Taking Charge of Technology

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ARMY LEADERSHIP is active, purposeful and authoritative. Army leadership doctrine captures the lessons of experience and uses the wisdom and methods of history's great captains to light the path for current and future leaders. Leadership doctrine tells us what we must be, know and do to lead successful organizations in stressful and uncertain combat conditions. It stresses the human dimension of war, which has been and will continue to be decisive in future battles. But writing doctrine and understanding the human dimension of leadership in the 21st century will be more complex than ever because of advancements in technology.

Advanced weapon and information technologies have changed people and process dynamics in the US Army and distinguish it from other armies and other types of organizations. Information technology is unique among other technologies because of its role in radically reinventing organizational structures, doctrine and procedures. Information technology is also very flexible because it can be altered to fit the culture and unique needs of the organization.

Despite the complexity of placing new information technologies in Army units, potential improvements in lethality, speed and situational awareness are enormous. Unlike many business leaders, unit-level Army leaders often cannot choose which technologies the organization will adopt. However, Army leaders have enormous influence on the positive or negative impact of information technology in their units. Beyond the decision of which technologies to adopt, Army leaders of all branches and at all levels play a key role in implementation. Information superiority does not come from advanced machines alone. Along with understanding the human dimension of leadership in battle, it takes competent leaders to translate a technological edge into battlefield victory.

Unlike past innovations, which tended to bestow an enduring competitive advantage on the innovator, many information-age technologies are equally accessible to all competitors. The discriminator among competitors is not who possesses the technology but who uses it best.

The skill set required for leading technology-rich units extends, but does not replace, traditional leadership. US Army Field Manual (FM) 22-100, *Army Leadership*, gives an effective conceptual guide to understanding how to mesh people, processes and technology.[1] But those less familiar with how to take charge of technology than with how to take charge of people will find that doctrine raises more questions regarding technology than it answers.

The Information Age

In 1994 General Gordon R. Sullivan wrote, "leaders of America's Information Age Army will 'think differently' than those of the Industrial Age."[2] More than six years after the Advanced Warfighting Experiment (AWE), the Army is still defining and developing the skills needed to take charge of technology.[3]

In the early part of the 20th century, the internal combustion engine, mobile radio and airplane contributed to significant warfighting changes. The military did not drive development but eventually adopted technological innovations for military use. It was not immediately clear how each was to be used to achieve a military advantage. Only after lengthy debate, experimentation and feedback from the field did each technology reach its true

potential, often surpassing expectations of the original proponents.

Introducing the tank did not produce the "armor age," nor did the airplane usher in the "air age." The Army did not rewrite leadership doctrine as a result of these innovations. General Ulysses S. Grant did not learn "railroad leadership" at the US Military Academy, and yet he used the railroad system decisively during the Civil War. Information technology is different. It defines an age because it permeates society, changing the way we live, work and fight. The ability to process, store and exchange information and knowledge now forms the core of both production and destruction.

Technological specialists are not unassailable experts who can magically make information technology work for the organization. While focusing on a system's technical aspects, they might overlook the importance of a user's perspective. Leaders, therefore, must be involved at all stages of the process. Uninformed and unmanaged implementation causes increased resistance to change and will dull the technology's potential benefits.

The information age has also been called the information revolution. A closely related concept is revolution in military affairs. The term "revolution" connotes what George Gilder calls a paradigm shift, or the "collapse of formerly pivotal scarcities" coupled with "the rise of new forms of abundance."[4] In the competitive environment of economic and military power, technology is the abundant resource, while time and attention are scarce. To react faster than the competition, leaders make decisions in progress. With the explosion of data and human limitations, attention becomes a scarce resource. For the Army, as well as for business organizations, the goal of information-technology design and use is to free up time and attention for more critical and strategic tasks. Accomplishing this often requires finding entirely new ways of doing things, not just more efficient ways of doing things the same way.

Army leaders recognize the potential value and unique threats information-age technology poses. Unlike past innovations, which tended to bestow an enduring competitive advantage on the innovator, many information-age technologies are equally accessible to all competitors. The discriminator among competitors is not who possesses the technology but who uses it best. The pace of change is necessarily accelerated as each player attempts to stay ahead of the competition by retaining either the newest systems or the best doctrine and procedures to optimize the effectiveness of existing systems. For the military, this concept is called information dominance: the ability to collect, process and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same.

What a Leader Must Be

The demands of information-age technology may require leaders to be technological experts. Technology experts may have to master the organizational leaders' social and political skills. Given limited information-technology literacy and limited involvement in selecting and implementing information systems, how can leaders contribute to the success of the process?

