LEAP-AHEAD LOGISTICS MANAGEMENT TECHNOLOGY: TURNING THE EVOLUTION IN MILITARY LOGISTICS INTO A TRUE REVOLUTION

A MONOGRAPH
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Second Term AY 98-99

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	3 MAY 99	MONOGRAPH

4. TITLE AND SUBTITLE
LEAP-AHEAD LOGISTICS MANAGEMENT TECHNOLOGY: TURNING THE EVOLUTION IN MILITARY LOGISTICS INTO A TRUE REVOLUTION

5. FUNDING NUMBERS

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
School of Advanced Military Studies
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Fort Leavenworth, Kansas 66027

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Command and General Staff College
Fort Leavenworth, Kansas 66027

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*
SEE ATTACHED

14. SUBJECT TERMS SUPPLY CHAIN MANAGEMENT; ENTERPRISE RESOURCE PLANNING; FORCE XXI LOGISTICS; ARMY AFTER NEXT LOGISTICS; LOGISTICS; GCSS-A; ERP; MRP; SCM

15. NUMBER OF PAGES 52

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNLIMITED

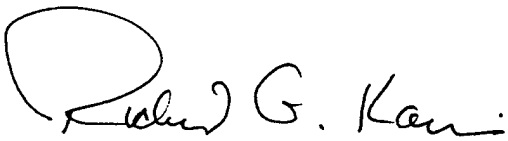
SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Randall M. Bentz

Title of Monograph: *Leap-Ahead Logistics Management Technology: Turning the Evolution in Military Logistics Into a True Revolution*

Approved by:



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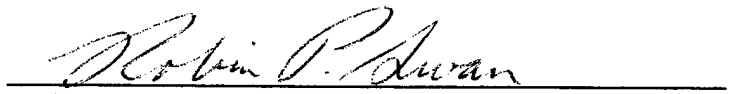

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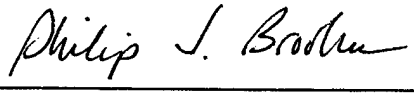

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Accepted this 27th Day of May 1999

ABSTRACT

Leap-Ahead Logistics Management Technology: Turning the Evolution in Military Logistics into a True Revolution, by Major Randall M. Bentz, United States Army, 52 Pages.

A Revolution in Military Logistics is a necessary precursor to the Revolution in Military Affairs. Army and the Department of Defense senior leaders have affirmed and reinforced this idea in logistics literature throughout the past two years. What, however, is a Revolution in Military Logistics and is the Army actively seeking to bring one about? This monograph provides evidence that the growth of logistics systems in the Army has been incremental and evolutionary and that the Army is not presently seeking profound change in improving its logistic support to the war-fighters. The Army has established criteria for a revolution in military logistics, but the system that it is currently developing, Global Combat Service Support – Army (GCSS-A), does not meet those criteria. There are systems that exist currently in the corporate sector known as Enterprise Resource Planning (ERP) Solutions that, if adapted for Army use, would fundamentally improve the Army's logistic posture and bring about a true revolution in military logistics.

This monograph examines the Army's current collection of logistics management systems and where they fall short of fulfilling the Army's future logistic requirements. It then examines and compares the Army's system, GCSS-A, and a theoretical ERP solution adapted for the Army's use in light of the tenets of the revolution in military logistics and the descriptive requirements of a twenty-first century logistics system. By the Army's own definition, GCSS-A does not meet most of the requirements necessary to represent a revolution in military logistics. An ERP solution, however, does meet and even exceeds the Army's requirements for a revolutionary system capable of supporting combat forces in the next century.

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Introduction

It would appear that the Army logistics system is in the midst of a revolution. One need only look in logistics publications throughout the Army to see the phrase "The Revolution in Military Logistics" in widespread use. In fact, it is quickly becoming one of the most over-used phrases in the logistics article writer's lexicon. The most recent issue of *Army Logistician* magazine, entitled "The Revolution in Military Logistics," invokes that phrase and its associated acronym, "RML" at least 200 times in less than 160 pages[1]. Is Army logistics truly in the midst of a revolution? It is, undoubtedly, in the midst of a period of significant change. The Army is evolving from the Army of Excellence organization, a force structure engineered to fight and defeat a conventional mechanized threat in central Europe, to Army XXI, an improved force that harnesses information technology (IT) to achieve rapid power projection, improved situational awareness, increased lethality, and unmatched agility.[2] Army XXI also serves as a stepping stone to the Army After Next (AAN), a force designed from the outset to incorporate IT and the lessons of Force XXI in order to achieve "full spectrum dominance" over all other land forces in the twenty-first century.[3]

The rapidly changing world of the twenty-first century will produce a profound shift in the way the nation views, equips, and employs its military force. Technological advances, combined with a radically transformed global political order, will change the way the Army looks and operates. The embedded and widespread use of information technology in weapon systems and combat forces will necessitate changes in organizations and doctrine. The Army has addressed these changes in various publications, including *TRADOC PAM 525-5* (Force XXI,) *Army Vision 2010*, and

writings on the Army After Next.[4] Throughout all of the doctrine and concepts for the twenty-first century, the need for a logistics system that can adequately support a significantly changed Army has consistently surfaced as a requirement. The Army realizes that its logistics system must adapt to a fundamentally different twenty-first century environment in order to support the force. In fact, a radically altered logistics system is actually a prerequisite to a transformed Army. The current Army Chief of Staff, GEN Reimer, has stated on several occasions that "there can be no revolution in military affairs without first having a revolution in military logistics."[5] Other agencies, researching this same issue, have come to the same conclusion that, without improved logistics support, the improvements due for the combat forces "cannot be fully realized."[6]

Given the requirement for a revolution in military logistics (RML), is there evidence that the Army is actively working towards achieving such a revolution or has the Army, a fundamentally conservative organization, opted for an essentially incremental approach? Is the much-touted revolution in military logistics in fact an *evolution* in military logistics? Evidence indicates that the Army is developing its logistics infrastructure in an incremental manner.[7] This is not necessarily a bad thing. An incremental methodology allows for the trial and testing of various approaches, to see what works and what doesn't. Over time, the system becomes transformed and can develop into an advanced, capable means of supporting the force. The key, however, is the time required to make such a change and the resultant end product. An extended development and fielding period can result in opportunity costs; namely, the inability to incorporate the latest technological advances due to a set schedule and the sunk costs of a lengthy development period. It may also result in an end-product that does not represent

a fundamental change from the original system. Conversely, a relatively rapid change is fraught with uncertainty and possible danger. It could result in the adoption of a system that is unsuitable, unworkable, and unsupportable. If the objective system, however, is one that has proven itself elsewhere over a period of time and could be adapted for Army use, then a relatively rapid change from the Army's current logistics system to that proven one could result in a successful Army logistics system that can be called "leap-ahead": fundamentally improved, even if greatly different.

One way of determining whether a systemic change in Army logistics represents a Revolution in Military Logistics is to examine the requirements for a twenty-first century logistics system, as described in the Force XXI manual, to explore the concept of "focused logistics," as outlined in *Army Vision 2010*, and to examine the tenets of the RML, as articulated by GEN Reimer:

1. A seamless logistics system
2. Distribution based logistics
3. Agile infrastructure
4. Total asset visibility
5. Rapid force projection
6. Adequate logistics footprint[8]

A system whose attributes most closely matches the requirements a future system and of these tenets is the system that will produce an RML. By examining both the incremental and "leap-ahead" approaches in light of these tenets, especially the tenets where the two approaches differ, it becomes apparent that the incremental approach, as epitomized by the development of the Global Combat Support System – Army (GCSS-A), will not

enable a true RML. Conversely, changing the Army logistics structure through a "leap-ahead" approach, represented by the proposed adoption of a civilian industry-developed Enterprise Resource Planning (ERP) solution, will produce a logistics system that does represent an RML. By adopting and adapting a commercial enterprise system based on practices that are considered "best of class" in the civilian sector, the Army can develop an integrated Supply Chain Management (SCM) environment. That environment will embody an agile, seamless logistics system with total asset visibility and an adequate footprint that can go anywhere and deliver the right item to the war-fighter at the right place and time.

The current plan for changing the Army logistics system is, for the near-term, to develop GCSS-A for Force XXI and then, in the long-term, further develop the support concept for AAN to include a seamless, enterprise-wide SCM system that closely resembles current best-of-industry practices.[9] This leads to some obvious questions. Why, if the systems and technology are available now, does the Army plan on waiting until 2025 to implement them? If a leap-ahead system that fulfills the requirements for an RML can become functional in the next few years, why is the Army satisfied with developing and living with a system over the next ten to twenty years that will only be incrementally better than our current legacy systems? Why settle on a system based at its core on methodologies and business practices that are forty to fifty years old when a new system, based on the lessons of the last ten years of the information revolution, is available and ready for adoption? This paper answers these questions with evidence that an adapted ERP solution is the best alternative for Army logistics in both the near and long term.

