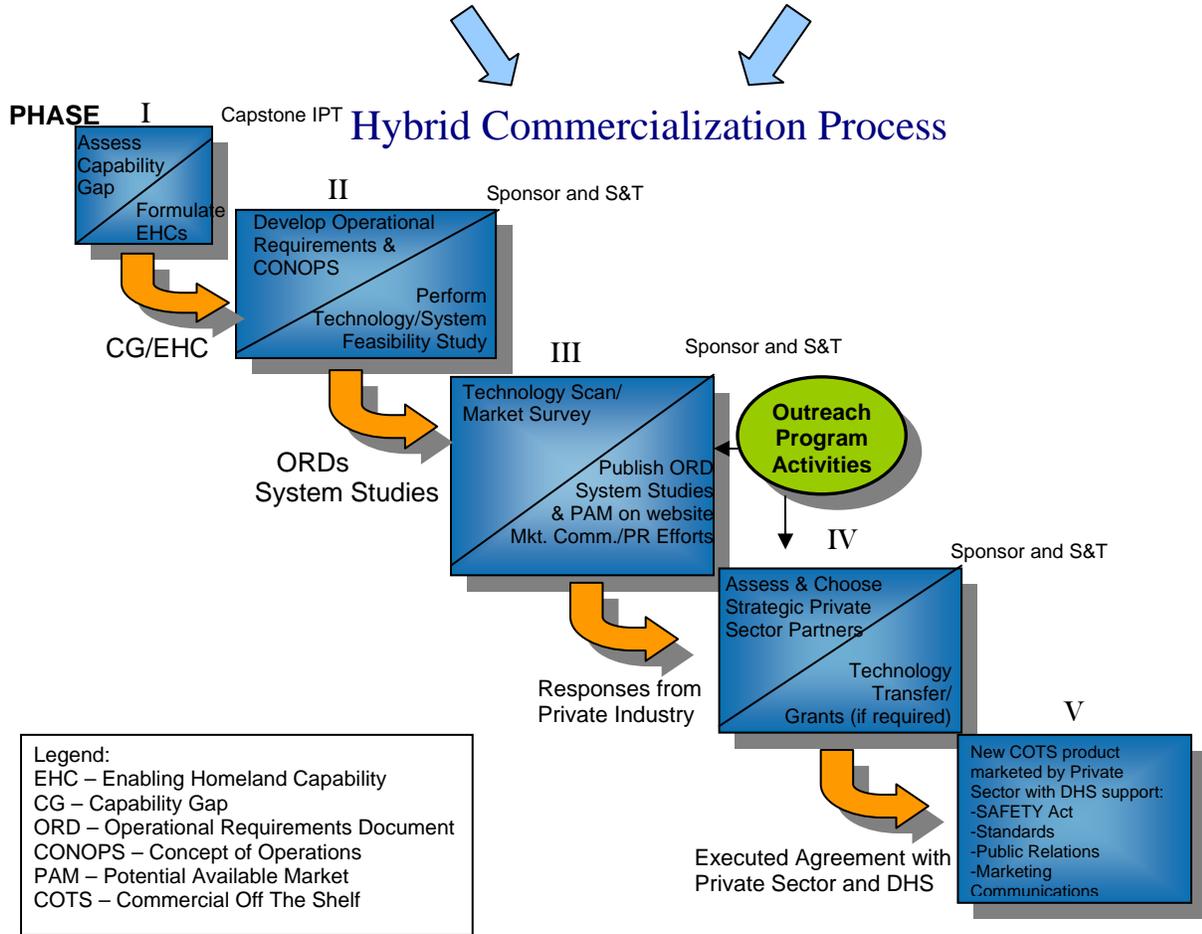
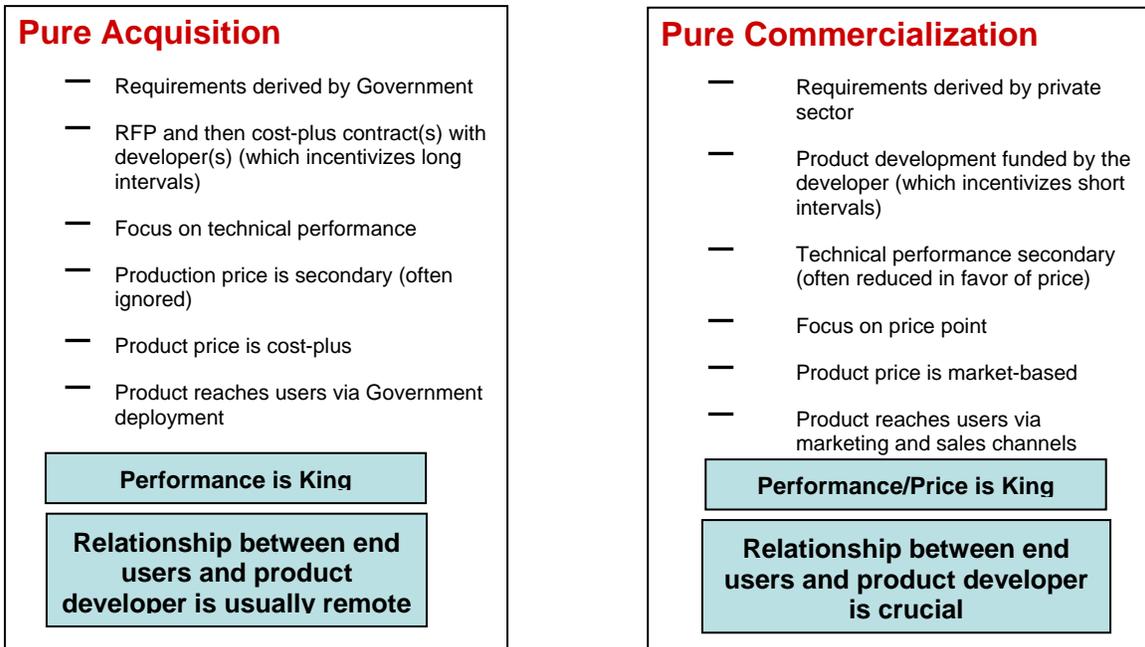


