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**OPPORTUNITIES FOR IMPROVING
ARMY MODELING AND SIMULATION DEVELOPMENT:
MAKING FUNDAMENTAL ADJUSTMENTS AND BORROWING
COMMERCIAL BUSINESS PRACTICES**

BY

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**OPPORTUNITIES FOR IMPROVING ARMY MODELING AND SIMULATION
DEVELOPMENT: MAKING FUNDAMENTAL ADJUSTMENTS AND BORROWING
COMMERCIAL BUSINESS PRACTICES**

by

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ABSTRACT

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The U.S. National Security Strategy calls for using all elements of national power to continue U.S. engagement and leadership abroad. The Army must balance decreasing resources with uncertain requirements; requirements which span the conflict spectrum. The Army's current staff training simulation development process could better support all possible scenarios by making some fundamental adjustments and borrowing commercial business practices. This paper briefly explores project management principles, leadership theory, and commercial business practices, suggesting improvements to the Army's modeling and simulation development process. Finally, the paper suggests adjustments that might improve the process and identifies areas for further research. Suggested adjustments and practices are:

- Encourage senior leaders to meet regularly with project teams and review as part of regular counseling.
- Empower modeling and simulation domain managers to make resource decisions.
- Organize modeling and simulation personnel, to include standards category representatives, into and make assignments from functional pools.
- Train senior leaders and project managers to understand and articulate projects' support to Army vision and goals.
- Emphasize providing high quality products as a top modeling and simulation priority.

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OPPORTUNITIES FOR IMPROVING ARMY MODELING AND SIMULATION DEVELOPMENT: MAKING FUNDAMENTAL ADJUSTMENTS AND BORROWING COMMERCIAL BUSINESS PRACTICES

Technology and an ever-increasing pace of development have made a linear, conservative technique for change truly obsolete. It is still important that there be a vision and seminal concept for what might be, but there is no longer time for fully developed doctrine to spawn organizations, equipment, training and leader development in sequence.¹

—GEN William W. Hartzog, USA Retired

The current domestic and international environment requires Army modeling and simulation developers to address many different, challenging issues with limited resources. Fundamental changes to the development process would improve modeling and simulation support provided to the Army. These changes include: encourage senior leaders to meet regularly with simulation development project teams; empower modeling and simulation domain managers to make resource decisions; organize modeling and simulation personnel into and make assignments from functional pools; train senior leaders and project managers to understand and articulate projects' support to Army vision and goals; and emphasize providing high quality products as a top modeling and simulation priority.

The Cold War is over and the United States won. The Army must now organize, equip, and train in preparation for future missions, based on a National Security Strategy, which states, "Our strategy is founded on continued U.S. engagement and leadership abroad."² Additionally, it says, "...we must always be mindful that the primary mission of our Armed Forces is to deter and, if necessary, to fight and win conflicts in which our vital interests are threatened."³ This means the Army must be ready to perform missions like those assigned over the past ten years: heavy force operations (Desert Storm and continuing deployments to the Persian Gulf region); peace enforcement operations (Bosnia and Kosovo); and, humanitarian assistance operations (Somalia, Haiti, and Honduras).

Preparation for varied types of relatively short notice missions to culturally diverse areas with a smaller force (and smaller budgets) from which to draw suggests the Army must be efficient, responsive, and flexible in order to support the National Security Strategy. Training strategies, programs, and tools used to prepare forces must also be efficient, flexible, and responsive. Likewise, training simulation development, which provides some of the tools that contribute to the overall training strategy, must be efficient, flexible, and responsive.

This paper will briefly discuss the current training environment and simulations' role in it. The paper will then describe, in general, how the Army's current simulation development process relates to the National Security Strategy. It will then identify barriers to simulation development and suggest changes, based on leadership concepts and commercial business practices, which might help Army simulation development overcome each barrier. Finally, it summarizes recommendations and recognizes possible areas for future research.

TRAINING IN TODAY'S ENVIRONMENT

Regardless of the structure (organization and equipment) required to support the National Security Strategy, training to prepare for all possible contingencies must consider much more than the name, educational background, and military tendencies of the motorized rifle division commander expected to oppose our units. A comprehensive training strategy must consider using resources efficiently to take full advantage of live, virtual, and constructive simulations (Table 1). It must take into account live fire exercises, field training exercises, and command post exercises across all sizes and types of units, and must include simulations in that accounting.

Live	Actual engagements among military forces and vehicles with simulated weapon effects.
Virtual	Interactions among manned simulators of weapon platforms, operating wholly synthetic within a computer generated environment.
Constructive	Mathematical models of combat ranging from duels between weapons to wars among nations.

TABLE 1. SIMULATIONS TYPES

Most unit leaders prefer live simulation training and live fire training.⁴ However, resource constraints preclude conducting only live simulation training and live fire training. In fact, training regulations, directives, and guidance often specify requirements, such as size of unit to train and frequency, for Field Training Exercises (FTX) and Live Fire Exercises (LFX).⁵ Unit leaders must then plan virtual and constructive training events intent on maximizing training benefit of the live simulation and live fire training. For example, units at Fort Hood, Texas, train vehicle crews in the Close Combat Tactical Trainer (CCTT)⁶ before conducting live simulation and live fire training. As a result, crews and teams begin live simulation and live fire training already proficient in some routine individual, crew, and team tasks. Field training can then focus on more difficult, higher-level unit tasks.

