

Simulation and Modeling for Acquisition, Requirements, and Training—SMART

Enabling the Transformation

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Currently, the U.S. Army has a very capable arsenal of weapons for fighting the last war. But the Army needs to be prepared to fight the wars of the future, where the battlefield will be uncharacteristically complex and unpredictable. To meet that challenge, the Army needs to transition from our current heavy-based force to a force that is responsive without loss of lethality. We need an Army that is capable of deploying a brigade combat team in 96 hours, a division in 120 hours, and five divisions in 30 days.

The Army of the future needs to be agile, with the capability of maneuvering forces in and out of warfighting operations. We need an Army that is versatile and capable of rapidly transitioning from a peacekeeping force to a combat force as the situation may dictate. That force must be lethal and survivable, which will require incorporating the latest in technology. Certainly, the Army must be sustainable, with a reduced logistical footprint that can still adequately supply the forces in combat. Although the U.S. Army transformed itself several times in our nation's history as the need arose, one thing that makes the Army's current transformation particularly unique is the timeline in which it must be done.



Army Transformation is clearly on display as Army Sgt. Joseph Patterson models the Future Warrior Vision outfit for members of Congress and their staffs at the Rayburn House Office Building in Washington, D.C. The suit he demonstrated May 3, 2001, features body armor and integrated systems for cooling and heating, stress monitoring, and communications.

Photo by Army Sgt. 1st Class Kathleen T. Rhem



The new Army Light Armored Vehicle III variant equipped with a 105mm gun on display at the Pentagon May 17, 2001. As part of Army Transformation, and if all goes well with the system, the Army hopes to buy 2,131 of the vehicles to outfit six brigades. Officials said the first brigade could be operational by spring 2003, with initial operating capability by November 2003.

DoD photo by Gerry J. Gilmore

Implementing New Ideas

The Transformation Campaign Plan calls for beginning the transition from the Interim Force to the Objective Force by 2008. A critical enabler that will advance the Army's transformation within this time period is the Simulation and Modeling for Acquisition, Requirements, and

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Training (SMART) concept. Designing the Objective Force through SMART will provide the warfighters with systems of greater military value than if we continue doing business as usual. The concept of collaborative environments allows all stakeholders to contribute during the “Concept and Technology Development Phase” and the “Systems Development and Demonstration Phase,” when inputs have the greatest impact. SMART also affords the opportunity to design across all fundamental areas rather than at the expense of one or two. Bringing the end user into the



collaborative environment helps to ensure that the design meets the needs of the soldier. Mistakes can be made, doctrine changed, and new requirements identified long before we put soldiers in harm's way.

Collaborative development of new systems in a virtual world will allow us to develop more virtual prototypes and allow more testing in a virtual environment. Many more simulations can be run, and more designs and concepts tested through models and simulations than can be done on a test range. Tests can also be conducted in synthetic environments for conditions that are more harsh and extreme than at our test ranges, thereby providing more insight into the weapon's capability. This is not to say that Modeling and Simulation (M&S) will replace all hardware testing,

but by doing more testing in the virtual environment we can ensure that our hardware tests are more successful and less costly.

M&S vs. SMART

The military has obviously been doing M&S for a long time—and doing a lot of it. What sets the SMART concept apart? The difference between SMART and just “doing a lot of modeling and simulation” is very clear. Read carefully the SMART Vision, as developed by senior Army leaders in August 1999:

“Be a world leader in M&S to continuously improve Army effectiveness through a disciplined, collaborative environment in partnership with industry, government, and academia.”

The difference between the old way of using M&S and the SMART methodology is in the term “collaboration.” To help understand the difference, we need to know how SMART got to where it is today.

Origin of SMART

SMART has its origins in a 1995 DoD initiative headed by Dr. Patricia Sanders, former Deputy Director, Test, Systems Engineering, and Evaluation. Her new approach to acquisition was called Simulation Based Acquisition (SBA) to differentiate it from the traditional approaches to acquisition and to emphasize its reliance on the tools and processes made possible by advances in simulation technology. Ellen M. Purdy, serving at the time as an action officer within Office of the Assistant Secretary of the Army for Research, Development and Acquisition (ASA-RDA), was one of several people who analyzed Dr. Sanders' new strategy. Based on her years of experience as a lead project engineer at the Belvoir Research, Development, and Engineering Center (RDEC), she realized the significant effect such an approach would have on acquisition.