Figure 2: Comparison of “Pure Acquisition” versus “Pure Commercialization” models for product/system development and the resultant hybrid model implemented by DHS.

Figure 3 delineates the overall description of DHS' new commercialization model and its first private sector outreach program called the SECURE (System Efficacy through Commercialization, Utilization, Relevance and Evaluation) Program to develop products and services in a private-public "win-win" partnership, recently approved in June 2008 by DHS and described in detail at www.dhs.gov/xres/programs/gc_1211996620526.shtm. Briefly, the SECURE Program is based on the premise that the private sector has shown that it is willing and able to use its own money, resources, expertise and commercialization experience to develop and produce fully developed products and services for DHS if significant market potential exists. The private sector has shown remarkable interest in devoting its time and money to such activities if and when an attractive business case can be made related to large revenue/profit opportunities that certainly exist at DHS and its ancillary markets to participate in the advancement of DHS commercialization efforts. The private sector requires two things from DHS: 1. detailed operational requirements, and 2. a conservative estimate of the potential available market(s). Once this information is posted to the SECURE Program website, small, medium and large companies are open to generate their own business cases and pursue possible participation in the program.

A New Model for Commercialization...

- Develop Operational Requirements Documents (ORDs)
- Assess addressable market(s)
- Publish ORD and market assessment on public DHS web portal, solicit interest from potential partners in a way that is open to small, medium and large businesses
- Execute no-cost (CRADA-like) agreement with multiple private sector entities and transfer technology and/or IP(if necessary)
- Develop supporting grants and standards as necessary
- Assess T&E findings after product is developed to assure DHS and ancillary markets that product meet its published specifications
- New Commercial-Off-The-Shelf (COTS) product marketed by private sector with DHS support

SECURE Program



- Application – Seeking products/technologies aligned with posted DHS requirements
- Selection – Products/Technologies TRL-5 or above, scored with internal DHS metrics
- Agreement – One-page CRADA-like document that outlines milestones and exit criteria
- Publication of Results – Recognized third-party T&E conducted on TRL-9 product/service. Results verified by DHS, posted on DHS web-portal to provide confidence to potential customers at DHS and its ancillary markets that product(s) meet or exceed their published specifications in reference to their actual performance.

Figure 3: Step-by-step guide to the commercialization process developed and adopted by DHS with a brief summary of the popular SECURE Program.

In order to provide DHS operating components, the first responder community and other end-users with products that meet their specific requirements, the SECURE program provides a vehicle by which private sector entities can offer products and/or conduct product development geared specifically toward meeting those needs. Private sector entities currently possessing a technology/product/system rated at a Technology Readiness Level TRL-5 (i.e. applied or advanced R&D) or above that potentially closes a defined DHS capability gap by addressing detailed operational requirements supplied by DHS-S&T on the SECURE Program website will have the opportunity enter into a CRADA-like agreement to continue development of their technology/product/system to TRL-9 (i.e. fully field deployable product) at their expense. The CRADA-like agreement also provides private sector entities with the assurance that DHS-S&T will verify their recognized independent third-party test(s) of a given technology/product/system. A Cooperative Research and Development Agreement (CRADA) is a written agreement between a private company and a government agency to work together on a project¹.