In order to appreciate the nature and extent of the RML, and what changes GCSS-A or an ERP solution could potentially bring about, it is necessary to examine the current state of Army logistics. By examining the current mix of old and new logistics systems in the Army, obvious stovepipes, discontinuities, and "seams" appear and require remedy through an integrated system. This is followed by discussions on how both GCSS-A and an ERP system remedy these deficiencies, and how each of the systems fits in with other developing technologies in order to produce a seamless, integrated logistics system. Using the tenets of the RML, the requirements of a Force XXI logistics system, and the concept of focused logistics as bases for evaluation, both systems demonstrate how they represent or fail to represent a revolution in military logistics.

The final issue that deserves considerable attention is how a revolution in a system affects its most important component – the people who support it and are supported by it; its owners, operators, and customers. As mentioned previously, the Army is an inherently conservative organization. The changes envisioned through the RML, especially in an SCM/ERP environment, promise radical change in the way the Army logistics system looks and operates. This combination of conservatism and change will no doubt create tension and even resistance throughout the Army, especially where systems, funds, positions, and parochial and territorial interests are threatened. The type and extent of change necessitated by a true revolution in military logistics can only come about through the complete acceptance and buy-in on the part of senior leaders, operators, and customers. The technology part is easy. Changing the human dimension is where the real revolution will take place. This, perhaps, will be the true challenge in developing a leap-ahead logistics system for the Army of the next century.

Chapter One: Making do with the Status Quo

It was, he decided, like looking for the proverbial needle in the proverbial haystack; except that this needle was 20 feet long and brown in color, and the haystack was over a mile square. CPT Jones, the SSA platoon leader supporting the Aviation Brigade, surveyed the port container yard with a sense of growing dismay. "We'll never find that Milvan in this mess, Perkins." SPC Perkins, the driver, scanned the hundreds of similar containers stacked in the holding yard. Squinting in the sunlight, he replied "Well Sir, the info on the web site said that the RF tag on the container got "pinged" by the interrogator at the main gate, so it has to be in here somewhere. Were there any specific markings on it?" "No, not that I'm aware of," replied Jones, "I'm sure the guys at the depot threw the engine into the first available milvan, slapped on the tag and shipped it off. The only way I found out the tag number was by having the MMC run a search on it for me so I could look up its last location on the Army's web site." SPC Perkins gestured back to the tent by the main gate. "The guys in the office said that milvans normally clear this place in about three days. After that they go to the Division Main where the vans are opened and the items get rerouted. We'll probably have better luck tracking it down there." "Well," replied Jones, "at least we can tell the guys there to keep an eye out for it if it hasn't shown up yet. I wish we could call them from here. Having to rely on this MSE system is getting to be a real pain. Let's go," he said, moving back to the HUMMV, " we can drop off these SARSS transaction disks while we're there." Climbing into the passenger seat, CPT Jones leafed through his notebook with a mounting sense of frustration. He wasn't going to enjoy informing his boss, MAJ Burton the AVIM company commander, that the UH-60 engine needed to bring the phase bird

back up was nowhere to be found. He also knew that MAJ Burton was not going to enjoy passing the information along to the brigade commander. Oh well, maybe they'd get lucky at the division main...

The phrase "current Army logistics system" is actually a misnomer, because it isn't really a system. It is, rather, a collection of independently developed and managed stovepipe applications that, in aggregate, perform the functions necessary to sustain the Army. The missing element is integration. Beginning in the sixties, as Army Logistics made its first tentative steps into the computer age, developers wrote programs to overlay the manual systems that individually handled the various logistic functions in the Army: supply, maintenance, ammunition, medical support, personnel, etc. The new automated applications aided information processing within each subsystem, but there was little inter-functional communication or information sharing. This inability to cross-talk perpetuated a situation in which each individual branch and functional area proponent carved out its niche by developing its own independent systems. As each agency spent further funds and time improving its own systems, ownership and territorial issues became paramount. Each individual agency sought to optimize its own system without regard to the larger Army system. This lead to the proliferation of stand-alone, proprietary software and hardware systems that began to litter logistic units and management centers. A battalion support operations office might have four or five different types of computers running different logistics applications, none of which are compatible or usable on the other platforms.

> Today's logistics is a highly segmented, linear architecture. Each node of the system focuses on increasing its own efficiencies without regard to overall system performance.[10]

This problem becomes increasingly amplified at successively higher echelons. At Army level, the result is a logistic system that isn't really a system.

In the Army currently there are fifty-five separate automation systems that are used for materiel and maintenance management.[11] Each system represents money, time, and effort that each agency, branch, service, and office expended to improve the efficiency of their internal operations. Each subsystem performs an important part of sustaining Army operations in its area and "each offers in some way a different approach to a common solution – indeed, in many cases, we find that they have independently arrived at the same solution set."[12] What is needed, then, is a way to tie them together to form a unified, integrated system.

A system cannot achieve optimization unless all subordinate elements actively seek to meet that goal. A subsystem that seeks to optimize its own operations may do so to the larger system's detriment. A transportation node, for example, that seeks to drive down costs by shipping only full containers may detract from the overall supply system's effort to decrease delivery times. Similarly, a maintenance facility that seeks to maintain good stewardship and accounting through extensive documentation of transactions may slow down the overall repair cycle time because of the added paperwork requirements. Such sub-optimization decreases the parent system's overall efficiency and can only be overcome through improved communication and information sharing. In recent years, with the growing use of e-mail, the internet and its associated world-wide-web, the Army has made progress in addressing the inter-system communication problem. Initiates such as Objective Supply Capability (OSC), Velocity Management (VM), Total Asset Visibility (TAV), and others represent early efforts to harness information technology.

Developers write software programs that enable communication between systems and give the user the ability to query separate data bases in order to gain information on the location of items in the supply pipeline and to allow the limited transfer of data between systems.

These efforts have shown some positive results, as illustrated in the above story about CPT Jones and the engine, but there is still a long way to go. Integration still happens, in most cases manually, by physically carrying data from one location to another, or by using voice communication to ask another person to search for the required information. The efforts to integrate these systems, moreover, has resulted in the creation of bridges and patches over the original systems, many of which are outdated, written in archaic programming language, and running on obsolete platforms. In an austere theater of operations where the only available communications system is what the Army brings with it, currently limited-band-width systems restrict the volume of message traffic. This makes it difficult for leaders and materiel managers to gain information and control events without physically traveling to the sources of information. In this sense, current logistics practices are not significantly different from those of the earlier wars of this century. Even with the overlaying of current technology, our logistic "system" is still based on an outdated, inadequate automation infrastructure.

One reason the Army has retained this infrastructure for so long is because of sunk costs. Agencies have spent enormous resources creating, developing, and improving these systems. Managers and operators have also spent years training and working in these systems. Project offices employing hundreds of personnel have grown up around these systems, each with its own goals and priorities. Solutions that use the

old systems while expanding on them and incrementally building out into a larger, integrated system of systems are typically more acceptable than any solution that involves the elimination of a particular system in favor of something new. The more time it takes to attain a completely efficient system, the less turbulence and change to the existing routine and therefore, the more acceptable the solution to most bureaucracies.

Despite the obvious positive connotations of an efficient system, there is a strong, if barely noticeable, undercurrent in the Army that does not desire an efficient logistics system, and with justifiable reason. An efficient system, by its very definition, has little or no "slack" and is therefore susceptible to a system-wide failure brought on by vagaries of environment, threat, or the prevailing political winds. Conversely, a non-integrated system may experience failures in certain functional areas, but the overall operation will continue. Planners and futurists are therefore faced with a dilemma. They have to choose between a disjointed, unresponsive system that, while lacking flexibility and productivity, is very difficult to destroy; and a highly efficient, agile system that can respond to various contingencies but lacks the depth and redundancy necessary to withstand a catastrophic blow. This problem is especially apparent in the controversy over inventories.

The Army's current logistics processes were designed in a period when materiel was relatively inexpensive and transportation relatively expensive.[13] Another factor in the process design was (and continues to be) the uncertainty of war itself. There are, indeed, only two absolute certainties in warfare: the Clausewitzian concepts of fog and friction; namely, that there is never "perfect" information and that something will always go wrong. This caused many to assert that "the military must sacrifice some measure of

efficiency to maintain a higher margin of safety."[14] This fostered an environment of stockpiles at every level of command and echelon of support. Even if commanders had more materiel than they needed, this was still the best solution. Many people have reinforced this idea, such as historian Martin Van Creveld, who wrote:

> If the logistics system in question is not to be hopelessly fragile and liable to catastrophic breakdown,...if it is to function under changing circumstances and be capable of switching from one objective to the next; if, in short, it is to be capable of coping with the uncertainty that is the result of enemy action and, as such, inherent in war – in that case a certain amount of redundancy, slack, and waste must not only be tolerated, but deliberately built in."[15]

Given the very human tendency to rely on supplies at hand rather than on what has been promised to accomplish the mission and the problems with accurately forecasting future consumption requirements, it is not surprising that all levels of management in the Army maintain large inventories.

