

**STRATEGY
RESEARCH
PROJECT**

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DIGITAL LOGISTICS

BY

MR. ANTHONY DEVITO
Department of the Army

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USAWC STRATEGY RESEARCH PROJECT

Digital Logistics

by

Anthony DeVito
Department of the Army Civilian

Tom Sweeney
Project Advisor

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U.S. Army War College
CARLISLE BARRACKS, PENNSYLVANIA 17013

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ABSTRACT

AUTHOR: Anthony DeVito

TITLE: Digital Logistics

FORMAT: Strategy Research Project

DATE: 17 March 2000

PAGES: 21

CLASSIFICATION: Unclassified

In 2030, everything has been computerized, digitized and is "on-line". Not only that, but our grandchildren have grown up in this world and are as comfortable with being on-line as we are with color television! Marketplace globalization has marched on at an increased pace, making the world more interdependent than ever thought possible. Technology has made it so there are few places in the world where you cannot go on-line. Computer processing power and availability have made virtual reality worlds as real as the real world. Virtual reality scenarios move beyond the gaming industry and find uses in all aspects of daily life. Nanotechnology, biotechnology, and infotechnology advances have made the impossible, possible. Low cost computing is a part of everything we do. These changes will have dramatic effects on military logistics. Changes to our logistics processes, computer systems and how we manage our people need to be put into motion now so that we will be prepared to take advantage of the digital future.

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DIGITAL LOGISTICS

Liberalization, globalization, and technology are the primary global forces that are shaping the future. While observers may differ with regard to the "end states" to which these currents may be carrying the world, there is no denying their existence or their magnitude. Under these circumstances, then, it is meaningless to discuss a "business as usual" scenario since there is no alternative to large-scale change.

— Charles B. Curtis

In 2030, everything has been computerized, digitized and is "on-line". Not only that, but our grandchildren have grown up in this world and are as comfortable with being on-line as we are with color television! Marketplace globalization has marched on at an increased pace, making the world more interdependent than ever thought possible. Technology has made it so there are few places in the world where you cannot go on-line. Computer processing power and availability have made virtual reality worlds as real as the real world. Virtual reality scenarios move beyond the gaming industry and find uses in all aspects of daily life. Nanotechnology, biotechnology, and infotechnology advances have made the impossible, possible. Low cost computing is a part of everything we do. These changes will have dramatic effects on military logistics. Changes to our logistics processes, computer systems and how we manage our people need to be put into motion now so that we will be prepared to take advantage of the digital future.

Thirty years in the future, most of us will be enjoying retirement. This future world is in many ways familiar to us -- after all we are only talking about 30 years! But at the same time there are subtle and dramatic differences, just think of the changes we have seen in the past 30 years. We need to prepare now for the changes that the future will bring, one way to prepare is to imagine ourselves in the future environment and 'pull' ourselves into the future. In a sense we must place ourselves into the future now and look back to the present to make the right changes to prepare for a new and exciting world.

Logistics support to military operations will need to undergo tremendous large-scale change to keep up with technology and the business world. E-commerce, digitization, biotechnology and nanotechnology will create possibilities that will reduce the logistics footprint while at the same time creating accurate and rapid delivery methods.

In 2030 the Army is a digitized force that operates primarily in truly joint and coalition endeavors. Consideration must be given to our level of high technology, digitization and capabilities as compared to our allies. It will be important to our success that we understand their level of technological sophistication, or lack of high technology equipment. There will be times that our capabilities will exceed their ability to interconnect digitally. There will also be instances when we will need to take advantage of technological leaps made by our allies. The 'clash' of high tech with low tech must be considered, especially as we move toward very high tech solutions to our military needs. The end goal is to create Army Forces that are small, agile and extremely lethal to our enemies.

Technologies that have made tanks obsolete opens the door to a radically different future. The multispectral sensors, high-speed computers, and brilliant munitions (as well as the advanced materials used in the vain attempt to prolong the life of the tank) raise the possibility of a superior soldier or, to use a phrase from a study by former CINC South Paul F. Gorman, a *Supertroop*.¹

Increased lethality allows for small unit operations capable of meeting lethal mission requirements. The small unit operations will need a lesser logistics footprint. The computer and communication systems capability inherent in a Supertroop will also provide the information needed for logistical support. The on-line systems of the Supertroop permit direct interface by logisticians to predict replenishment of critical supplies, ammunition, fuel, food and water to name a few. The same technology improvements that allow the creation of a Supertroop also suggest a need for operational changes to take advantage of the expanded capabilities. The operational changes will become interwoven with new logistics support concepts and procedures to maximize capabilities. The super high technology used to create the supertroop will place high demands on our logistical systems for rapid delivery of very high dollar value repair parts and constant maintenance to keep the super troop operational.