Leaders use this same concept in staff training. Units conduct Command Post Exercises (CPX) to train primary staff members and staff sections before deploying to the field for live simulation training. Thus, staffs can emphasize training on more complicated, cross function staff skills during field training, comfortable that they are proficient at routine activities. Staff training simulations can be the tool of choice used by leaders to guide CPXs. A unit leader might use a low overhead, low cost staff training simulation to help train his staff on plans and orders development. In this way, the primary staff can conduct a CPX while most of the unit performs other activities.

TRAINING SIMULATION DEVELOPMENT CHALLENGES

One significant simulation development challenge is providing a low overhead, low cost staff training simulation to unit leaders. In order to conduct simulation supported CPX training using current simulations, a unit commander must: schedule the facility and equipment for the training; provide or coordinate for other people, in addition to those targeted for training, to provide administrative and technical support (overhead positions); and plan preliminary training for input and output device operators.⁷ If a leader wants to conduct the CPX during a "post support" cycle, external taskings from the post support mission will likely deplete the parent unit, and the commander must get soldiers from other units to fill required overhead positions.

Additionally, most current staff training simulations portray heavy maneuver force engagements based on a standard, consistent "road-to-war"⁸ used for all scenarios. That characteristic does not accurately reflect most real-world deployments over the past ten years. For example, a typical road-to-war for heavy forces might not specifically address activities conducted before full force-on-force engagements. The National Security Strategy and recent deployments indicate that units could use staff training simulations addressing peace enforcement activities (not handled by most current staff training simulations) to help prepare for operations other than heavy force battles. This means that current staff training simulations do not fully support the National Security Strategy. There is a gap in training simulations that needs to be fixed.

The Army apparently recognizes it needs a viable low overhead staff training simulation to support training across all possible missions and is currently managing an effort to develop such a tool. The project, University XXI, links the Army with the University of Texas and Texas A&M University to develop a digital battle staff training simulation.⁹ Though initially focused on training staffs of "digitized" units at Fort Hood, Texas, this project is certainly an important step in using state-of-the-art technologies to build a responsive, low overhead staff training simulation for the entire Army.

To better support all possible missions described in the National Security Strategy, including missions other than heavy force battles, the Army should ideally create an environment that allows agencies to develop and modify staff training simulations more rapidly. A more responsive, efficient, and flexible training simulation development process could reduce the time between recognizing the need and delivering a useful product. It could provide a simulation that very closely replicates specific scenarios identified by leaders. Also, it could provide variable training scenarios based on changing strategic, operational, and tactical situations. Ultimately, a more responsive, efficient, and flexible training simulation development process would better support the National Security Strategy, the Chief of Staff of the Army's vision, and the types of missions units have faced over the past five years and the types of missions units might face in the future. It would do this by reducing product delivery time and providing realistic, variable scenarios.

The Army's heavy units must be more deployable. The Army's light units must be more lethal.¹⁰ In general terms, this sounds like the Army must be more flexible. In fact, some have suggested that flexibility be adopted as an American Principle of War.¹¹ To support increased institutional flexibility, efficiency, and responsiveness, the Army's staff training simulation development process must also become more flexible, efficient, and responsive.

The Army Modeling and Simulation (M&S) Master Plan provides M&S direction for Army organizations; describes the Army's vision for M&S; reviews the Army's M&S management structures and processes; details the Army's strategy for achieving the vision; and provides strategic guidance for M&S managers, developers, and users.¹² As a whole, the Army M&S Master Plan does a very good job of establishing an M&S framework and process. It provides an excellent base from which to begin process improvement efforts.

However, the Army M&S development process described in the Army M&S Master Plan, Army Regulation 5-11, Army Regulation 71-9, and other related publications, seems inflexible, inefficient, and unresponsive. The current development process:

- Restricts cross-domain interaction
- “Stovepipes” category standards coordination.¹³
- Sets approval authority too far removed from the user and developer
- Requires an extensive, complicated, and time-consuming justification and approval process.

A less hierarchical approach to M&S development, which gives more decision making authority to lower levels within the process, might respond quicker to commanders’ needs, permitting rapid changes, adjustments, and adaptations. A less restrictive framework that allows organizations to anticipate technological advances, take advantage of those advances, and borrow best practices from commercial businesses to stress flexible, efficient, and responsive simulation development would better support the National Security Strategy, M&S development, and staff training simulation development in particular.

IMPROVING THE PROCESS

M&S development has many characteristics of project management. A Guide to the Project Management Body of Knowledge defines a project as a temporary endeavor undertaken to create a unique product or service.¹⁴ That definition certainly describes staff training simulation development. Therefore, the military could use accepted project management techniques combined with current leadership theory and proven (from the commercial viewpoint) business practices to improve flexibility, efficiency, and responsiveness when developing staff training simulations.

David I. Cleland, Project Management Institute (PMI) Fellow, identified six “drivers” that have strongest positive association to project team performance (Table 2). He also identified six strongest barriers to project team performance (Table 3).¹⁵ Military modeling and simulation development guidance should focus on creating an environment that supports the drivers of project team success and eliminates the barriers to quality team performance.