The concept of SBA for the Army was a good start, but it needed to be expanded to specifically include the acquisition, requirements, and training communities. Thus, the Army's version of SBA be-

came SMART. Restricting the use of M&S to just an integrated approach for functions traditionally classified as acquisition ignored other critical processes. An integrated environment was needed where all the functions—from requirements analysis and concept generation through development, testing, and procurement to training and support—could collaborate through the use of models and simulations. In the past, these stakeholders had developed and used their own M&S in a stovepiped fashion, in many cases duplicating efforts that produced costly redundancies.

Collaborative Environments

With the advent of increasingly sophisticated technologies, the time had finally come when a concept such as SMART could be implemented. Thanks to the Internet, computers could be networked to allow players across the country to collaborate on the development of new requirements, doctrine, weapons systems, and training devices. It was now possible to take a concept and develop it within a virtual environment. Today's real-world budget, regulatory, and resource constraints, however, made this a challenge; nevertheless, with the ever-increasing power of the Digital Age, the means now exist to create the collaborative environment envisioned in 1997. It is now possible for all players in the Army modernization process to work collaboratively on the same models throughout the developmental process. Through the collaborative environment, all players can work with the warfighters and engineers to optimize the end product across all the functional processes.

Employing a collaborative environment does not mean that each player must use the same tools. Rather, through the use of standards and appropriate interfaces, each community can use the models and simulations most advantageous to meet its specific needs. Through the distributed network, the effect of each attribute of the system can be assessed across all communities, and a final design reached leading to the most effective and efficient doctrine, training device, or weapon system.

While the technology is available to achieve the SMART Vision, a cultural change is required—a cultural change from the traditional way of doing business in the Army. No longer can we afford for each community to develop its own synthetic environments, terrain, and threats. We cannot afford to pay for duplicative sets of models to conduct analysis or do testing, and pay for still other sets of models for training. The Army pays multiple times for models and simulations that have the same functionality. Now—on the eve of the new Objective Force—is the time for the Army to make the required cultural changes. The new way of doing business is not only a cost-efficient way of developing, buying, and using models and simulations, it is the efficient approach to achieving the Objective Force within the established timelines and budget constraints.

Stakeholders

Since all stakeholders need to be a part of a SMART collaborative environment, let us begin with the logisticians. By including logisticians as part of the collaborative environment, sustainability can be incorporated into the Objective Force as a design parameter rather than waiting until the system is fielded to determine how it will be sustained. The logistician's role is essential in making sure that the new force is responsive by "designing in" sustainability factors. The logisticians can also make recommendations on how to minimize the number of spare parts needed, and make design recommendations so that the soldier in the field can accomplish the bulk of the maintenance. In fact, the logistician may be able to develop an entirely new supportability concept for the new system, rather than forcing it to conform to the traditional concept that may not be optimal. The logistician can make important inputs into a new system's design to ensure that the system is capable of being transported on a platform as small as a C-130, thereby making the Objective Force more agile.

Closely tied to the logisticians are the cost estimators. The Army needs to look at coupling the costing tools to the com-

ponents of the systems design so that life cycle costs can be performance-based and used as a more reliable factor in design trade-offs. New costing analysis tools may need to be developed to incorporate emerging and cutting-edge technologies.

Including the intelligence community in the collaborative environment will ensure that the new systems are modeled to be survivable against dynamic and diversified world threats. The intelligence community provides the credible input on potential enemy capabilities so that systems can be designed to not only counter the opposing force, but also out-perform them. Because today's technology allows the collaborative environment to be adaptive, the latest threats can be quickly incorporated to ensure the survivability and lethality of the new systems.

With the help of the Command, Control, Communications, Computers and Intelligence (C4I) community, the collaborative environment can ensure that the systems of the future are truly system-of-systems designs. This will contribute to a more versatile and responsive force by not only allowing all Army units—down to the individual soldier—to effectively communicate with each other, but also allowing joint and coalition units to also have a common operational picture. To achieve that end, the C4I community must also help us address the issue of information overload that will result from the greater number of systems in the network. Actual C4I systems can also be used as stimulators to the models and simulations in our SMART collaborative environments.

Future Battlefields

The battlefield of the future is going to require new and versatile types of training. Models used for virtual conceiving will be upgradeable to serve as credible trainers so that soldiers can be trained before the actual system rolls off the assembly line. Designing embedded training into the system will allow soldiers to maintain individual proficiency and unit readiness while deployed. This will also save the cost of developing and

maintaining stand-alone trainers. Virtual realities will be used to train, plan, and rehearse missions throughout the full spectrum of potential missions. By virtue of the simulations, soldiers will have greater opportunities to train and cross-train.