Large inventories, however, cause their own problems. The physical amount of materiel possessed by each level of command necessitates additional transportation assets, which in turn increases the logistic support requirements for the logistics system itself. Logistic units are large, cumbersome organizations that cannot move as quickly as the supported combat forces and require a significant overhead of their own in support and security. Large stockpiles also make it hard for logistics units to keep track of items. Poor visibility and difficulties with accountability impair the commander's ability to know what is on hand at any given time. Because of this lack of visibility, materiel managers cannot easily transfer resources from one unit to another based on mission and need. Inventories are also becoming financially unsupportable as well. The reduction of

the Army and the constant erosion of the defense budget are making the retention of large inventories fiscally impossible.

Is the existence of large inventories merely a cost associated with the uncertainties of war? Even if a combat support system must maintain a certain amount of inefficiency for safety's sake, it is arguable that a significant amount of the Army's stockpiles were caused by inefficiency within the system itself. Inefficiencies required inventories. Large stockpiles equated to and caused a certain amount of system inefficiency, which in turn caused more stockpiling. By the middle of the 1990's, fiscal restraints combined with reduction of Army support infrastructure brought about the need to do something about large, wasteful, and inefficient inventories. The Army commissioned the RAND Corporation in 1994 to study the supply system and to make recommendations for improvement. The study resulted in the initiation of Velocity Management (VM.) Simply stated, VM is the substitution of mass for velocity. In other words, the Army could reduce the size of its inventories by shortening its supply delivery times. The entire Army logistics system was targeted for improvement. As stated by MG Robinson, then Commander of the Combined Arms Support Command (CASCOM,) "the responsibility for implementing VM lies with everyone in the Army Logistics System."[16] The process began in earnest in early 1995.

The goal in improving the system was to increase the commander's confidence in the logistics system.

> The key function here is to provide high confidence that a complete and effective solution to a readiness shortfall can be delivered at a specific time. Without definite results, the user will have no confidence in the support system, and refuse to step away from today's practice of ineffective and redundant ownership of assets and capabilities at each level of command.[17]

Commanders required large on-hand inventories of materiel because of long Order-Ship Times (OST) which, they assumed, were the result of an inherently inefficient system. The system, however, was not inherently inefficient. As leaders and technicians discovered throughout the VM process, it was inefficient because of wasteful and inefficient practices at every level throughout the system. As site improvement teams and process improvement teams targeted each of these practices on an individual unit or installation basis, OST's throughout the Army began to come down. Over a three-year period, average OST's decreased between twenty-five and fifty percent.[18] This improvement began to give commanders the confidence to reduce their on-hand stocks and free up resources for other programs. No commander would eliminate his stocks, however. The J-4 of the Joint Staff echoed this sentiment: "Never, ever in a military operation do we want to talk about just in time. Safety levels are required."[19] Most commanders, having grown up in an inefficient system, will not have complete confidence until they are certain that the distribution and transportation systems can deliver the necessary items at the right time in order for the unit to meet its mission. As stated by Paul Kaminski, Undersecretary of Defense, "neither the "just in case" or the "just in time" system is right for the Defense Department (and, by extension, the Army). A tailored approach is needed."[20] Although current logistics operations in the Army are in a state of steady improvement, system performance is still below the level needed to give the commander the confidence to reduce his materiel inventories. In order to instill the necessary confidence, the Army needs to go beyond merely wringing out inefficiencies in the old system and look toward the design and implementation of a new

system. What comprises the best possible system is the discussion of the next two chapters.

Chapter Two: GCSS-A and the Incremental Approach

"Well," thought MAJ Jones, "At least it's easier to find things now." He stared at the screen of the Pentium computer in his makeshift Support Operations Office. He scrolled through the pages of data as the GCSS program sought out information on the location of the various parts, people, and fuel he'd need in order to form a forward support sustainment team for Second Battalion. This was definitely better than chasing all over the theater in a HUMMV, but the system wasn't quite entirely there, yet. "Sergeant Perkins!" he yelled. SSG Perkins stuck his head around the side of the cubicle. "Yes, sir?" he asked. "I need you to get in contact with the TSSA and find out the status on the rations for the sus'team," said Parker. "They're leaving tomorrow and still don't have any food." "By the way," he added, "where are the ammunition forecasts for the next 72 hours? Division's beating me up for them." "The guys in the Class V section were having some trouble with SAAS," replied Perkins. "Something about report formats being incompatible with the rest of GCSS." "Well, just get me the raw data so I can pass that to Division. Maybe someone will write a patch for these programs on the next go-around." SSG Perkins started to leave, then turned around. "Oh, by the way, sir," he said, "I overheard the colonel talking on my way in this morning. I think he's going to ask for another forecast on fuel, parts, and ammo for the next operation." MAJ Jones grimaced. "Well, I guess we'll determine that in our usual method." He pulled open his field desk drawer and pulled out several dried chicken

bones. He threw them on the floor and looked at SSG Perkins. "What do you make of the signs, sarge?" SSG Perkins smiled at their private joke. At least, he thought, it wasn't as messy as sheep entrails....

The plan for improving the current Army logistics system is a logical and methodical one, designed to integrate existing systems into fewer and fewer larger systems in an orderly manner over time. Called the Global Combat Support System-Army (GCSS-A), it has at its heart an integrated data base, formed from over sixty individual data bases currently used by various Army materiel management programs.[21] The intent of GCSS-A is to integrate and manage all of the individual stovepipe maintenance and materiel management systems currently in use.

> GCSS-Army is much more than a close combat coordination and CSS delivery information system; it is a system that integrates and fuses information from the factory to the foxhole, coordinating, expediting, and managing the numerous activities in between. Performing these functions requires communications and interactions not only within and between command layers and theaters but also between sister services.[22]

It initially integrates three hardware configurations, seven operating systems, eight programming languages, and five communications protocols into a single system baseline.[23] Based in the Windows NT operating system, GCSS-A will have a relational database that is easily imported into any Pentium desktop or laptop computer. Over a scheduled nine-year development and implementation period, it will, in sequence, integrate the Army's tactical logistics systems, or the Standard Army Management Information System (STAMIS,) followed by an integration of the Army's wholesale and retail supply system.[24] Final system development will ensure inter-operability with sister services and joint agencies. The basic approach of the GCSS-A development team is sound:

- The project is focused on early payoffs.
- The implementation is incremental.
- The project will fund subsequent implementation increments with savings from early increments.
- The system design allows for technical insertion and upgrade.[25]

The Army's current methodology is to "carve out a manageable subset"[26] of the total number of materiel and maintenance management programs and consolidate the most urgent and high priority requirements first.

> The philosophy is to reduce systems incrementally, by ten to twelve at a time, replacing the aging stovepipe systems with new systems or modules until the US Army has a single logistics system. This is a prudent but potentially lengthy process.[27]

The project takes individual STAMIS programs, reformats and rewrites them to operate in a Windows environment, and then reformats and rewrites the databases to interact with the rewritten programs. The projected length of the process, as stated above, is nine years. The programs and modules may also require modification later during the retail/wholesale and joint integration phases, depending on the requirements of sister services and other joint Defense agencies. In summary, the GCSS-A is a conservative, incremental approach that preserves the "look and feel" of the Army's current logistics automation systems while updating them to work within an integrated environment. Does the development and fielding of GCSS-A, however, represent a Revolution in Military Logistics? An examination of the requirements for an advanced logistics system as well as the elements and tenets of the RML is necessary to determine this.

TRADOC Pamphlet 525-5, *Force XXI Operations*, describes the requirements for an ideal twenty-first century logistics system:

> Split-based operations, total asset visibility, telemetry to allow anticipation of requirements, containerization automation and assured communications will provide flexible, prompt, and efficient sustainment on future battlefields.[28]

These requirements mainly concern information, as opposed to management, requirements for a logistics system. Total asset visibility, automated containerization, and communication allow leaders and technicians to know where items are in the system at any given time. This is information that GCSS-A will fuse into one location to allow faster and more positive access. GCSS-A does not possess the telemetry to anticipate requirements, but it can be combined with vehicle-based sensors[29] that transmit usage and wear data to a centralized location to allow individual short-term requirements forecasting. There is, however, no modeling capability within GCSS-A that allows for a mid- to long-term forecasting ability. Assured communications is an issue that GCSS-A does not address. The project relies on a communication system that is better than what currently exists, but does not focus on communication requirements and seems to assume that the communication system will improve in step with the logistics system.