Stage Four: Product Development

After DHS determines whether the Acquisition or the Commercialization process is appropriate, the fourth stage commences and the system prototype is demonstrated in an operational environment. S&T and the end user/customer have begun to develop a final transition plan and updates have been made to the operational and/or functional requirements document. Interoperability has been demonstrated and Management Directives (MD) have been reviewed to assure compliance. An operations and maintenance manual has been completed and a security manual has been developed.

Since the technology has been proven to work in its final form and under expected conditions, TRL 8 represents the end of true system development. Technology components are therefore form, fit, and function compatible with an operational system. The operational test report has been completed and a Limited User Test (LUT) Plan has been developed. A training plan has also been developed and implemented.

The actual system is then proven through successful mission operations and the end user fully demonstrates the technology in the CONOPS. All critical documentation has been completed and planning is underway for the integration of the next generation technology into the existing program components.

During the last stage, the private sector focuses on the manufacturing plan and the development effort includes the final design reviews, product prototypes along with documented product test results and other product development deliverables. Sales/Marketing update the marketing plan, the sales and distribution plan, and all sales materials. Manufacturing develops assembly and manufacturing procedures, designs and fabricates manufacturing tooling. Quality Assurances updates the Test Q/A plan and creates the quality plan. They also develop testing procedures, create test and fixture

designs, perform reliability testing on the prototype and design and test the shipping container.

The goal of the private sector during the final stage is to demonstrate product manufacturing according to quality assurance standards while remaining within cost/schedule targets. The development effort concludes with a customer-adopted defect-free product, implemented engineering change orders and a final user's manual. Applications engineering and technical engineering support are then implemented. Sales/Marketing also provides sales training, creates a promotional plan and coordinates literature advertising and public relations. Manufacturing establishes the final manufacturing/assembly routines and procedures, the final manufacturing tooling, and the manufacturing document release and acceptance, then undertakes an analysis for future product cost reduction. Quality Assurance does the final QA and test pooling, prepares the final QA/test procedures, and compiles the manufacturing yield data.

Management reviews for both the public and private sector are required to ensure that the final exit criteria and deliverables are met. Since the actual system has been proven through successful mission operations, the product is then deployed to captive users or sold as COTS directly to end users.

Conclusion

The Commercialization Office has developed a number of processes, programs and tools to clearly articulate the needs of DHS. Outreach efforts are also critical and center on notifying the private sector about opportunities that exist for partnership and business development to address the needs of the Department. Therefore, we have developed a "Product Realization Chart" that serves as a useful guide to relate and correlate terminology used by both the public and private sector in order to develop and deliver required technologies/products that meet the specific operational requirements of the Department of Homeland Security's operating components and its end users such as first responders.



Thomas A. Cellucci, Ph.D., MBA is the U.S. Department of Homeland Security's first Chief Commercialization Officer. In his role, he recently published two comprehensive guides: *Requirements Development Guide* and *Developing Operational Requirements* to aid in effective requirements development and communication for the department. He possesses extensive experience as a senior executive and Board Member in high-technology firms in the private sector.

ⁱFor more information on CRADAs, please visit:

http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=browse_usc&docid=Cite:+15USC3710a and
<http://www.usgs.gov/tech-transfer/what-crada.html>.

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- **HSARPA:** Register to join the HSARPA mailing list to receive various meeting and solicitation announcements. Link to the Long Range Broad Agency Announcement solicitation, where multiple awards are anticipated and will be based upon the proposal evaluation, funds availability, and other programmatic considerations. Also link to Representative High Priority Technology Areas, where DHS areas of interest can be found. <http://www.hsarpabaa.com>
- **Small Business Innovation Research(SBIR):** SBIR's goal is to increase the participation of innovative and creative small businesses in Federal Research/Research and Development (R/R&D) programs and challenge industry to bring innovative homeland security solutions to reality. <http://www.sbir.dhs.gov>
- **SAFETY Act:** The SAFETY Act enables the development and deployment of qualified anti-terrorism technologies and provides important legal liability protections for manufacturers and sellers of effective technologies. <https://www.safetyact.gov/>
- **TechSolutions:** The mission of TechSolutions is to rapidly address technology gaps identified by Federal, State, Local, and Tribal first responders by fielding prototypical solutions within 12 months at a cost less than \$1M per project. www.dhs.gov/techsolutions
- **Commercialization:** The mission of S&T's commercialization efforts is to identify, evaluate, and commercialize technologies that meet the specific operational requirements of DHS operating components and first responder communities. The commercialization efforts actively reach out to the private sector to establish mutually beneficial working relationships to facilitate cost-effective and efficient product development efforts. Please contact Chief Commercialization Officer Tom Cellucci at S&T-Commercialization@dhs.gov.



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