Small-unit operations in the past were associated with low levels of destructive force. Small units in the future will be capable of tremendous destructive force. Soldiers will have a deep sense of unit loyalty and, simultaneously, a strong sense of personal independence. In a physical sense, the individual's level of isolation will dramatically increase. Visual contact with other troops may be impossible. The data links will keep the unit together – but when those fail, the mission will have to continue.²

Reliance on technology will have to be tempered with old-fashioned ground tactics to minimize negative effects on digital failure. Our super-troop of the future will have technology to provide instant and constant voice, image and digital contact with each other as well as the base unit. These widely dispersed units will have true situational awareness through the use of sensor technologies, and will have an advantage in 'knowing' where the enemy is and where the friendly forces are.

Medical monitoring at the individual level will provide leaders with the ability to monitor blood pressure, pulse and breathing rates to tell if the trooper is in medical trouble. Medical logistics support will be called in from rear locations to evacuate troops that have been injured in battle. Or perhaps, the Supertroop will be remotely medically treated by sensors embedded in the trooper that can stop bleeding, apply fibrin bandages, or medicate the trooper to counter battle damage.

Small unit operations of the future will have the logistics support to ensure success. Training will be conducted as small teams to optimize efforts and provide the knowledge that although they cannot see each other - they are always in constant contact with friendly forces. The synergistic effect of which will increase unit cohesion. This can be a double edged sword -- when one member of a small team drops out, by simple mechanical failure, or by injury or death, the rest of the team may experience traumatic results -- and may no longer be as functional a team. Training and re-training will be key to providing the

teams the skills needed to reform and adjust quickly and effectively. The small teams will rely heavily on high technology to be lethal and functional. Rapid, assured logistics support will be key to keeping the small teams fully capable.

Within the military community, too, there are reservations, perhaps to the effect that science and technology today distort the military by substituting high-tech weapons that do not always work for more basic military hardware and discipline.³

New systems will be in place to provide real-time logistics support, anyplace in the world. These systems will exist to support their peacetime function as globalization of markets continues, but the same commercial infrastructure will be used to support the soldier. Robotic systems will be even more commonplace than today. Small scale and very inexpensive robotics will be in place to support a variety of uses.⁴ We should not always think of robotics as highly technical devices that replicate humanoid shapes or functions. Robotics will greatly aid in providing logistics support. Unmanned vehicles (air and ground vehicles) will be used to deliver supplies and other materiel to the combat zones, allowing the placement of logistics bases in relatively safer areas. The entire concept of logistics support will be modified to permit seamless support directly into military operations. Doctrine will find techniques to merge high technology logistics methods to newly developed operational concepts. For example, robotic, unmanned, disposable logistics delivery vehicles that can bring fuel cells directly (by use of sensor technology) to a unit – or even to a Supertroop, will allow a higher level of dispersion and attack than currently supported by today's logistics base concepts. Today's operational tactics are limited by our ability to provide sufficient and timely logistics support. Technologies of the future will allow us to break those limitations -- operational tactics will emerge that take advantage of improved logistics support. The small unit of the future will be better able to 'swarm' into battle areas, inflict damage on our enemies, and move out of harms way. Logistics support will mimic these operations, swarming in to provide the logistics support as needed, directly into the forward battle when needed.

There will be dramatic increases in nanotechnology and biotechnology. These technology changes will increase our ability to create the effects we need to impose our national will on enemy forces. At the same time, the nanotechnology and biotechnology advances will help reduce two of the largest logistics transportation burdens of today -- fuel and ammunition. As the technology develops, we will deploy fewer soldiers, but each one with more individual firepower than ever before. New vulnerabilities emerge as we rely on high tech solutions. Today we can rely on some level of redundancy to ensure that we have enough firepower to win the battle. In future small unit scenarios, the loss of a single Supertroop can mean the loss of a battle. System downtime can result in disaster. Assured logistics will be the key to ensuring continuous operations. Corporate partners will provide digital solutions to logistics delivery. As we make technological advances, so will our allies, and our enemies! Our success will be in our ability to tie small unit lethality to rapid assured logistics support, all tied to new operational concepts that allow 'swarming' of firepower as well as replenishment and repair.