In addition to the Force XXI requirements, there are other metrics with which to evaluate GCSS-A in light of the RML. The tenets of the Revolution in Military Logistics are the first and foremost. They are, as stated in the introduction: a seamless logistics system, distribution-based logistics, agile infrastructure, total asset visibility, rapid force projection, and adequate logistics footprint. The first tenet, a seamless logistics structure, bears closer examination. A seamless logistics structure is one that integrates

> ...the Army's logistic management framework, command and communications processes, and automation architecture into one seamless accessible system that will be transparent on one end to the user and on the other end to the supplier. Such a system underpins much of what we characterize as the revolution in the future of military logistics, because it

> will leverage the best commercial business processes, infrastructure designs, and global information and electronic commerce technologies.[30]

TRADOC PAM 525-5 states that:

> Creation of this new (twenty-first century) CSS system necessitates weaving the current strategic, operational, and tactical levels of logistics into a seamless continuum. This seamless concept must extend throughout the total force and take into consideration the integration and application of civilians and the reserve components.[31]

Information technology that enables a seamless logistics system is critical to the success of the system, so much so, in fact, that characteristics of the information system and the logistics system are the same. "All functions, missions, and organizations (in the logistics system) must be connected and integrated by an enterprise-wide, end-to-end information system.[32] GCSS-A accomplishes most of this, over its entire development period, but it will not fully integrate all logistic systems into its footprint. As of late 1997, the program included no plans for integrating Class VIII (medical supply), Class I (food), personnel data, or TC-AIMS (transportation coordination).[33] The project office recognized the need to develop bridges to these programs, but will not assume them under the GCSS-A umbrella. GCSS-A will also, at least initially, not be able to view the Army logistics system "from a holistic viewpoint" because it will have to operate within the constraints of separate retail and wholesale logistics systems, a unique DoD construction.[34] A separate initiative currently exists to unify the retail and wholesale systems into a Single Stock Fund (SSF), but this is outside of the GCSS-A project's purview. A seamless logistics system is the foremost tenet of the RML because without it, the logistics system cannot capitalize on the benefits of advanced technology and provide the commander the agile and rapid response he needs to command and control an

advanced force. Given this information about GCSS-A, it is evident that as an integrated logistics system, it falls short of being truly "seamless."

Another metric for evaluating GCSS-A to determine if it meets the requirements of an ideal logistics system for the next century is the operational concept of focused logistics. A supporting concept for Force XXI and Joint Vision 2010, focused logistics is:

> the fusion of logistics information and transportation technology for achieving rapid crisis response, deployment and sustainment, the ability to track and shift units, equipment, and supplies even while they are enroute; and the delivery of tailored logistics packages and sustainment directly to the war-fighter.[35]

It is, in other words, the enhanced ability to project the proper item, person, or unit to the right place at the right time. It's elements, according LTG Cusick, former J-4 of the joint staff include:

- Information fusion
- Multinational logistics
- Joint theater logistics command and control
- Joint health services support
- Agile infrastructure
- Joint deployment
- Rapid distribution[36]

GCCS-A's design calls for information fusion although, as shown above, it will not integrate all Army logistics data. Its development schedule calls for eventual joint integration during its third phase of development, but not during the first years of its deployment.[37] Agile infrastructure is one of its design parameters with the goal of

achieving rapid deployment and distribution. Where GCSS-A falls short is in providing for multinational integration and coverage of health services support. With the intent of operating in largely joint and multinational environments in the future, an integrated Army logistics system should at least address the integration of Allied systems with its own. The lack of evidence showing any GCSS-A link with the medical system is also problematic. By most of the metrics, however, GCSS-A does meet the requirements for a system that will deliver focused logistics.

GCSS-A, regardless of how useful it becomes, will represent only a portion of the entire twenty-first century Army logistics system. It is management software that must be combined with a forecasting capability, a total asset visibility capability, a delivery and distribution system, and a communication system in order to form a complete logistics system. How does GCSS-A measure up as the integrating component of a total logistics system? It will give managers a more comprehensive view of logistics information but will not reduce human management requirements because of its lack of decision support software.[38] GCSS-A will be able to detect short-term weapon system component requirements via reception of fault diagnostics and prognostic data from affected weapon systems. Weapon-based sensors aid in detecting impending failures, but do not enable GCSS-A to predict materiel consumption on a fleet-wide basis in the mid- to long-term due to GCSS-A's lack of a true forecasting capability. It will be able to determine exactly where incoming supplies need to go, but still relies on a physical delivery and distribution system to actually deliver the goods. In this, it is no different from any other logistics management system, including the best from the corporate sector. GCSS-A, like any other advanced system, relies on an assured communication

system. There are no indications, however, that communications development and GCSS-A development are proceeding in a synchronized manner. This lack of synchronization of GCSS-A's overall development may in fact be one of the greatest obstacles to becoming a seamless system.

GCSS-A's development is incremental and modular.[39] Developers have compared its progress and the resultant transformation of the logistics system to "eating an elephant" which must proceed "one bite at a time."[40] While this approach may appear well-advised from a resources perspective, it holds several hidden risks to overall systems integration. First, the Army's current method of maintaining overall project management while dividing the actual development work between different agencies and contractors may result in sub-system modules that do not fully integrate or may contain unnecessary redundancies. Second, building individual modules through multiple development efforts increases the management effort required to keep the individual systems coordinated across the entire project. Third, each individually developed system requires its own lengthy approval process. Also, a modular and phase approach fosters sub-system optimization that, as pointed out in the last chapter, is detrimental to overall system optimization. Finally, a piecemeal approach takes much longer to deliver a finished product to the user.[41] The extended, dispersed nature of the GCSS-A development detracts from its ability to be a truly "seamless" system.

As an integrated logistics information system, GCCS-A meets most of the requirements for fulfilling its role as the Combat Service Support system for the next century. The fact that GCSS-A does not meet the requirements of a seamless system, however, prevents it from being the driving force in creating a revolution in military

logistics. It is not a seamless logistics system and it does not possess a predictive capability for gross fleet materiel requirements over the mid- to long-range period of an operation. GCSS-A integrates systems, but demonstrates no design features that would tend to alter the current logistics organizational structure in any substantive way. It is, in the final analysis, an information system. GCSS-A is not a management system because there is no decision support functionality built into the software. Decisions, no matter what kind, are still the venue of the human manager. Organizational layers of decision making authority are still necessary. All in all, GCSS-A, as designed, is a very capable system that marks a significant improvement to the way the Army performs logistic support. It is also a system that has a familiar look and feel to it, making it more acceptable to an organization uncomfortable with rapid change. There is, however, a potentially better system already in existence that can meet and exceed all of GCSS-A's standards while performing those critical functions that truly cause it to be a driving force in the revolution of military logistics. That system is the focus of the next chapter.

Chapter 3: Enterprise Resource Planning Solutions – The Leap-Ahead Approach

"These kids," grumbled LTC Jones, "sure have it easy today." "Careful, sir, your age is showing," said MSG Perkins with a laugh. They were both watching the flat, high definition LCD screen hanging from the wall of their office van in the Theater Support Command area. Parts requests were coming on screen from Second Battalion. As the mechanics downloaded the diagnostic data from their weapon systems into their hand held processors, they could determine which subassemblies were approaching failure. Using the built in satellite transceiver in their processor to communicate directly

through the Iridium/Teledesic constellation, they could then log on to the Theater Support Command's web site, pull down the on-line technical manuals, point and click to the part they needed and transmit that request directly to the Class IX manager. "This sure beats having to post changes to paper TM's by hand," said LTC Jones. "Let's see what kind of visibility we have on that transmission that just came on screen." "According to the readout from our last OP/LOG session," said MSG Perkins, scrolling through the Window at the bottom corner of the screen, "the MRP engine predicted that we would need three transmissions for this operation. Let's see..." he said, clicking to another Window, "three transmissions left New Cumberland 16 days ago. According to the GPS readouts on the Milvan transmitter, They're 150 kilometers off shore heading this way, ETA to port is five hours." LTC Jones looked at the 3-D map on the left side of the screen. "Second Battalion's log team is here, kind of off the beaten path," he said, highlighting a grid on the map with a touch of an IR pen, "process that request as an immediate fill. Have the automatic sorter at port pull one of those transmissions from the van and route it through the aerial delivery section for immediate drop into the log team's DZ." "Done," said Perkins with a couple of clicks through the tool bar. "Oh, by the way sir," said Perkins, scrolling through the on-screen schedule, "we have another OP/LOG session with the Strike Force S-3 tomorrow afternoon. They're planning an operation 200 k's to the southeast three weeks from now. They'll want to use the MRP engine to help wargame again. Where do you want to set up the VTC?" "Tell you what," said Jones, standing up to stretch, "how about we actually get out of this van and go over to their location for a change? Send the files and data over to their box and I'll

get us some wheels. I could do with a change of scenery and I kind of miss not being able to drive around in my HUMMV..."