1) Professionally interesting and stimulating work.
2) Recognition of accomplishment.
3) Experienced engineering management personnel.
4) Proper technical direction and leadership.
5) Qualified project team personnel.
6) Professional growth potential.

TABLE 2. SIX DRIVERS THAT HAVE STRONGEST POSITIVE ASSOCIATION TO PROJECT TEAM PERFORMANCE

1) Unclear project objectives and directives.
2) Insufficient resources.
3) Power struggle and conflict.
4) Uninvolved, disinterested upper management.
5) Poor job security.
6) Shifting goals and priorities

TABLE 3. SIX STRONGEST BARRIERS TO PROJECT TEAM PERFORMANCE

This paper addresses each barrier separately and gives examples of each barrier to performance as it relates to Army M&S development and, by extension, to staff training

simulation development. The paper then suggests philosophical approaches and commercial business practices that might apply to Army M&S development and help reduce the barriers.¹⁶

UNCLEAR PROJECT OBJECTIVES AND DIRECTIVES

Personnel management policies and practices and the budgeting process create project team leadership turbulence and funding changes that contribute to unclear objectives and directives. If a team leader knows he likely will not see the project through to completion because of assignment policies and because full project funding is not guaranteed, he may not be able to provide clear objectives and directives. He may not feel a need to clarify due to uncertainty and he may not want to limit his successor by specifying narrow or inflexible objectives and directives. It may appear to team members that the project leader has no investment in the project. For him, it is a temporary assignment within career progression. Successful project completion by him is not required. As a result, team members see no reason to fully invest themselves in the project because the leader does not provide clear, long-term objectives and directives.

Additionally, at the senior level, many leaders must learn to change their leadership and management style. Rather than carefully managing many aspects of a project to ensure success, a technique that worked well earlier in their career, they now oversee multiple projects and cannot focus exclusively on one single effort. Senior leaders must become indirect leaders. The most effective indirect leaders are those whose subordinates say, "We did it ourselves."¹⁷ Senior managers and leaders must be less concerned with receiving personal credit and recognition for good work and should look for ways to provide all tools that subordinates need. This includes clear guidance, support, and freedom to work toward project objectives so the project team members believe they made the project succeed. By setting the conditions for success and empowering project team members, leaders help clarify objectives and directives.

Simulation development, which depends heavily on technology, constantly changes to take advantage of the latest, most powerful tools available. Fluid, seemingly endless hardware and software improvements can overwhelm project objectives. To combat this, commercial software developers regularly hold team and customer meetings to ensure everyone maintains proper focus. Often, senior representatives of the developer and customer participate to reaffirm commitment to and support of the project. Ideally, these meetings coincide with project milestone reviews. Periodic developer and customer meetings to recognize accomplishments, clarify project direction, and reinforce expectations also reduce senior leaders' direct involvement and allow team members to feel good about contributing to an important project. Regular interaction that includes team members as well as senior project and customer representatives reinforces the importance of the members and helps assure clear understanding of objectives and directives. Commercial simulation developers use initial guidance from company executives and regular progress reviews to focus their senior managers on the importance of job site visits, developer and customer meetings, and project team interaction.¹⁸

The Army might reduce this barrier by encouraging senior leaders supervising simulation development to regularly meet with the team developing the product. Initial orientations could cover this topic and required periodic counseling sessions would regularly address it. Frequent interaction allows high level leaders and managers to review project objectives and reissue directives, if necessary. This does not mean change initial guidance, but suggests reaffirming commitment to existing objectives and evaluating compliance with directives. It also shows team members that high-ranking leaders in the organization understand and appreciate the important project to which they are assigned.

INSUFFICIENT RESOURCES

As mentioned earlier, the Army is changing in response to evolving priorities. One of the biggest changes is shrinking resources -- less money and fewer people. The Army budgeting process aggravates resourcing problems because funds may be shifted between programs each year as priorities change. A three-year project might receive all funds requested during the first year, but might receive significantly less money than requested or needed during subsequent years. The project may fail or disintegrate due to lack of funding.

Additionally, the Army's Modeling and Simulation requirements integration and approval (RIA) process influences resource allocation. The M&S RIA process seems inefficient, cumbersome, and unresponsive, which slows funding. In general, that process, for a new staff training simulation (i.e., no existing simulation can be modified to fill the requirement), is:

- M&S need identified and coordinated with appropriate domain manager to ensure no existing simulation fills the need or could be modified to fill it.
- Operational Requirements Document (ORD) for major M&S systems or Model and Simulation Requirements Document (MSRD) for lesser systems defines requirement; submitted to domain manager for review.
- Domain manager reviews and forwards approved document to Requirements Integration Working Group (RIWG).
- RIWG reviews ORD or MSRD; recommends approval to the applicable authority (Training and Doctrine Command (TRADOC) Deputy Commanding General [coordinated through the flag-level Requirements Integration Council] for cross-domain M&S; Domain Agents for single domain M&S).
- Approved ORD or MSRD becomes user's document for creating a program that will compete for funding through normal agency, Major Army Command (MACOM), or Department of the Army (DA) funding channels.

- For funded programs, M&S proponent identified and necessary developers chosen.