Some futurists predict by 2020 high performance, multinational corporations that exploit a third generation of cyberspace will dominate the global economy. Those corporations will be an engine for the diffusion of advanced weapon technologies and systems to a global market. The biotechnology revolution will have reached an unimagined maturation, and nanotechnology for civil and military uses will be emerging rapidly. The petroleum era may be coming to a close with the full exploitation of fuel cell, natural gas and wind turbine powered systems.⁵

Is this science fiction – or science fact? This paper will present evidence that much of this technology already exists, and is very likely to be prevalent in worldwide commercial practices in the near future. The Army needs to change logistics systems and practices now to be prepared to operate efficiently in the future.

THE COMPUTER AGE

The digital revolution's velocity and trajectory create more frequent and more disruptive ripples than did earlier technologies, giving everyone a permanent case of what Alvin Toffler many years ago termed "Future Shock." We call this phenomenon the Law of Disruption, which states that where social systems improve incrementally, technology improves exponentially. As the gap between the two increases, so does the potential for noncontinuous, disruptive, indeed revolutionary change.⁶

Rapid and continuous changes in computer chip technology have aided the digital revolution. In the early 1970s, Intel produced the first computer-in-a-chip with a couple of thousand transistors on it and could operate at 60,000 instructions per second. Today, less than 30 years later Pentium chips have about 5.5 million transistors and operate at more than 300 million instructions per second.⁷ The same advances are expected for the next 30 years – predictions are that computer chips will have transistor capacity in the billions with processing speeds greater than 100,000 million instructions per second.

The unrelenting, exponential improvements in semiconductor speed, size, and cost that have operated since the 1960s follow Moore's Law, a prediction by Intel founder Gordon Moore that every eighteen months, for the foreseeable future, chip density (and hence computing power) would double while cost remained constant, creating ever more powerful computing devices without raising their price.⁸

Computing speed is not everything - what use is a fast computer if few people use it. The real advances happen when access and use are global. The more people use a system, the more valuable it becomes to the people and to the creators of the systems.

Less well known than Moore's Law is the observation made by Robert Metcalf, founder of 3Com Corporation, that networks (whether of telephones, computers or people) dramatically increase in value with each additional node or user. Metcalf's Law values the utility of a network as the square of the number of its users, and can easily be appreciated by considering the impact of standard railroad gauges, Morse code, and standardized electrical outlets in the last century, and telephones, fax machines and the Ethernet and Internet protocols today. Once a standard has achieved critical mass, its value to everyone multiplies exponentially.⁹

When we consider the effects of Moore's Law and Metcalf's Law on the digitization of everything, we can predict that the trends will continue for the future. But will those trends revolutionize our daily lives? In the past, technology trends predicted that we would be living on the moon – or even Mars by the year 2000. Of course those predictions have not been met. So should we trust on a future that predicts the digitization of everything? How will the human factor weigh in? Current technology trends support a rather optimistic view, but one tempered by real science and human behavior.

Two key concepts, Moore's and Metcalf's laws work together to enhance the effects of digitization. At the same time that computing power gets incrementally faster and less expensive, the computer related networks are also getting bigger and better. The bigger the networks, the more value that they hold, and more businesses will decide to participate in the web world. In the past few years, web related business has jumped significantly. This is due in part to the increase in the number of home computers and in the trust that the public has in buying goods on-line. These factors feed on each other making the value of the on-line shopping 'network' so valuable that all businesses must consider it and find a way to interact.

In less than 30 years, the on-line shopping experience will become the norm. The entire experience can be enhanced by rapid advancements in virtual reality technologies – so that the on-line shopper may become so immersed in the experience that it 'seems' life-like. Although this all sounds quite positive and enticing, there are some negative aspects that must be considered. We will need ways to mitigate the cost of 'chasing' technology, will have to educate and re-educate the workforce to maintain currency, and be prepared for the ever expanding threat of cyber attack —a means of crippling an operation without ever firing a weapon!

Army logistics practices will have to be modified at the strategic level to keep up and take advantage of the changes. For example -- the digitization of weapon systems also allows the passive collection of logistics data, things like fuel consumption, ammunition usage, food that people eat, spare parts failure, on and on. A network of information must be created to make it valuable. The more systems come on-line and digitized, the more useful the information becomes (Metcalf's law). Real-time logistics information will be linked to on-line systems so that a supply manager will be able to go immediately on-line to order replenishment of everything. The same sensors in the equipment will accurately report location, so the delivery systems can ensure delivery directly to the user. Delivery systems will become more complex and potentially more difficult to manage. Managers must be groomed to handle the complexities to take advantage of the complex web of information and delivery. Hands-on experience may become a thing of the past – or a luxury that we cannot afford. Defense logisticians will need to know how to work closely with their commercial counterparts to orchestrate the delivery and redirection of critical materiel. Our data systems and those of our commercial partners will be potential targets to our opponents and will need safeguards to limit unwanted intrusion and data tampering.