What would comprise an ideal logistics system for the next century? As outlined in the last chapter, an advanced logistics system needs to be seamless. An ideal twenty-first century military logistics system would include a global, wide-band wireless communication system, a precision tracking and locating system, smart machinery for sorting and distributing, and a precision delivery system, to include airdrop capability. At the heart of such a system would be its manager; an integrated, end-to-end and top-to-bottom information system that ties together all logistic functions throughout the force with predictive capabilities and decision support software built in. The above story's seemingly utopian vision is actually possible through technology that is available today. Most large corporations throughout the world use systems that possess some or most of these capabilities.[42] Civilian chief executive officers and managers recognize that "the key to some of the best practices found in world-class organizations is an integrated information system with total real-time asset and activity visibility."[43] These systems allow for a process known as Supply Chain Management (SCM).

SCM is described as a company's ability to "move the right items to the right customer at the right time by the most efficient means."[44] It is "built on the assumption that a company's logistics system, its supply chain (internal and external) is a resource to be exploited for market position."[45] According to experts in the commercial sector, "An integrated supply chain...is a connected series of organizations, resources, and activities involved in the creation and delivery of value, in the form of both finished products and services, to end customers."[46] Supply Chain Management has the dual objectives of

maximizing the value of each organization, or link, in the chain while also achieving synergy through integration that improves the aggregate performance of the entire chain.[47] According to the discussion in Chapter One, however, sub-system optimization and over-all system optimization are mutually exclusive. How then, can an organization improve the performance of its links while simultaneously improving the performance of the entire chain? It can do so through the use of automated management systems that eliminate inefficiencies throughout the entire organizational structure. These systems are typically referred to as Enterprise Resource Planning (ERP) solutions.

ERP solutions are the necessary ingredient in corporate systems that make SCM possible. In the words of one industry expert,

> You've got to have a consistent process in place for planning production and distribution across the whole supply chain. Your goal is to be able to replace inventory – suppliers, customers and your own – with information. To do this you and your suppliers and distributors need to have integrated time-phased inventory management software, like ...Enterprise Resource Planning (ERP) technology, in place.[48]

ERP has been defined as "a fully integrated, modular, application software system having a flexible and open-ended architecture, covering the needs of most functions of an organization and built around the best practices in a particular industry."[49] As an ERP programmer writes, ERP is:

> software designed to model and automate many of the basic processes of a company from finance to the shop floor, with the goal of integrating information across the company and eliminating complex, expensive links between computer systems that were never meant to talk to each other.[50]

The ability to integrate a company's functions and departments into a cohesive, agile structure has been the primary contributor to the productivity increases enjoyed by civilian industry in the past decade.

Integrative software solutions have been in existence with civilian industry since the 1970's. Material Requirements Planning (MRP) systems were among the first. These systems translated manufacturing master schedules for end items into time-phased requirements for subassemblies, components and raw materials.[51] The software and systems evolved over the next twenty years.

> In the 1980's the concept of MRP-II (Manufacturing Resource Planning) evolved which was an extension of MRP to shop floor and distribution management activities. In the early 1990's MRP-II was further extended to cover areas like Engineering, Finance, Human Resources, Projects Management, etc; i.e., the complete gamut of activities within any business enterprise. Hence, the term ERP (Enterprise Resource Planning) was coined.[52]

Although no longer used as a stand-alone system, MRP functionality still exists at the heart of ERP systems, because MRP possesses the predictive and decision support tools that drive an ERP system.

Companies that install an ERP system typically have the goals of:

- Lowering total cost in the complete supply chain
- Shortening throughput time
- Reducing stock to a minimum
- Enlarging product assortment
- Improving product quality
- Providing more reliable delivery dates and higher services to the customer, and
- Efficiently coordinating global demand, supply and production.[53]

These are the same goals that the Army sets in improving its own logistics system. Civilian firms that have successfully implemented an ERP solution have, moreover, achieved the following results:

- Reductions in inventory
- Information system standardization, consolidation and centralization
- Improved productivity
- Increased customer service (added functionality and data)
- Quicker reporting and information gathering
- Improved control over operations making the organization more responsive to change.[54]

The question remains, however, on whether a civilian-oriented system is applicable to a military environment.

Successful civilian businesses seem to offer the Army much in the way of models for developing an effective logistics system. A closer examination, however, shows that many examples do not provide adequate models, because they do not provide answers to many of the military's problems. Federal Express, which uses ERP tools for example, does not constitute a valid model for comparison to the Army, because FedEx is a transportation provider, a delivery system. Army logistics, while devoting significant resources to transportation, has a much greater purview. Likewise, companies that focus mainly on supply, maintenance, or other functional areas as their core competency also fall short in the comparison to Army Logistics, a multifunctional discipline. What about a distribution system like Wal-Mart? There are many similarities between Wal-Mart and Army logistics, but comparisons in this area also fall short because the demand for items

in Wal-Mart's system are *independent* of Wal-Mart's actions. Events outside of Wal-Mart's control, such as seasons, customer preference, etc, drive the demands in its distribution system. The Army, however, works in a *dependent* demand environment; that is, demands in the Army's supply system depend on what the Army does. Its operations, deployments, OPTEMPO, etc, drive the demands on the system.[55] One sector of the civilian economy that does closely model Army Logistics is the manufacturing industry. While this may seem strange at first glance, a closer examination reveals some interesting similarities.

A manufacturer brings together, at a certain time and in a certain order, people, equipment, tools, raw materials, parts, and money to produce a product that is then delivered to a customer. The Army, likewise, also brings together people, equipment, tools, parts, raw materials, and funding to produce its product, readiness, or rather lethal force that it delivers to its "customers", the enemies of the nation. The most successful manufacturing firms use ERP solutions with an embedded Material Requirements Planning functionality that translates manufacturing goals into material requirements. An auto manufacturer, for example, planning on building several thousand copies of a certain model of car would use MRP to determine exactly the parts, supplies, people, and space, needed to accomplish that goal. MRP also helps to develop a plan for sequencing all elements of the manufacturing process in time and space in order to build the cars within the constraints of the schedule and budget. Army logistics could use an MRP system in much the same way.

A Materiel Requirements Planning engine adapted for Army use could work in the following manner. As a unit's operational planners begin to design a future military

operation, logistics planners work directly beside them to determine the requirements for that operation. The MRP engine translates the operational data into materiel requirements. An armored task force, for example, with a certain number of vehicles performing a movement to contact over a certain distance in a certain environment will consume an amount of materials, supplies, and repair parts. The MRP program, using models and algorithms based on historical data and constantly updated with new data from each operation, determines on a fleet wide basis what sustainment items the task force will need over the course of the operation and when, approximately, it will need them. MRP will not predict when a certain tank will need a certain replacement part, but it will predict that a fleet of tanks, based on a certain mission and projected OPTEMPO, modified by the operating environment, will need a certain number of specific replacement parts for the mission. The benefit of this process is that these predictions can take place early enough before the event to allow filling of the supply pipeline for delivery to the theater in time for the operation.

What this predictive function amounts to is a radically enhanced forecasting capability beyond anything the Army has ever used that improves with each successive operational iteration. MPR has other possibilities as well. In addition to determining gross requirements for an operation, it can, based on known materiel constraints, determine the logistic feasibility of a planned course of action. In this manner MRP can serve as a valuable war-gaming tool.

An ERP solution with its internal MRP functionality can serve as a viable logistics system in an Army environment. Does ERP, however, come closer to representing an RML than GCSS-A? An examination of the requirements for a Force

XXI logistics system, as outlined in the previous chapter, gives no specific requirements for a logistics management capability. The management capability that an ERP/MRP system provides, however, will achieve the requirements of Force XXI logistics: requirements anticipation, split-based operations, total asset visibility, advanced distribution, and assured communications.[56] An ERP solution can perform as an integrative manager of an advanced logistics system. ERP is, by design, integrative and predictive. It is developed specifically to tie all information sources together throughout a system, interface with adjacent enterprises, tie together suppliers, managers, and customers, and automate all of the major business processes of the organization.[57]

Another advantage of ERP is in the area of communications. A benefit of ERP's integrated, modular design is its scalability.[58] An integrated ERP solution is scalable; that is, it is designed so that individual portions of the system can be applied to different agencies and organizations while maintaining an overall, aggregate functionality for the entire system. This means that each individual management node may not need use of the full system and therefore does not require a robust communications architecture to support it. The practical result of this is that ERP can provide an enhanced logistics management capability within the existing communications structure. As the Army's communications infrastructure grows, an ERP/MRP system can grow with it. Each agency or organization can add new modules while maintaining integration throughout the system. For the same reasons, ERP also meets the requirements of a seamless logistics system, the key tenet of the Revolution in Military Logistics.