Project management completed in accordance with AR 5-11.¹⁹

Within this RIA process, it is possible that a staff training simulation identified to support initial operations in Bosnia, for example, might not be funded until several months into the peace enforcement deployment. After all required coordination, development, and user testing, it might not be available for training use until other units were deployed to Kosovo, three years after the need was first identified.

Simulation related technology progresses very rapidly, with capabilities improving about every 18 months or less,²⁰ rendering today's hardware and applications nearly obsolete within one to three years. The deliberate RIA process outlined above, if the requirement is approved at all, means the requirement then must compete with other projects for funding. Military budgeting (with funding decisions made annually) progresses much more slowly than simulation related technology. The unwieldy RIA process combined with highly political budgeting process may force agencies to seek funding from specialized sources that might benefit from the product, thus diverting valuable resources from the primary development mission. Additionally, the specialized source and the simulation development effort might not be assigned to a specific domain manager. The needed simulation might be developed, but never widely distributed to other potential users because its development did not go through the entire procedure and was not tracked by a responsible domain manager's representative. In this case, responsive development was more important than going through the prescribed approval and funding process. Rather than impose a strict procedure on the development process, leaders should create an environment conducive to rapid review, approval, and resource allocation.

Limited resources hinder commercial simulation developers just as in the military. However, commercial developers can make resource decisions and shift resources much quicker than the military. Commercial developers know that technology continues to progress and that they must invest resources in something that will maximize available technology and

make a profit. Commercial developers thoroughly analyze market demands, pursue projects that show greatest potential for success, assemble the development team, and devote resources to the effort. If a project progresses slower or technology advances quicker than anticipated, or if a competitor beats them to market with essentially the same product, they can dissolve or refocus the team relatively quickly, not waiting for the next budget cycle. Fully resourcing projects initially, allowing significant resource decisions at lower management levels, and budgeting based on events rather than fiscal year constraints are methods used by commercial developers to tackle the insufficient resources barrier.²¹

The Army cannot expect resources to increase. Therefore, it must manage what it has more efficiently. A first step might be to give lower level leaders, maybe domain managers or managers of M&S development projects, more power to make resource decisions. This includes more freedom to shift resources between projects, perhaps based on relative progress, changing Army missions, or other similar criteria.

POWER STRUGGLE AND CONFLICT

As resources decrease, missions become more varied and complex, and guidance seems less specific, uncertainty increases. Contact between organizations may grow during uncertainty as agencies compete for resources by expanding their interests. Competition may lead to conflict between agencies and power struggles between agency heads and project team leaders.

Provisions for managing Army M&S could help eliminate potential power struggles regarding the development process. However, current policies seem to support conflict. Army Regulation (AR) 5-11, Management of Army Models and Simulations, identifies M&S management responsibilities for the Vice Chief of Staff, Army (VCSA), the Army Acquisition Executive (AAE), the Assistant Secretary of the Army for Research, Development, and Acquisition (ASA(RDA)), the Deputy Under Secretary of the Army for Operations Research

(DUSA(OR)), the Deputy Chief of Staff for Operations and Plans (DCSOPS), the Director of Information Systems for Command, Control, Communications, and Computers (DISC4), and the Commanding General, Training and Doctrine Command (CG TRADOC). Additionally, AR 5-11 specifies:

- The DUSA(OR) will “provide policy guidance for the life-cycle management, resourcing, verification, validation, accreditation, configuration management, interoperability, and release of all M&S.”
- The DCSOPS will, “serve as HQDA proponent for M&S planning, prioritization, and programming.”
- Principal HQDA and Secretariat officials, Major Army Command (MACOM) commanders, directors, and agency heads within the Army will, “serve as M&S proponents for individual M&S applications within their areas of responsibility.”
- CG TRADOC,” reviews and approves Army M&S requirements.”²²

Resourcing, prioritizing, proponentcy within areas of responsibility, and approval functions for managing Army models and simulations are spread across at least four different agencies, not counting all MACOM commanders, directors and agency heads who are active in the process with their own parochial interests. Perhaps in an effort to be all-inclusive, this structure supports power struggle and conflict among all agencies assigned responsibilities.

The Army M&S Master Plan further increases potential for conflict by establishing M&S “domain” managers as: the TRADOC Deputy Chief of Staff for Combat Developments in the Advanced Concepts and Requirements (ACR) domain; the Principal Deputy for Acquisition, Army Materiel Command (AMC) in the Research, Development, and Acquisition (RDA) domain; and the TRADOC Deputy Chief of Staff for Training in the Training, Exercises, and Military Operations (TEMO) domain. Additionally, some simulations could be classified under more than one domain. For example, if a MACOM identifies the need for a new staff training simulation, and the project is approved and funded, conflict might arise over whether the

simulation is a new product within the RDA domain, managed by AMC, or a training tool within the TEMO domain, managed by TRADOC. Simply assigning domain responsibility does not necessarily solve the conflict problem, as organizations compete for limited resources.

The Army M&S Master Plan also establishes standards categories (Table 4) as a framework for managing current M&S procedures, practices, processes, techniques, data, and algorithms. It identifies Standards Category Coordinators (SCC) whose responsibilities include executing the Standards Development Process for the category, publishing the SCC annual report, and supporting the Army Model Improvement Program (AMIP). The Army M&S Master Plan assigns individuals from six different, independent agencies as coordinators for 18 standards categories.²³ Rather than consolidating responsibility at a single focal point, this further increases the potential for conflict in managing the simulation development process.