Clearly, the Army sees SMART as an enabler for achieving the Objective Force. A look at the Army's Transformation Campaign Plan reveals entries for SMART as an enabler for "Modernization and Recapitalization," "Training and Leader Development," "Development and Acquisition of Advanced Technology," and "Strategic Communication" Lines of Operation. Also readily apparent is how these entries are linked to every remaining Line of Operation.

SMART is the solution for substantially reducing the time, resources, and risk associated with this transformation. By applying the SMART concept, we will be able to increase the quality, military worth, and supportability of our systems—and do so with a reduced total ownership cost for the life cycle of the force.

The mechanism to ensure that SMART is an effective enabler is being put into place. The SMART concept began in the Army's Research, Development, and Acquisition (RDA) M&S Domain. Although the name was changed from SBA to SMART, concern still remained that SMART was too RDA-centric. At the SMART Conference held in Los Angeles in January 2000, part of the feedback recommended that the execution of SMART be moved to an organization outside of any single M&S domain. In the spring of that year, co-chairs of the Army Model and Simulation Executive Council (AMSEC) assumed responsibility as the proponent for the SMART mission, with the Army Model and Simulation Office (AMSO) acting as the Executive Agent. Upon that transfer, AMSO was charged with finalizing the Planning Guidelines for SMART, planning for the SMART 2001 Conference (which was held in Orlando, Fla., in April 2001), and developing an Execution Plan for SMART.

Funding for SMART

The SMART Execution Plan is the road map for where the Army will go in implementing SMART. A public release version of the SMART Execution Plan is available at <http://www.amso.army.mil/smart/>. The Execution Plan was staffed in the fall of 2000 and endorsed by the AMSEC in November 2000. The Plan contains 51 tasks, most of which require refocusing existing mission funds, especially for the short term. For the first time, the Army is obtaining funding for SMART. This funding is not meant to help particular models "get well," or to help a specific program pay for its M&S. The funding will be applied to those aspects of SMART that support the infrastructure. It will support those aspects that are beyond the scope of any particular Program Manager (PM) to develop, or those that a PM cannot be realistically expected to pay from program funds.

The SMART funding will support efforts that will be of long-term benefit to the

Army and other PMs. They will support development of collaborative environments that are reusable, and allow customers to "plug and play" as well as share data and information. The Execution Plan will support the development of new cost analysis tools that are interoperable and can adequately address life cycle costs. In addition, it will support the RDEC federation, a Logistics federation, and Test and Evaluation federations that are reusable, interoperable, and are of long-term benefit to the Army. The Plan also addresses policy, and we will be looking for opportunities to incorporate SMART into Army documents as they are being updated, as well as developing a review process for Simulation Support Plans. An architecture will be closely examined so that standards can be recommended whenever they will be beneficial.

Funding in the SMART Execution Plan will also be applied to educating the workforce. Already, at the last SMART Conference tutorials were being pro-

vided. Additional online and electronic educational formats are being developed. In addition, the Plan identifies tasks to establish partnerships with other Services and government agencies to leverage efforts and investments outside the Army.

Gaining support for the funding initiative has not been easy. We have succeeded because SMART is a tool required for the Army to meet its goal of transforming itself into the Objective Force. AMSO is succeeding because the Army's senior leadership believes in, and has demonstrated enormous support for SMART.

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Intellectual Property: Navigating Through Commercial Waters

ISSUES AND SOLUTIONS WHEN NEGOTIATING INTELLECTUAL PROPERTY WITH COMMERCIAL COMPANIES

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The concept of Intellectual Property (IP) is fundamental to a capitalist society. A company's interest in protecting its IP from uncompensated exploitation is as important as a farmer's interest in protecting his or her seed corn. Often companies will not consider jeopardizing their vested IP to comply with the government contract clauses that have remained in use since the days when DoD was the technology leader and frequent funder of research programs. We must now create a new environment for negotiating IP terms and conditions that protect the true interest of the government—incorporating technologically ad-

vanced solutions into the weapons systems and management systems we deploy.

This guide was created for the government acquisition community (i.e., contracting personnel, legal counsel, and program managers) and its industry partners as a tool to equip them with new ideas and solutions to address the IP issues that divide us in the negotiation process.

Currently published online, the guide may be downloaded from the Director, Acquisition Initiatives Web site at <http://www.acq.osd.mil/ar/doc/intelprop.pdf>.