Organizational analysis complements systems analysis. Leading a technology-rich organization requires systemic understanding and not simply functional efficiency. It also requires that the organizational leader and the technological specialist know enough about each other to communicate and cooperate in accomplishing the mission. This does not mean that leaders have to be Maneuver Control System operators or know how to program computers in universal network information exchange (UNIX) language. But leaders require a technical vocabulary to communicate their technological intent precisely to the operator or developer. The technological specialist requires skill in politics and organizational change as well as in technical matters. Both the leader and the specialist must invest in organizational learning to help the unit become familiar with and confident in the technology. The unit can then develop the best techniques and procedures for optimizing the technology's capabilities and generate constructive feedback from users to improve or alter the technology.

Even the meaning of "expert" has changed. An expert used to be considered a repository of facts. Today the sheer volume of accessible facts available to any one individual has changed that view to one who can efficiently find and manipulate data, recognize patterns and integrate new facts from data without being overwhelmed.

While leader and technical skills overlap, the two perform distinctly different roles. Henry Kissinger observed that "it is, after all, the responsibility of an expert to operate the familiar, and that of the

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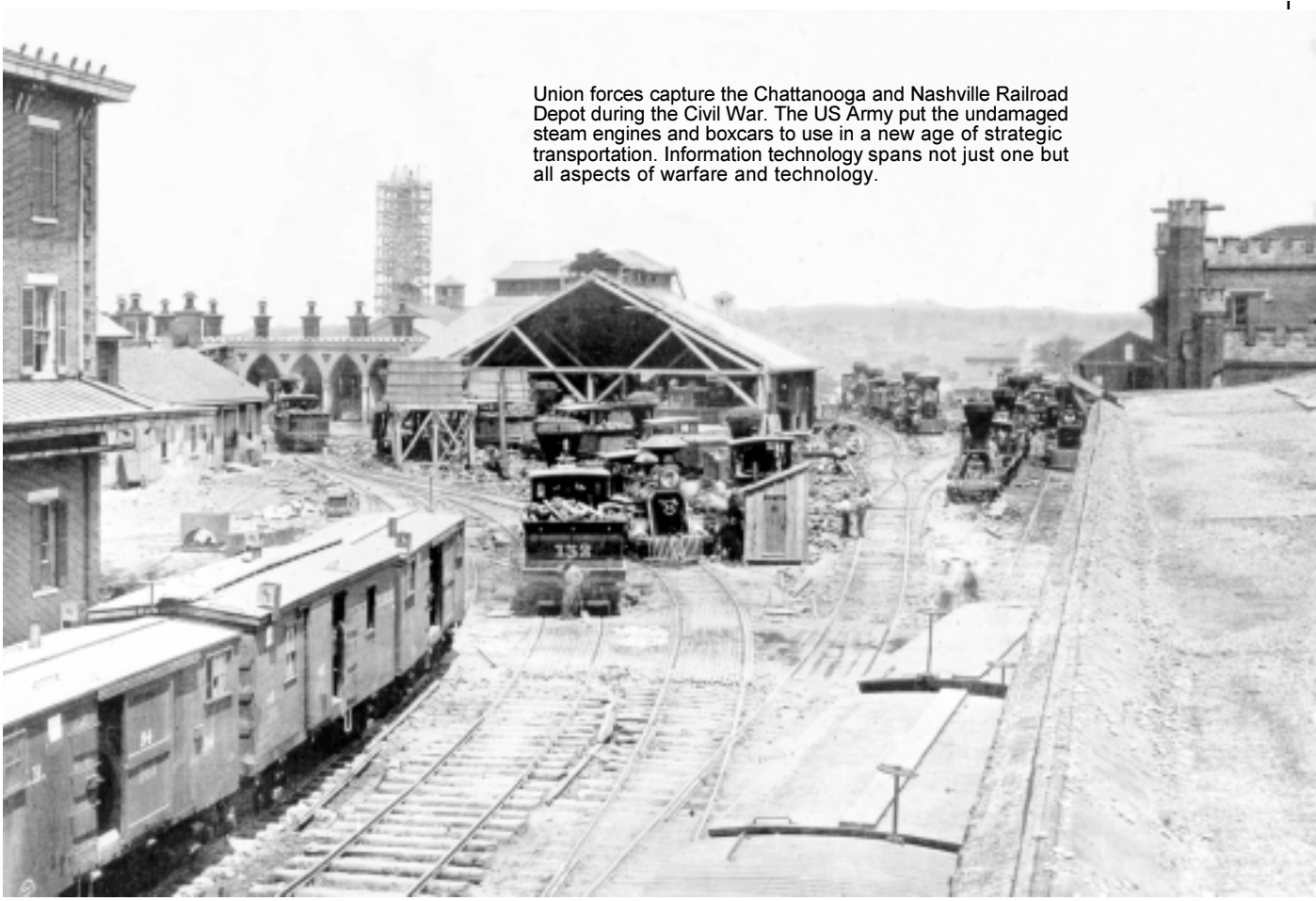