<u>STANDARDS CATEGORY</u>	<u>RESPONSIBLE ORGANIZATION²⁴</u>
Acquire	TRADOC
Architecture	AMC
Attrition	AMC
Command Decision Modeling	TRADOC
Control, Communications, and Computers Systems Representation	TRADOC
Cost Representation	CEAC
Data	AMC
Deployment/ Redeployment	MTMC
Dynamic Environment	AMC
Functional Description of the Battlespace	TRADOC
Logistics	TRADOC
Mobilization/Demobilization	CAA
Move	USACE
Object Management	AMC
Semi-Automated Forces	TRADOC
Terrain	USACE
Verification, Validation & Accreditation	TRADOC
Visualization	TRADOC

TABLE 4. M&S STANDARDS CATEGORIES AND RESPONSIBLE ORGANIZATIONS

Commercial simulation developers, in general, organize more by functions and draw from functional resource or manpower pools to create project teams. Teams consist of

knowledgeable representatives from each function. Team members determine if the simulation performs correctly, based on project objectives. If a team member questions some piece of the simulation, he can consult with functional counterparts not on his team, but within the parent company. The Army could use similar techniques to speed simulation development. Rather than maintain standards category approval authority at the various agencies, standards category representatives could be assigned to all installations conducting M&S development or to each simulation project. Category representatives on site or assigned to the project approve applicable standards replication in local M&S projects. If uncomfortable approving some aspect of the category, they could then consult with the category coordinator for assistance. The team leader's vision or customer desires guide function and performance, aided by responsive functional approval.

Additionally, the Army might reduce the potential for power struggle and conflict by allowing a senior representative of each domain, perhaps each domain manager, to make resource and priority decisions. Each domain could include standards category representatives authorized to approve procedures, practices, processes, techniques, data, and algorithms that emerge within the domain. The standards category representatives in the domain could consult among themselves regarding changes, contact standards category representatives in other domains, or address the issue at the annual SCC Workshop prescribed in the Army M&S Master Plan. These adjustments would empower domain managers and standards category representatives to make responsive resourcing and technology decisions, potentially streamlining the development process and reducing power struggle and conflict.

UNINVOLVED, DISINTERESTED UPPER MANAGEMENT

High-level managers often supervise several projects located in numerous states, regions, or countries. Team members and local leaders may seldom see or receive input from the senior project managers. To the project teams, upper management may seem uninvolved or disinterested. Several factors contribute to this perception.

Continual personnel turbulence, geographic separation, layers of bureaucracy, and different, changing priorities across all levels of Army leadership, management, and participation prevent leaders from cultivating good teamwork and showing their interest with regular involvement through project completion. Moreover, the Army seems to provide no incentive for upper management to genuinely embrace a project. The Army's constantly changing M&S environment and restrictive budgeting process limit the time and effort upper management can realistically devote to various projects. Also, upper management exercises relatively little direct control over many of the project's resources (e.g., personnel assignments), further reducing motivation to see or guide a project to completion.

When contractors develop staff training simulations for the military, their pursuit of additional contracts or follow-on projects sometimes may weaken commitment to existing efforts. In those cases, developing extra business for the parent company becomes more important than producing the best product to fulfill current requirements.²⁵ Disinterested upper management is actually more interested in developing additional work.

Commercial simulation developers, in general, believe upper management is very interested in all company projects. However, they recognize that good managers are not necessarily good leaders. Among other things, good managers fully account for all resources, including money and people, organize teams very well, maintain project schedules appropriately, and meet all deadlines. By contrast, good leaders visit team members at work; they understand and can articulate the organization's vision and goals; they can explain how projects contribute to those goals; and they are dedicated, professional examples to their fellow

employees.²⁶ Good leaders, by their actions, positively motivate team members. Good managers do not necessarily provide that positive motivation. One definition of leadership is "that process in which one person sets the purpose or direction for one or more other persons, and gets them to move along together with him or her and with each other in that direction with competence and full commitment."²⁷ Upper management, unable to exercise effective leadership, may appear uninvolved and disinterested when, in fact, they are very interested and want to get involved. It may be they just cannot relate the company's overall vision to the projects that they manage.

Commercial developers address this problem by guiding upper management to clearly understand the company's vision and stressing the need to share the vision with all employees. Senior managers may attend off-site workshops, directed by the parent company, to learn effective leadership techniques. At staff meetings, company executives emphasize to their senior managers the importance of regularly reinforcing connections between ongoing projects and the company's goals and vision. Officers remind senior managers to highlight the significance of team members' work when they visit work locations and when they distribute project updates. These practices show all projects are important to the company and that upper management is interested.²⁸

For the Army, this means leaders should continuously reinforce the importance of training simulation development. By understanding and conveying a training simulation's support of the Chief of Staff of the Army's and Secretary of the Army's vision statement, overall Army goals, and the National Security Strategy, upper management demonstrates project value. By visiting project teams at work and reinforcing project importance, senior Army leaders demonstrate involved interest. Additionally, team members might gain job satisfaction by knowing their project is important.