Our existing logistics software systems are based on old (1970's era) technology and should be scrapped. They cannot be modified or changed to meet the needs of the web based world. This is a drastic step, but one that must be championed at the highest level to meet the needs of our future high tech systems. Even the newest systems developed in this decade are 'old' – in that they rely on data feeds from our existing legacy systems. Corporations have found that they must adjust to digital realities and abandon the old ways of doing business. Our logistics systems will need to tie in to sensor technology to anticipate replenishment; the systems will also need to tie into commercial systems to allow more direct vendor delivery. The systems need to be redesigned at the most basic levels to reap the benefits of digitization. Web-based technologies are becoming common in the commercial sector. Major corporations have completely revamped their methods to keep current with competitors; the military must do the same. The military needs to look at how major corporations have revamped their support structures to meet the needs of the digital age, and take steps now to prepare.

As one might imagine with a corporation the size of General Mills, the company has a lot of people who need a lot of stuff. There are more than 2000 separate approval processes for everything from office furniture to computers to supplies. To streamline the process, the company is implementing an online purchasing system that not only makes ordering easier for the 1500 employees who use it but also integrates the entire procurement process.

Under the system, employees use a Web browser to search the corporate catalog for items that meet their specifications. Once located, the items are put into an electronic shopping cart, much as they would be gathered at consumer shopping sites. Depending on the users profile, which can include a limit on the amount that person can order without approval, the electronic requisition is automatically routed to anyone who must sign off on the request. Designated approvers are notified by e-mail or alerted automatically about any requisitions awaiting their OK. Employees can also check the system to find out the status of their order, eliminating repeated calls to the purchasing department to find out where those requisitioned laptops have gone.¹⁰

There are many similarities to military logistics and the General Mills example – our systems can and should become web based and easy to use. In the web-based logistics of the future, any soldier will be able to go on-line, point and click to the parts or services needed and place an order. Using General Mills' example, all of the routing for approvals, application of any limits on what can be ordered, and shipment status to inform the supply clerk would happen automatically, simplifying the order process.

Even today, the government and military are working with industry to make revolutionary change, one that relies on industry standards instead of creating DOD unique systems. Consider how we pay contractors for services rendered. Use of digital technology is speeding up the process while providing a high level of transaction security. In a few years, this type of payment will be the norm, freeing up DOD resources.

Fifty U.S. Defense Department contractors are helping the Federal Reserve Bank of Boston test an electronic version of the paper check. In the test, the Defense Department creates electronic checks that are signed digitally and E-mailed to the contractors. The contractor then digitally endorses the check and E-mails it with an electronic deposit slip to its bank, which verifies both check and endorsement signature.

The electronic check information is processed by existing bank systems that use and Internet-enabled front end.¹¹

The on-line shopping may even develop to a virtual experience. Computer processing power will be so advanced that the on-line experience will become 'real'. Virtual reality experiences may become a common method of deciding what to buy. The days of supply clerks needing to know National Stock Numbers and transaction codes will be gone, as the on-line capabilities will make getting the right part simpler. When the built-in diagnostics chip does not automatically order the correct item, the supply clerk of the future will be able to click on an image of the weapon system and drill down to identify the correct part. Ordering becomes simplified by a point and click operation. This sounds simple to do, but it is not. Our existing logistics systems cannot meet the challenge; major changes at the strategic level will need to be in place to allow this to happen. The emphasis must be placed on completely redesigning our logistics support systems. In the virtual shopping experience of the future, a sensor in a vehicle may determine pending failure of the transmission. The sensor automatically sends a signal to the logistics base, notifying them of the pending failure. If the transmission is in stock locally, a signal is sent back to the vehicle to notify the vehicle operator that maintenance is scheduled, at the same time, the maintenance shop is notified and the new transmission is 'pulled' from storage and staged in the maintenance bay. If the transmission was not locally available, it is automatically ordered from the wholesale level. Status is sent (perhaps by e-mail msg.) to the supply clerk and vehicle operator. The status informs the clerk that the part is ordered, notifies the clerk when it is shipped from the vendor, and even provides the transportation tracking information. Since all this happens digitally, the data is gathered and can be used by the vehicle designers to determine what caused the failure in the first place. This all happened in a virtual world, with information shared by all, and with minimal human interface.