Union forces capture the Chattanooga and Nashville Railroad Depot during the Civil War. The US Army put the undamaged steam engines and boxcars to use in a new age of strategic transportation. Information technology spans not just one but all aspects of warfare and technology.

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leader to transcend it."[5] It would seem that the need for both experts and leaders is as important as ever, but the roles and expectations of each may be significantly different in the information age.

The Army's Officer Personnel Management System (OPMS) XXI has changed the definitions of functional specialists and generalists. Officers may now choose to follow the operations track or the more specialized functional area (FA) track. Functional areas related to information technology are FA 53 and 24. FA 53, Information Systems Management, encompasses the traditional, technically based information systems management positions associated with the systems automation officer. FA 24, Information Systems Engineering, encompasses highly technical systems-engineering functions that typically require hard-skill undergraduate engineering or science degrees.

Under the new system, specialized officers who previously would not have been competitive for promotion without having commanded in units will now compete within their own career fields. Specialized career field officers first gain operational experience, then convert to their functional areas. With operational experience behind them, complemented by specialized education and training, FA 53 or 24 officers theoretically include areas that encompass the specialist and generalist. The officers are prepared to optimize technology and increase its usefulness so nontechnical staff members can influence how information technology is designed and used. As users become more familiar with the capabilities and characteristics of information technology, they become change agents themselves.

Understandably, psychological adaptation lags far behind technological advancement. Adaptation requires leaders willing to innovate and participate in the process. In the past, applying early-generation information technology required a high degree of technical expertise; end-user involvement was limited to identifying requirements early in the development cycle. Modifying the finished product was

difficult. That model has changed; modern digital information systems can be designed with more flexibility. Nevertheless, technological specialists are not unassailable experts who can magically make information technology work for the organization. While focusing on a system's technical aspects, they might overlook the importance of a user's perspective. Leaders, therefore, must be involved at all stages of the process. Uninformed and unmanaged implementation causes increased resistance to change and will dull the technology's potential benefits.

Information overload is not new. In the mid-19th century, the information and communication requirements of centrally controlling large and complex armies overwhelmed commanders. The solution was to decentralize some of that data processing by creating a general staff. The modern analog is transferring management of things to computers, leaving commanders free to lead people.

Information-age subordinates can also differ distinctly from their predecessors. Their styles and perspectives might appear counterproductive and counterintuitive to the traditional leader. Consider the varying levels of experience and training within a hypothetical organization. Seasoned officers and noncommissioned officers (NCOs) who are familiar with older equipment must learn new procedures. Junior officers and NCOs are technically skilled with new systems but lack experience with integrating them into the unit's operations. The 21st-century soldier is comfortable with new technology and is quick to learn and adapt to change.

This example illustrates how knowing your soldiers has changed somewhat. A leader must know soldiers' individual and team capabilities, as well as how the unit's information technologies increase or decrease these capabilities. Under the electronic direction of a doctor using telemedicine technology, a medic might be able to perform at a level far above traditional expectations. A mechanic could solve a complex maintenance problem by electronically obtaining guidance from technical experts thousands of miles away. In both cases, nontraditional means can achieve specified effects.

Predictions of how technology will change society in general are common but are often based on theory and imagination rather than experimentation. Assumptions that technology may eliminate physical contact or that computers will create a paperless office are extreme. A historical example illustrates the potential extremes of speculation. During what was termed the "telephone age," circa 1900, some speculated that the rising use of the telephone would:

- Create alert, tense, speedy minds and people on edge, trained to expect immediate results.
- Create impersonality and superficial civility that would carry over to other areas of life.
- Make one neighborhood of the whole country and erase dialects.[6]

Each of these predictions seemed plausible at the time, but none was realized as originally conceived. Speculation should include the complexity of the mutual effects of technology on people and people on technology but should not become a barrier to innovation.