POOR JOB SECURITY

For military contractors and soldiers working on M&S projects, this barrier might more appropriately be HIGH JOB UNCERTAINTY. Much of this uncertainty stems from budgeting issues discussed earlier. Projects that lose funding compared to prior years can not operate at the same level. Doing more with less has its limits. Reduced funding leads to less time and fewer people working on a project. Although reduced, funding continues, which means agencies cannot terminate the project and redistribute funds to higher priority projects. The project may slowly die, siphoning resources that might be better used elsewhere. Budgeting requirements impose restrictions and limitations that hinder efficient, responsive resource allocation.

Personnel stability is the key to overcoming this barrier. Commercial simulation developers seek the best available people and keep them on projects through completion. In a highly competitive, dynamic field, successful developers keep a core of their best people to maintain institutional knowledge and carry a positive attitude with them to other projects.

Overcoming this barrier may require a change to the Army's personnel assignment policies and practices. Current practices (e.g., two or three year assignments) might be inappropriate for those involved in training simulation development, or similar career fields. Simulation developers might be grouped by functional expertise at regional installations. The managing headquarters could then assign them to projects within the region. Project teams would be more stable, reducing job uncertainty and improving job security. This also supports organizing by functions and assigning from those functional pools. As mentioned earlier, drawing from functional pools facilitates commercial simulation development.

Officer Personnel Management System (OPMS) XXI may help relieve some of the job security or job certainty problems by assigning people for tours longer than the current average. Since OPMS XXI changes apply to field grade officers, middle and upper level managers responsible for multiple projects may realize assignment stability. However, OPMS XXI does

not address enlisted soldiers and company grade officers; those people who provide significant administrative support and serve as individual project leaders.²⁹

SHIFTING GOALS AND PRIORITIES

Leaders, presidents, and chief executives establish the vision for their institutions, organizations, or commercial enterprises. Among other things, the vision is the basis to guide overall efforts and justify existence. From the vision, leaders identify institutional goals and priorities to help focus routine activities and specific business ventures. When the leader, business climate, or operating environment change, the vision may also change. Constant changes in the areas mention can lead to frequent adjustments to the organization's vision and goals.

The United States Constitution and the Congress (as the lawmaking body) contribute to this barrier for the military. The Commander in Chief of the Armed Forces can change every four years. Legislators can change every two to six years. The Chair of the Joint Chiefs of Staff, service Chiefs of Staff, and geographic and functional Commanders in Chief all experience similar personnel changes. Global events drive international political, military, environmental, and economic changes. These changes and others require shifts in national goals, objectives, and priorities, leading to shifts throughout all levels of military organizations.

We honestly do not know the future structure of the Army. It might be four different kinds of forces: Special Operations Forces; modernized, rapidly deployable, easily employable heavy forces; digitized and better sustained light/forced entry forces; and smaller, more lethal medium-weight deterrent forces.³⁰ It might be organized into a prevention and deterrent force, an engagement force, an experimental force, and a generation and sustainment force.³¹ It might provide a major theater war force and a smaller-scale contingency force, each organized to fully and independently support itself.³² It might be a hybrid combining features of all these. Due to

goal, priority, vision, and structure changes, an M&S project initiated to support former Army Chief of Staff General Dennis Reimer's strike force might not be appropriate to support General Eric Shinseki's interim brigade combat team.

In the midst of conflict or when there is a definite threat, such as during the Cold War, goals and priorities are relatively easy to define and maintain. A simple statement, for instance "Fight and Win the Nation's Wars," may be enough. When the threat, structure, and possible missions are uncertain, no simple statement applies. This uncertainty permeates through all levels and activities of the Army, including training and M&S development.

In order to minimize the effect of uncertainty in the M&S environment (which can change rapidly), commercial simulation developers might identify quality-related goals to help focus priorities. For example, a commercial simulation developer may state it intends to provide the "best" product available. Often it then defines "best" in terms of hardware and software supportability, upgrade potential, interoperability with existing tools, acceptance throughout the simulation community, or combinations of these aspects. (Commercial simulation developers usually do not identify low cost as a consideration.) That technique clearly establishes the company's approach so that all employees understand goals and priorities.³³

The Army M&S community could use the same approach to maintain relatively consistent goals and priorities. In fact, the Army M&S Master Plan provides a clear vision for the M&S community:

- **World-Class Models and Simulations** supporting the full spectrum of Army operations in the 21st century
- **Tools for the Total Force**
 - Fully integrated into operational and business decision making processes and systems
 - Credible "Synergized Realities" for education, training, analysis, acquisition and research
 - Customer-focused sets of interoperable systems of varying fidelity

- **Carefully Managed as a Core-Enabling Competency**
 - Cultivated infrastructure energized by quality people
 - Prioritized investments
 - Responsive to change
- **Army Maintains Leadership** in the use of technology for more effective M&S support
 - Pre-eminent in art and science of simulating joint operations on land
 - DoD lead in the representation of leadership and human dynamics for operational command and control

The stated vision suggests flexible, responsive support across the full spectrum of 21st century Army operations. However, the vision does not specifically address M&S state-of-the-art technologies. Additionally, when discussing the M&S vision, the Army M&S Master Plan implies cost may play an important role in all M&S considerations; more of a role than it plays in commercial firms.³⁴ Though a very realistic concern from the Army's perspective, it could dampen M&S efficiency, responsiveness, and flexibility if identified state-of-the-art support is judged too expensive to pursue. In this case, the Army must realize money concerns may degrade the Army M&S community's ability to fulfill its vision.