A seamless logistics system, as discussed in the previous chapter, is one that includes and integrates supplier, vendor, manager, and customer; one that transparently

provides information from the tactical to the strategic level; and one that uses "best of industry" practices to integrate systems and agencies. ERP/MRP *is* a best-of-industry practice that provides integration and management support throughout an entire enterprise. One of the major obstacles to a seamless Army logistics system is the unique division of supplies into separate retail and wholesale systems. This situation emerged in the past largely because of commanders' inability to maintain proper accountability of their stockpiles. In order to prevent commanders from wasting large amounts of resources, the Army gave them a budget and made them buy their supply items from the Army, thereby making them budget-constrained. ERP/MRP does away with the need to constrain commanders fiscally. The predictive nature of MRP tells the commander what he needs for the operation. Commanders then order only what they'll need to accomplish their mission. This will reduce waste of materiel assets throughout the Army and obviate the need for a secondary accounting system.[59] ERP solutions exists solely to create a seamless logistics system and does so by design.

The final metric for determining whether ERP/MRP is an acceptable logistics management system is the concept of focused logistics. Does an ERP solution meet the requirements of information fusion, multinational logistics, joint theater logistics command and control, joint health services support, agile infrastructure, joint deployment, and rapid distribution?[60] It certainly meets the requirements of information fusion, agile infrastructure, and rapid distribution. As an integrated system, it ties together all logistics systems and their associated information. The decision support functions and its predictive capability allow items of supply to move quickly through the distribution system. Managers can rapidly shift the direction of the pipeline as necessary

to meet operational requirements. ERP's capabilities in a joint arena will depend on what systems the other services adopt. The Air Force is currently developing a commercially based, ERP solution as its future logistics management system.[61] An Army system, adapted from industry and designed from the ground up to be compatible with the Air Force system, could provide inter-service operability on a scale never before seen, at least between the Army and the Air Force. ERP also provides the potential for enhanced multi-national functionality. Commercial ERP systems have been adopted by corporations around the world. The largest ERP software vendor, S.A.P., is a European-based corporation.[62] Operating in a forward theater, the Army could possibly tie directly into international vendors in order to procure materiel locally and shorten the supply pipeline. Allied forces that adopt these commercial logistics solutions could also be readily integrated into a theater-wide logistics network. Given the enhanced functionality and interoperability that an ERP/MRP solution could bring to Army logistics, it is apparent that such a system not only meets the requirements of Force XXI, the tenets of the RML, and focused logistics, it does so to a greater extent than GCSS-A.

With all of their capabilities and possibilities, however, these automated logistics management tools are not a solution in and of themselves. They must function in an integrated environment with other capabilities and technologies. MRP, combined with an advanced, agile communication system, embedded health and usage sensors in weapon systems, a true total asset visibility system, precision delivery, and advanced distribution technology, all tied together by an over-arching Enterprise Resource Planning system, will form a truly integrated logistics system. Advances in the supporting and enabling

technologies are already underway, and are necessary whether the Army chooses an ERP system or continues to develop GCSS-A.

One important enabling technology is the Army's use of the Internet. Leaders at the highest levels recognize that "one of the changes ahead involves putting much of the Army's supply system on the Internet."[63] Currently, an initiative exists for Army personnel to order items directly through the Internet. The Defense Electronic Mall (E-Mall) and its associated Army gateway (A-Mart) "provide access to government-awarded, indefinite-delivery contracts; blanket purchase agreements; and vendor catalogs in an on-line, paperless medium."[64] Further development of this initiative would provide more functions and better usability for its customers. Indeed, such development is necessary. According to the Undersecretary of Defense for Acquisition, the military logistics system "would need to function like a DoD-wide intranet where everyone has access to the same information base."[65] An ERP solution can provide the Army with its own Intranet, or provide secure ties to the existing Internet, the other services, and DoD agencies, expanding the soldier's ordering capabilities to include any item necessary for mission accomplishment. Ordering parts could become as easy as ordering books from "Amazon.com," a capability that is currently available.

Another supporting initiative that moves the Army closer to an objective just-in-time system is precision locating and delivery capability. The use of GPS locating and guidance systems aids logisticians in locating in-transit goods and directing the correct supplies to the correct customer. A precision airdrop capability allows assured resupply to units that are separated by long distances and inadequate transportation infrastructure.[66] Tied to this is a largely automated distribution system that routes items

to different areas based on commands from centralized management nodes. These kinds of distribution systems already exist in the commercial sector.[67]

Another enabling technology is the ability to monitor the health of weapon systems with smart sensors and diagnostic/prognostic devices. As with GCSS-A, these systems perform the short-term forecasting role by alerting operators, maintainers, and managers of weapon systems' sub-components that are operating out of design tolerances, indicating an impending failure. "Sensor devices can be embedded in equipment to predict and isolate failure with higher levels of confidence."[68] These enhanced sensors, which will provide accurate short-term predictions of repair part requirements, form a necessary compliment to the mid- to long- term forecasting capability of MRP. MRP determines the gross number of items a unit will need over a specified period of time, and the sensors on the weapon systems themselves give the detailed information of where to precisely direct the forecasted materiel. The MRP forecasting system can also contain, as part of its design, a self-improvement capability that constantly modifies and updates the internal models and algorithms based on actual materiel use. The combination of an MRP system that fills the supply pipeline in CONUS, weapon system sensors that direct the incoming materiel to the proper location, and an over-arching management system that ties the two together and allows managers to make the best possible decisions for sustainment will enable timely, precision delivery to the war-fighter.

The final supporting technology is the infrastructure that makes all of the other technologies relevant: an assured communication system. Theater communication systems have been improving in recent years, but are still largely tied to wire-based, limited band-width voice and data systems that are labor-intensive and not very mobile.

In the civilian sector, satellite-based communication systems are being used on an ever-increasing scale by businesses. Supported by constellations of satellites that number from the dozens to the hundreds,[69] these communication systems including Iridium, Teledesic, Global Star, Orbcomm, Sky Station, and others provide mobile, robust, and reliable voice and data links anywhere in the world. Today's existing systems are expensive to use but, as more satellites go into orbit and more systems become operational, competition and redundancy should drive the operating costs down.

All of the prime and enabling technologies discussed in this chapter exist in a viable commercial format. Adaptation and use of these systems would be for the Army a quicker and less expensive option than developing its own capabilities in-house. All of these systems are available today and, with an integrative element such as an ERP/MRP solution, could form a highly advanced and fundamentally better logistics support system than what the Army currently enjoys. A logistics system composed of these elements would radically alter the Army's way of doing business and represent a true Revolution in Military Logistics.

Chapter Four: Impediments to Change

> *Out-of-box thinking isn't automatically better, nor is it necessarily synchronized with the corporate preparedness to switch to something radically different. Decision makers focused on realigning existing supply relationships with the accelerating business environment are generally unwilling to risk the current income stream on unproved concepts.*[70]

Radical change within the Army logistics system would have the same effect as any action within a closed system: it inspires a reaction. Whether the Army chooses GCSS-A or an ERP solution, the act of integrating the logistics system and transforming

it into something that moves faster, anticipates more, reacts quicker, and supports better will produce at least some amount of resistance to change. Some of the resistance will be human and some will be result of inadequate infrastructure that doesn't allow a full adoption of the new system all at once. Infrastructure and equipment are relatively straight-forward to correct, but the human element requires a more imaginative approach. The first requirement is leadership.

Civilian corporations that have successfully transitioned from an inventory-based supply system to an information-based system have done so because leaders believed in the change and communicated their vision to the rest of their companies. There has to be a complete "buy-in" by top managers and the development of the ability of all personnel to push their thinking beyond the bounds of their individual organization.[71] An integrated system that spans all levels of the organization and connects with suppliers, customers, and adjacent units is a very complex system. This complexity and a certain amount of fragmentation in the way the new supply system is understood and applied by members of the organization also inhibit full and successful implementation.[72] In order to successfully develop and implement a complex supply system, especially one that will promote a Supply Chain Management environment, like an ERP/MRP solution, the following steps are necessary.

- Each level within the organization and the supply chain must use consistent planning tools and processes. Standardization is essential.
- All information systems must be integrated to allow the movement of requests and demands from customer through supplier in the fastest, most transparent manner possible.

- Communications among all levels must be effective and timely.[73]

The attainment of a true Supply Chain Management environment requires a breakdown in compartmentalization. It requires information sharing and understanding of other agencies' functions. These requirements, while difficult to achieve in a corporation, become even more problematic in a bureaucracy.