What a Leader Must Know

Most leaders are aware of the potential pitfalls of digitization, including its inability to overcome the fog and friction of war. Digitization promotes:

- Overreliance on electronic sensors, communications and information processing.
- Vulnerability to electronic and asymmetric attack.
- More centralized control.
- Information overload and other pathologies.

FM 22-100 points out these issues and refers to technology as a stress to manage and cope with much the same as combat stress.[7] This language overlooks the human role in designing and implementing information technologies. Army leaders need practical guidance to avoid these pitfalls and achieve the intended technological advantages.

With all the high-speed, high-capacity advanced technologies of the information age, what value does the Army leader add to the fight? Is the human being the weak link in the system? Leaders must remember that the most powerful processor on the battlefield is between their ears. No automated decision-support tool invented has replaced the ultimate decision maker—the commander. Certainly change is a source of stress, and information technology changes rapidly. But a leader's inability to understand and manage complex systems only contributes to the problem. Change occurs over time because of the environment and as a positive result of learning. Change can be accommodated when it is seen as an interactive and adaptive process that can lead to innovation.[8] Leaders can develop the conceptual, technical and organizational skills ap-

US Army

The HMMWV's horseshoe notwithstanding, success at the NTC has little to do with luck. Training feedback and learning make successful leaders and units.

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Mentorship is more important than ever. Successfully integrating information technology requires several feedback loops: between users and developers, between operators and leaders, and between external observers and user organizations. The Army's combat training centers (CTCs) are also excellent sources of external observations on how effectively units control information flow and use information and communication technology. CTCs should encourage experimentation with procedures and control measures that optimize information technology and integration. Best practices should be shared Armywide, just as they are with mission planning, execution and support.

The information explosion has outpaced people's ability to comprehend, much less control, it. Obsession with control only exacerbates the chaos and alienates members of the organization who try to make the system work. Army Vision 2010 describes a warfighting environment with enlarged battlefields, increased firepower and precision, dispersed units, accelerated operations, compounded stress for leaders making critical decisions and coping with information overload. Such strain is not new. In the mid-19th century, the information and communication requirements of centrally controlling large and complex armies overwhelmed commanders. The solution was to decentralize some of that data processing by creating a general staff. The modern analog is transferring management of things to computers, leaving commanders free to lead people.

Abundant information requires increased emphasis on information management. For individuals, this skill is similar to using the Internet. *Users* choose to search the net, clicking from website to website, letting whatever seems interesting determine the next site. *Searchers* know what to ask for, frame a search strategy and avoid becoming overwhelmed by the possible answers. Separating essential information from the interesting information takes practice and discrimination.

For networks, directing information, filtering it and withholding it from certain locations improves performance by reducing or balancing the processing that a subsystem or node must accomplish.

Information technology can standardize or customize processes for decentralized control and decision making. Technology allows increased control of large bureaucracies or empowers large networks. It can be a powerful servant to an industrial or information-focused strategy or a powerful example of a knowledge-focused strategy.

Army leadership doctrine already encourages decentralized execution; information technology can standardize or customize processes for decentralized control and decision making as well.[9] Technology allows increased control of large bureaucracies or empowers large networks. It can be a powerful servant to an industrial or information-focused strategy or a powerful example of a knowledge-focused strategy.

Choices are controlled by those in power, not technology.[10] For example, during the Vietnam War, US President Lyndon B. Johnson used available information and communication technology to become mired in tactical operations and targeting. In contrast, during the Gulf War, information and communications systems were greatly superior to those used in Vietnam, but strategic leaders refrained from becoming overinvolved.

Modern information technology permits many leadership approaches; therefore, the optimum solution is to use the style that is appropriate for conditions. A leader should not discount the alternatives to extreme centralization and decentralization. Information technology enables parallel and collaborative planning and decision making. With video teleconferencing and collaborative tools within the Army Battle Command System, parallel planning promises shorter planning time, easier dissemination of orders and rapid adjustment to conditions. Doctrine, leader development and unit structure determine leadership style.

Leaders must balance the need for physical presence with the need for speed and dispersion and choose their medium accordingly. Instead of having one or two channels of communication, leaders now must choose among several different media for communicating orders and intent. New choices require leaders to practice and refine new skills. Electronic communications increase commanders' span of control, but the inspiring and motivating effect of physical presence is diminished. Decentralized control by disconnected decision makers is different from decentralized control by connected decision makers. Being connected is not enough. To be an effective communicator in each medium—voice, video, graphic image or text—a leader must have certain skills.