SOME RECOMMENDATIONS

This paper addressed each of the six strongest barriers to project team performance and suggested some techniques, practices, or policy changes to help overcome the barriers. In summary, the barriers and suggestions to help overcome them follow:

Unclear project objectives and directives. - The Army should encourage senior leaders to regularly meet with project teams. Initial job orientation would emphasize the importance of this practice and required counseling sessions would address individual progress in this area. Regular visits allow high level leaders and managers to reinforce project objectives and

directives. It also shows team members that high-ranking leaders in the organization understand and appreciate the important projects to which they are assigned.

Insufficient resources. - The Army must manage what it has more efficiently by giving lower level leaders, perhaps domain managers or managers of M&S development projects, more power to make resource decisions. This includes more freedom to shift resources between projects, possibly based on relative progress, changing Army missions, or other similar criteria.

Power struggle and conflict. - The Army should organize into and assign M&S personnel from functional pools. This includes assigning standards category representatives to all installations conducting M&S development. The representatives approve applicable standards replication or, if necessary, consult with the category coordinator for assistance and approval. This requires a fundamental change in personnel assignment policies and practices, including policies for Department of the Army (DA) civilians, to create functional pools and put category representatives on installations. Additionally, the Army should allow senior representatives in each domain to make resource and priority decisions.

Uninvolved, disinterested upper management. - Army M&S project leaders and managers must understand and articulate models' and simulations' support to the Chief of Staff of the Army's and Secretary of the Army's vision statement, overall Army goals, and the National Security Strategy. They should visit project teams at work, reinforcing the importance of simulation development to team members.

Poor job security. - Current personnel assignment practices exacerbate this barrier's effect on M&S development, and OPMS XXI only partially helps reduce the problems. A regionally focused, functional pool assignment process would better support project team stability, reduce job uncertainty and improve job security. Extend OPMS XXI personnel assignment concepts to captains, enlisted soldiers with appropriate specialties, and qualified DA civilians.

Shifting goals and priorities. - The Army should avoid indirectly emphasizing cost when discussing its M&S vision. Remove all discussion of minimizing cost from M&S documents, regulations, and plans. Efficient, responsive, flexible support, suggested by the vision, should translate into providing useful, state-of-the-art, high quality M&S products. The cost versus quality trade-off could impede the Army M&S community's ability to fulfill its vision.

THE TOUGHEST CHALLENGE

This paper briefly described the environment in which Army staff training simulation development operates. It proposed that simulation development closely resembles project management. It then presented six barriers to project team performance identified by David I. Cleland and gave examples of each barrier to performance as it relates to Army M&S development and, by extension, to staff training simulation development. The paper then suggested some ways in which leadership theory and commercial business practices could be used in Army M&S to overcome the six strongest barriers to project team performance. However, some of the adjustments suggested may require the Army to change fundamental views, policies, and practices in areas such as personnel management, resource allocation, and decisionmaking authority, as discussed when addressing each barrier. Some changes may require alterations within a system that the Army cannot directly affect, e.g., the federal budgeting process.

This paper focused only on the Army staff training simulation development process. It might miss some unique aspects of Reserve Component training simulation requirements that need more study, particularly considering increased Reserve Component participation in peace enforcement operations.³⁵ Fundamental changes to personnel management policies and practices, suggested to help overcome several barriers, might require a separate, complete study. Other services may face similar problems with training simulation development

efficiency, responsiveness, and flexibility. Certainly, further analysis could address improving joint training simulation development. Also, transportable staff training simulations, with which units can train during all deployments, might deserve more scrutiny. Additionally, an approach similar to that used in this paper could explore the six factors that have strongest positive association to project team performance, identified by Cleland, recommending approaches and practices to further strengthen positive influence.

Corporate leaders establish goals and priorities, provide necessary resources, practice indirect leadership, and regularly reinforce their business philosophy by clear, ethical actions.³⁶ High level managers, when faced with the six barriers identified in this paper, do not deny their presence.³⁷ In fact, military leaders deal with many of these same barriers throughout their careers. Therein may lie the toughest challenge. How does the institution motivate its leaders to make changes like those suggested in this paper? Conditioned to operate within the established system, which includes institutional inertia, bureaucratic self service, and turbulence brought by poorly defined strategic guidance, it appears that some senior leaders focus less on improving the system and more on operating within it. A typical response to overcoming barriers to performance might be, "If we were fully funded, we would have no problems." Unfortunately, this response supports General (Retired) William Hartzog's view:

The 21st century will require leaders who run on the ragged edge of audacity – leaders who are bold risk takers, confident of their ability to make tough decisions and unafraid of any consequences short of battlefield failure. The institution does not now uniformly produce such a cadre of leaders.³⁸