As discussed in Chapter One, current Army logistics systems developed and grew into distinct, isolated systems because of sunk costs and a certain amount of system inertia. Developers and managers of these individual systems derive their prestige and job security from the maintenance of their systems' uniqueness and relevance. Information disclosure between agencies, needed in an integrated system, equate to a loss of power for the original holders of that information. An integrated system has the real potential of consolidating and eliminating sub-systems that do not add to the optimization of the system as a whole. The decision support software in an ERP/MRP solution may negate the need for humans to make certain decisions at certain points throughout the organization. This threatens the livelihood of mid-level managers who find that their decision-making responsibilities are being discharged through automation systems. This has already occurred in the civilian sector. A significant portion of corporate lay-offs in the past ten years have been these middle managers whose purpose (to make mid-level decisions) has been taken away by computers.

In the envisioned Army logistics system, the management software will also have some sort of decision making capability. This is necessary, due to the increased tempo of operations brought on the increased efficiency of the management systems. The decisions made by the software are primarily transaction management; that is, routine

decisions that are made based on situations where present conditions match established parameters. Human decision makers, who up to this time have focused largely on transaction management, will move toward decision making that establishes the underlying parameters on which the automated decision support software is based. They will also focus on resource competition resolution and prioritization. This will require fewer decision makers and will threaten the jobs of many mid-level managers throughout the Army logistics system. This will make many leaders and managers within the system leery of the new automated system and unwilling to exploit its potential fully.

This type of resistance can only be overcome by forceful and dynamic leadership. Top leaders in the Army must articulate a need for this new system that managers and operators can buy into in order to create a "ground-swell" attitude change within the ranks. There are two characteristics of companies that have successfully implemented these radical changes in their logistics operations, both of which seem contradictory. The first requires an open, entrepreneurial spirit throughout the organization.

> The companies that succeed with these applications do so by throwing out the rule book and applying the same levels of creativity, resourcefulness, and adaptability that lead them to success in other areas.[74]

The other characteristic calls for ruthless standardization throughout the organization.

> Industry leaders set and maintain strict information technology standards that facilitate the implementation of all types of hardware and software. Larger companies have a proportionally greater degree of standardization.[75]

This would be extremely important for the Army, which possesses tens of thousands of computers. A program of standardization would be necessary, but enormously expensive. How are these two characteristics reconciled? They are reconcilable in the

sense that the first deals with an attitude while the second deals with a methodology. An agile mind-set on the part of every member of the organization makes change possible.

> Agility is about change proficiency. Organizations of interacting elements (Supply Chains are one example) are said to be agile if they can accommodate a variety of different kinds of change adequately.[76]

The Army's supply system will be agile if it can adapt quickly to a changing operational environment. The Army itself will be considered agile if it can adapt quickly to a new way of doing business and a new way of looking at the logistics environment. This agile attitude is absolutely necessary if the Army ever wishes to adapt its logistics system to an advanced integrated and automated environment.

Conclusion

Logistics systems have taken on new importance in the civilian and corporate world. Logistics systems, or Supply Chains, are assets to be exploited for maximum gain in an organization or industry. In 1993, U.S. companies spent ten and one-half percent of the total Gross Domestic Product in logistics systems, particularly distribution.[77] Savings in this area can have an enormous effect on total cost savings.

> The cost of making a product is almost irrelevant. You have far more opportunity to get cost out of the supply chain than you do out of manufacturing. There's so much duplication and inefficiency.[78]

Logistics systems are becoming important, proprietary entities that companies jealously guard. During an Army survey of civilian firms to determine the nature of their logistics systems, many companies would not provide specific logistics information because they "have determined that their logistics systems provide an important competitive advantage and do not wish to reveal the costs or improvements that were derived."[79] The status of logisticians is also increasing in the corporate sector. Many companies are promoting

their logistics chiefs to executive vice president and senior vice presidents for logistics. This trend illustrates the importance of logistics to corporations.[80] Logistics has gained increased importance in the Army because, in addition to its cost saving potential, an improved logistics system is critical to the success of Army operations. "Logistics... represents a subset of national power because it links the nation's industrial base with its military forces."[81] That power is the enabler of the commander's operational success.

The importance of an integrated logistics system lies in its ability to give control of logistics operations back to the commander. A predictive system like ERP/MRP allows a unit to receive only the items it needs for the operation and no more. This is not a constraint, however; it is an enabler. The unit will receive everything it needs for the operation, when and where it needs it, in order to accomplish the mission. Using MRP, the commander dictates how the logistics system will support his operation. He does not have to limit his operation because of constraints caused by an inefficient logistics system. An ERP solution empowers the commander by putting him in control of his sustainment to a degree unheard of in the past.

A commercial Enterprise Resource Planning solution with an embedded Materiel Requirements Planning functionality best fits the requirements for the Revolution in Military Logistics. ERP/MRP is superior to GCSS-A because it is truly integrated, seamless, and goes beyond information retrieval and provides true predictive and management capability. The Army should adapt a commercial ERP solution and begin training its mid-grade and junior leaders now. The training and education should instill in them an agile mindset that makes them amenable to change and willing to lead Army logistics to success on the twenty-first century battlefield.

ENDNOTES

[1] *Army Logistician* 31, (Jan-Feb 1999) 2-159.

[2] United States Army, TRADOC PAM 525-5, *Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty First Century*, (Fort Monroe, VA: US Army Training and Doctrine Command, 1 Aug 1994) 1-6.

[3] United States Army, Army Vision 2010, (Washington, DC: Joint Electronic Library, Jun 1998) 1.

[4] Ibid., 1. See also *TRADOC PAM 525-5*, the January 1998 and January 1999 issues of *Military Review* (Force XX1 and the Army After Next, respectively,) *Joint Forces Quarterly*, Summer 1998 (Joint Vision 2010), and *Joint Vision 2010*, Joint Electronic Library, Jun 1998.

[5] Dennis J. Reimer, "The Revolution in Military Logistics," *Army Logistician* 31, (Jan-Feb 1999) 2. This has become perhaps the most quoted statement by a senior Army official in almost every logistics publication in the past year.

[6] Logistics Integration Agency, *A Technical and Programmatic Approach for a Single Logistics System for the US Army*, final report, (Alexandria, VA: US Army ODCSLOG, 14 November 1997) 5.

[7] Ibid., 6.

[8] GEN Dennis J. Reimer, "The Revolution in Military Logistics," *Army Logistician* 31, (Jan-Feb 1999) 2.

[9] Several sources. Edward J. Shimko and Thet-Shay Nyunt, "GCSS-Army: Making the Revolution in Military Logistics Happen," *Army Logistician* 31, (Jan-Feb 1999) details the development and implementation schedule for GCSS-A over the next 8 years. *Army Vision 2010*, (Wash DC: Joint Electronic Library, Jun 1998) describes itself as a bridge between Force XXI and the AAN. The logistic system envisioned by this document for 2010 is substantially the same as GCSS-A (16). The final source, United States Army Office of the Deputy Chief of Staff, Logistics, *White Paper: A Readiness Based Strategy for Supporting the Army After Next (AAN)*, (Alexandria, VA: US Army ODCSLOG, 1999), describes an advanced, seamless logistics system supporting AAN that resembles the commercial concept of a "Value Chain," that focuses all members of an enterprise on the goals of that enterprise (4). This is the essence of an Enterprise Resource Planning (ERP) environment.

[10] John W. Bucher, *System Synergism for XXI Century Logistics,* (Carlisle Barracks, PA: U.S. Army War College, 1996) 8.

[11] Ibid., 6.

[12] Ibid., 7.

[13] Dumond, John; Eden, Rick; and Folkeson, John, *Velocity Management: An Approach for Improving the Responsiveness and Efficiency of Army Logistics Processes,* (Santa Monica, CA: RAND Arroyo Center, 1995) 8.

[14] William "Gus" Pagonis, *Moving Mountains*, (New York: The Free Press, 1994) 210.

[15] Martin Van Creveld, *Technology and War*, (New York: Free Press, 1989) 316-317.

[16] Thomas W. Robinson, "Velocity Management: An Initiative to Improve the Army Logistics System," *Army Logistician,* (May-Jun 1995) 11.

[17]United States Army Office of the Deputy Chief of Staff, Logistics, *White Paper: A Readiness-based Strategy for Supporting the Army After Next (AAN)*, Draft, (Alexandria, VA: United States Army ODSCLOG, 1999) 6.

[18] Thomas J. Edwards and Rick Eden, "Velocity Management and the Revolution in Military Logistics," *Army Logistician* 31, (Jan-Feb 1999) 53. The 50% reduction figure applies to CONUS units. OCONUS units realized a 25-50% reduction in OST.

[19] John Cusick, as summarized by Norber Grabowski, "Focused Logistics: A Strategic Perspective," *Defense Transportation Journal* 53, (Dec 1997) 29.