For example, voice radios require the ability to communicate without nonverbal cues. Since almost 90 percent of human communication is nonverbal, developing this skill requires time and training. Using video teleconferencing may solve some of the nonverbal communication issues, but it also requires diverting bandwidth resources from other uses. Data radios require preparing data for transmission over limited bandwidth, properly programming and operating the radio in the data network, and receiving and interpreting the data. It may be more efficient to communicate with symbols and images than with voice and text. Success would depend on the subordinate's ability to interpret the symbol or image correctly. Leaders must understand the uses, benefits, costs and limitations of different media.

What a Leader Must Do

The technology genie is out to stay. Leaders must learn to use technology or risk being used by it. Army leaders should integrate information technology with action, purpose and authority. They must avoid "technological Darwinism," a belief that technologies can develop through a force of their own. Such deterministic thinking will discount leaders' influence in developing, implementing and using information technology in their units.

An interactive relationship can develop between the technology and the organization, replacing current management systems or integrating into them. The key is for leaders to develop organizational leadership styles to adapt both the organization and the technology to the circumstances. Developing systems require feedback, and feedback must come from the people who use the systems. Organizational leaders must know what they want technology to do for the unit and be able to measure and articulate the technology's effects. That assessment means examining the relationships between the technology and the organization.

Leaders must become familiar with information-technology applications and the organizational al-

ternatives they present. In a perfect world, information systems would perform all routine tasks and place useful information at users' fingertips. In reality, leaders must consider a system's capabilities and limitations. Based on experience and knowledge of what is possible, the leader must shape the unit's expectations rather than overselling computer technology. A leader should stay abreast of technology trends. Magazine ads for networking solutions can be informative, major newspapers such as the *New York Times* and *Wall Street Journal* feature daily technology columns, and the Internet brings experts to the user.

Implementing the appropriate training to facilitate change requires more than just learning what buttons to push. Training must occur in conjunction with ongoing operations and explain the relationship between the information system and how the organization will accomplish its mission. Leader training should not emphasize operating procedures over the more difficult tasks of measuring success, setting management controls and managing the human factors of information technology. Appropriate training leads to technological credibility. Leaders who are afraid of the technology or worried about information overload influence the organization and exacerbate the difficult task of meshing people, processes and technology.

Digital standing operating procedures and control measures are important, but they should not deny the commander critical information. Only commanders can decide what is germane to how they visualize the battlefield. They should determine the distribution of data processing and decision making, and the minimum and maximum information flow required to successfully execute the mission. Commanders and staffs must trust subordinates, decentralize appropriately and develop work-around procedures in case of communication or data-processing failures.

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Excellence is not an end state but a continuous, iterative pursuit. Information technology can help only if leaders are willing to use it. Users determine their own requirements through hands-on experience when they discover issues that were overlooked during the information system's initial design.

Leaders must also look beyond short-term adaptive difficulties and develop long-term vision. They must automatically assume technology is useless when the real culprit could be inappropriate structure, lack of skills or lack of integration with other processes. They should also provide constructive feedback to other network members.

Leaders must consider limitations and the dangers of overrelying on computers. Lack of understanding leads to technophobia, in which a natural resistance to change stifles creativity and innovation. Information technology is no silver bullet for instant battlefield success. Nothing will replace a leader's ability to think critically or inspire and motivate through physical presence. To lead means to influence, operate and improve an organization, regardless of technology.

NOTES

1. US Army Field Manual (FM) 22-100, *Army Leadership* (Washington, DC: US Government Printing Office, June 1999).
2. Gordon R. Sullivan and James M. Dubik, *War in the Information Age* (Carlisle Barracks, PA: Strategic Studies Institute, US Army War College, 6 June 1994), 61.
3. The Advanced Warfighting Experiment was conducted with an armor task force at the National Training Center, Fort Irwin, California, to identify critical information requirements for an information-age battlefield.
4. George Gilder, "The Gilder Paradigm," available online at <www.wired.com/news/technology/0,1282,619,00.html>.
5. Henry A. Kissinger, *Diplomacy* (New York: Simon and Schuster, 1994).
6. Claude S. Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkley, CA: University of California Press, 1994), 264-65.
7. FM 22-100, 3-8, 3-9.
8. For more on the Routine Change Model, see J. Pennings and A. Buitendam, eds., *New Technology as Organizational Innovation* (Cambridge, MA: Ballinger Publishing Company, 1987), 20.
9. FM 22-100, 1-13.
10. L.E. Sveiby, *The New Organizational Wealth: Managing and Measuring Knowledge Based Assets* (Williston, VT: Berrett-Koehler Publishers, 1997).

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