—GEN William W. Hartzog, USA Retired

ENDNOTES

- ¹ William W. Hartzog, "A Changing Army," Army Magazine, February 2000, 14.
- ² William J. Clinton, A National Security Strategy for a New Century (Washington, D.C.: The Whit House, December 1999), 3.
- ³ *Ibid.*, 11.
- ⁴ Ronald L. Bertha, "A Proven Alternative for Replicating the Combat Training Center Battle Command Experience," Landpower Essay Series (Arlington, VA: Association of the United States Army, October 1999), 4-8.
- ⁵ DA PAM 350-38, Standards in Weapons Training, and ARTEP 71-1MTP, Mission Training Plan for the Tank and Mechanized Infantry Company and Company Team, for example, specify LFX and FTX requirements.
- ⁶ Close Combat Tactical Trainer (CCTT) is a combat vehicle virtual simulation.
- ⁷ These are some, certainly not all, of the things a leader does to prepare for a CPX.
- ⁸ "Road to war" refers to a set of events that lead to commencement of hostilities between opposing forces.
- ⁹ Aubrey White, Institute for Advanced Technology, University of Texas at Austin, interview by author, 8 February 2000, Austin, TX.
- ¹⁰ Eric K. Shinseki and Louis Caldera, "The Army Vision Statement", 1999: available from <<http://www.army.mil/armyvision/vision.htm>>; Internet; accessed 26 February 2000
- ¹¹ Robert S. Frost, The Growing Imperative to adopt "Flexibility" as an American Principle of War (Carlisle, PA: Strategic Studies Institute, 15 October 1999), 15-23.
- ¹² Department of the Army, The Army Modeling and Simulation Master Plan (Washington, D.C.: U.S. Department of the Army, October 1997), p. 1-1.
- ¹³ Category standards are discussed more fully later in the paper, in the POWER STRUGGLE AND CONFLICT section.
- ¹⁴ Project Management Standards Committee, A Guide to the Project Management Body of Knowledge (Upper Darby, PA: Project Management Institute, 1996), 4.
- ¹⁵ David I. Cleland, Project Management: Strategic Design and Implementation (Blue Ridge Summit, PA: TAB Books, 1990), 305.
- ¹⁶ This paper presents the six drivers to positive project team performance to show that Cleland conducted a balanced examination in his book and to suggest further possible research.

¹⁷ Gifford Pinchot, "Creating Organizations with Many Leaders," in The Leader of the Future ed. Frances Hesselbein et. al. (San Francisco: Jossey-Bass, 1996), 26.

¹⁸ Greg Passmore, eGAD! Software, LLC, La Jolla, CA, interview by author, 29 November 1999, Orlando, FL.

¹⁹ The process depicted here is summarized from that explained in TRADOC Pamphlet 71-9, Force Development: REQUIREMENTS DETERMINATION, chapter 12.

²⁰ This refers to Gordon Moore's generally accepted observation that the amount of data a microchip can hold doubles about every 18 months (http://webopedia.internet.com/TERM/M/Moores_Law.html).

²¹ Gordon Walton, Origin Systems, Austin, TX, interview by author, 15 February 2000, Austin, TX.

²² Department of the Army, Management of Army Models and Simulations, Army Regulation 5-11 (Washington, D.C.: U.S. Department of the Army, 1997), para. 1.4.

²³ Army, The Army Modeling and Simulation Master Plan, pp. 3-8 - 3-10.

²⁴ Cost and Economic Analysis Center (CEAC); Military Traffic Management Command (MTMC); Concepts Analysis Agency (CAA); U.S. Army Corps of Engineers (USACE).

²⁵ This opinion is based on the author's personal experience as an Operations Research and Systems Analysis Project Leader, experience as a Contracting Officer's Technical Representative, and discussions with several military contractors.

²⁶ Walton.

²⁷ Elliot Jacques and Stephen D. Clement, Executive Leadership (Falls Church, VA: Cason Hall, 1991), 4.

²⁸ Walton.

²⁹ Department of the Army, "Officer Personnel Management System XXI (OPMS XXI) Briefing Online," 14 December 1999; available from <<http://www.army.mil/opms/Briefing.htm>>; Internet: accessed 12 February 2000.

³⁰ Hartzog, 12.

³¹ James M. Dubik, "Building a Strategy-based Force Structure," Landpower Essay Series (Arlington, VA: Association of the United States Army, December 1999), 6-9.

³² Mark E. Vinson, Structuring the Total Army for Full-Spectrum Readiness, (Carlisle Barracks, PA: U.S. Army War College, 1 April 1999), 20-25.

³³ Bernie Lofaso, Jr., Institute for Advanced Technology, University of Texas at Austin, interview by author, 7 February 2000, Austin, TX.

³⁴ Army, The Army Modeling and Simulation Master Plan, pp. 2-3 - 2-5.

³⁵ Aida Cerkez-Robinson, "Changing of the Guard: Part-time Officer from Austin takes U.S. Command in Bosnia," Austin American-Statesman, 8 March 2000, p. 2.

³⁶ Peter M. Senge, "Leading, Learning Organizations: The Bold, the Powerful, and the Invisible," in The Leader of the Future ed. Frances Hesselbein et. al. (San Francisco: Jossey-Bass, 1996), 50-53.

³⁷ Marc Raibert, Boston Dynamics Inc., Cambridge, MA, interview by author, 1 December 1999, Orlando, FL, and Walton.

³⁸ Hartzog, 18.

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