[20] Paul Kaminski, "Revolution in Defense Logistics," *Defense Issues* 10, (1995) 4.

[21] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODCSLOG, US Army, 14 Nov 1997) 5.

[22] Edward J. Shimko and Thet-Shay Nyunt, "GCSS-Army: Making the Revolution in Military Logistics Happen," *Army Logistician* 31, (Jan-Feb 1999) 21.

[23] Ibid., 21.

[24] Ibid., 23.

[25] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODCSLOG, US Army, 14 Nov 1997) 7.

[26] Ibid., 1.

[27] Ibid., 1.

[28] United States Army Training and Doctrine Command, TRADOC PAM 525-5, *Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century,* (Fort Monroe, VA: US Army TRADOC, 1 Aug 1994) 4-8.

[29] Edward J. Shimko and Thet-Shay Nyunt, "GCSS-Army: Making the Revolution in Military Logistics Happen," *Army Logistician* 31, (Jan-Feb 1999) 21.

[30] Roy Wallace and Christopher R. Hardy, "Seamless Logistics System," *Army Logistician* 31, (Jan-Feb 1999) 18.

[31] United States Army Training and Doctrine Command, TRADOC PAM 525-5, *Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century*, (Fort Monroe, VA: US Army TRADOC, 1 Aug 1994) 3-14.

[32] Ibid., 18.

[33] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODCSLOG, US Army, 14 Nov 1997) 11.

[34] Ibid., 7. There is no equivalent supply system in the civilian sector. Civilian firms view their supply systems as one consolidated operation from vendor to end-item.

[35] John M. McDuffie, "Joint Vision 2010 and Focused Logistics," *Army Logistician* 31, (Jan-Feb 1999) 7.

[36] John J. Cusick, summarized by Norbert Grabowski, "Focused Logistics: A Strategic Perspective," *Defense Transportation Journal* 53, (Dec 1997) 20.

[37] Edward J. Shimko and Thet-Shay Nyunt, "GCSS-Army: Making the Revolution in Military Logistics Happen," *Army Logistician* 31, (Jan-Feb 1999) 23-24.

[38] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODCSLOG, US Army, 14 Nov 1997) 37.

[39] Ibid., 4.

[40] Edward J. Shimko and Thet-Shay Nyunt, "GCSS-Army: Making the Revolution in Military Logistics Happen," *Army Logistician* 31, (Jan-Feb 1999) 22.

[41] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODCSLOG, US Army, 14 Nov 1997) 11. All of these disadvantages with an incremental development point to the advantage of developing a new logistics system within a single development effort, and developing the system to be an enterprise-wide solution.

[42] Ronald Henkoff, "Delivering the Goods," *Fortune* 130, (28 Nov 1994) 64-70. Examples include the Big Three auto makers, Sears, Federal Express, UPS, Wal-Mart, Most of the major Japanese corporations (Toyota, Honda, Sony, Panasonic, Mitsubishi, etc), and countless smaller firms. The U.S. Air Force is also implementing an ERP solution for its logistics system. See also the Logistics Integration Agency report, page 39 for a list of representative companies.

[43] Larry Smith, "Commercial Logistics Best Practices for the Revolution in Military Logistics," *Army Logistician* 31, (Jan-Feb 1999) 35.

[44] Vernon L. Beatty, "You Gonna Be a Greeter? Wal-Mart and Working With Industry," *Army Logistician* 29, (Jan-Feb 1997) 20.

[45] Robert Monkza and Jim Morgan, "What's Wrong with SCM?," *Purchasing*, (Jun 16, 1997) 53.

[46] Robert Monkza and Jim Morgan, "What Will Happen and What You Should Know," *Purchasing*, (Jan 15, 1998) 78.

[47] Ibid., 78.

[48] William J. Semich, "Information Replaces Inventory at the Virtual Corporation," *Datamation* 40, (Jul 15, 1994) 38.

[49] Partha Pratim Sengupta, "Definition of ERP: An Attempt," discussion group, ERP Supersite, (http//www.erpsupersite.com:8080/read?1161,53, 22 Mar 1999) 2.

[50] Christopher Maher, "Definition of ERP: Unsatisfactory, I'm afraid," discussion group, *ERP Supersite*, (http//www.erpsupersite.com:8080/read?1161,53, 22 Mar 1999) 1.

[51] S. Shankarnarayanan, *ERP systems – Using IT to Gain a Competitive Advantage*, (http://www.expressindia.com.newwads/bsl/advant.htm, 25 Jan 1999) 1.

[52] Ibid., 1.

[53] Ibid., 1.

[54] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODSCLOG, US Army, 14 November 1997) 11.

[55] This idea was presented to me by LTC Steve Canarossi, Chief, Theater Distribution Office, CASCOM, 29 Mar 1999.

[56] United States Army Training and Doctrine Command, TRADOC PAM 525-5, *Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century*, (Fort Monroe, VA: US Army TRADOC, 1 Aug 1994) 4-8.

[57] Christopher Maher, "Definition of ERP: Unsatisfactory, I'm afraid," discussion group, *ERP Supersite*, (http//www.erpsupersite.com:8080/read?1161,53, 22 Mar 1999) 1.

[58] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODSCLOG, US Army, 14 November 1997) 75-76.

[59] This idea was presented to me by LTC Steve Canarossi, Chief, Theater Distribution Office, CASCOM, 29 Mar 1999.

[60] John J. Cusick, summarized by Norbert Grabowski, "Focused Logistics: A Strategic Perspective," *Defense Transportation Journal* 53, (Dec 1997) 20.

[61] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODSCLOG, US Army, 14 November 1997) 38.

[62] Ibid., 5. Based in Germany, SAP produces 33% of all ERP solutions sold world-wide (see exhibit 6-33).

[63] Dennis J. Reimer, quoted in "ALOG Notes," *Army Logistician* 30, (Jan-Feb 1998) 44.

[64] Jodi Santamaria, "A-Mart: Army Shopping On-line," *Army Logistician* 31, (Jan-Feb 1999) 68.

[65] Paul Kaminski, "Lean Logistics: Better, Faster, Cheaper," *Defense Issues* 11, (1996) 6.

[66] Nancy Harrington and Edward Doucette, "Army After Next and Precision Airdrop," *Army Logistician* 31, (Jan-Feb 1999) 46-48. Capitalizing on advances in guidance and sensing technology, such as GPS and wind sensing, precision airdrop

systems can be deployed from high altitudes (up to 25,000 ft) and long off-sets (up to 20-25 km away) and can deliver payloads up to 20,000 lbs within a current circular error probability accuracy range of 100m or less. Delivery accuracy in the 10-20 meter range is envisioned for AAN.

[67] Vernon L. Beatty, "You Gonna Be a Greeter? Wal-Mart and Working With Industry," *Army Logistician* 29, (Jan-Feb 1997) 21. Distribution at Wal-Mart for the entire U.S. is controlled through one management center in Arkansas.

[68] Emmanuel J. Nidhiry and Gary L. Anderson, "Diagnosing Repairs with Embedded Sensors," *Army Logistician* 29, (Jul-Aug 1997) 27.

[69] Roger Houck and William R. Cousins, "Communications Technologies for the Revolution in Military Logistics," Army Logistician 31, (Jan-Feb 1999) 24.

[70] Rick Dove, "Agile Supply Chain Management," *Automotive Production*, (Apr 1996) 17.

[71] Robert Monkza and Jim Morgan, "What's Wrong with SCM?" Purchasing, (16 Jan 1997) 69.

[72] Ibid., 69.

[73] J.R. Turner, "Integrated Supply Chain Management: What's Wrong with this Picture?" *Industrial Engineering*, (Dec 1993) 52.

[74] Clint Willis, "How Winners Do it," *Forbes Magazine*, (http://www.forbes.com/asap/98/0824/088.htm, 24 Aug 1998) 2.

[75] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODSCLOG, US Army, 14 November 1997) 85.

[76] Rick Dove, "Agile Supply Chain Management," *Automotive Engineering*, (Apr 1996) 17.

[77] James Alampi, quoted by Ronald Henkoff, "Delivering the Goods," Fortune, (28 Nov 1994) 64.

[78] Ibid., 64.

[79] Logistics Integration Agency, *Technical and Programmatic Approaches for a Single Logistics System for the US Army*, final report, (Alexandria, VA: ODSCLOG, US Army, 14 November 1997) 21.

[80] Larry Smith, "Commercial Logistics Best Practices for the Revolution in Military Logistics," *Army Logistician* 31, (Jan-Feb 1999) 34.

[81] Paul Dronka, The Army After Next: Integration of Microchip Technologies, (Carlisle Barracks, PA: U.S. Army War College, 15 Apr 1998) 5.

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