Although it sounds like science fiction, and the word "cyberspace" in fact originated in a science-fiction novel, virtual reality is already a science, a technology, and a business, supported by significant funding from the computer, communications, design, and entertainment industries worldwide.¹²

The citizen of the twenty-second century might find it hard to understand how the human race ever managed to make do without the assistance of Virtual Reality systems, just as we take the usefulness of antibiotics, modern plumbing, electrical refrigerators, and literacy for granted today.¹³

When a user moves the mouse on the desk next to the keyboard, a cursor moves in an analogous manner on the screen. It became possible to issue commands by "pointing and clicking." In virtual realities of the future, gestural input using gloves and "wireless" gestural sensors could continue this line of development to its natural conclusion by enabling people to use their most common pointing device—their fingers.¹⁴

"An increasing number of companies will find that by opening their databases to the world, such as FedEx and others have done, they can get others to do much of the work. Moreover, customers and suppliers love it! Taking a company's intranet to the next logical step—by allowing customers to get the information

they need more quickly by directly accessing the corporate database—benefits both customer and company.”¹⁵ This concept should be explored by the military – we need to find ways to allow our corporate partners access to our critical data systems without sacrificing critical military security. For example, commercial partners could have access to our clothing sales data, using that information they could develop web based methods to allow soldiers to order uniforms from their home PC. Or by digitally opening our maintenance operations to corporate partners, real time logistics of maintenance repair parts can become a reality. The military weapon systems’ internal sensors could transmit pending failure (as in the vehicle transmission example above) to allow the corporate partner the ability to anticipate the needed repair part. This moves us well beyond just in time logistics to a newer concept called real time logistics. By opening our databases to commercial enterprise, we will increase the intrinsic value of the information, allowing entrepreneurs find ways to profitably meet our logistics needs. Small businesses as well as large will emerge to provide the totality of logistics needs such as food, fuel, services, delivery and materiel.

Office Depot has realized the importance of linking its core business with a new digital environment. This is more than simply creating a web site so to make on-line shopping easier. Integrating all facets of the business are needed.

In building our site infrastructure, we integrated our Internet site with our back-end systems, including inventory and customer databases. This allows customers to check for products at a local store or at the warehouse closest to them and confirm availability. We also check their address in real time to ensure that it's a real delivery address. We catch typographical errors as well as avoid sending our drivers to a non-deliverable location. We also verify credit card information in real time. This means that our customers won't get a message from us hours after ordering indicating a credit card problem.¹⁶

We can benefit from Office Depot's experience. By integrating our systems and data, our soldiers (customers) could also easily and quickly check the status and also confirm delivery. This would build customer satisfaction and reliance to reduce any reluctance to use the new systems. In today's military logistics systems, a complex mix of checks and balances are in place to reduce over ordering and waste. Despite these existing controls and balances, a significant amount of excess is ordered, it seems that despite all efforts, excess ordering of parts cannot be avoided. New systems need to be developed that provide the same level of confidence as for Office Depot's customers. The military would quickly adapt to the new higher level of service and soon come to expect no less than instant status and rapid, reliable delivery.

Food services will be on-line and fresh. Advanced systems can detect what foods are eaten (and not) to develop trends and monitor likes and dislikes, all so that a variety of fresh healthy meals are provided hot, anyplace, anytime. Sounds impossible, maybe not. SYSCO Food Services has an existing distribution

network throughout the entire continental United States. The pressures of the commercial world will soon make this type of service available worldwide.

We are your one-stop source for everything that appears on your breakfast, lunch or dinner menu - meat, vegetables, fruit, bread, beverages, desserts-as well as all the items you need to prepare and serve your special dishes, including kitchen equipment, cookware, utensils, dishes, even the furniture in your dining room. And we offer the tools and chemicals you need to keep your operation spotless.¹⁷

Real Time Logistics is rapidly replacing Just-In-Time logistics. Real Time logistics will be an on-line; web based intuitive shopping experience with rapid delivery. Shoppers – including the Army will have to pay as you go; a change from today's standard of delayed billing. Sensor technology and the younger generations' acceptance of everything on-line will make it work. To take advantage of the capability will require a complete revolution in logistics concepts. Our existing logistics computer software, systems and processes should be scrapped and new systems put in place that can capitalize on web based technologies.

THE HUMAN FACTOR

The model for the soldier of the future is not the GI of our large-scale wars, but the Special Operations trooper—the Green Beret, Special Air Service, Spetznaz, or, indeed, the knight of old. The future soldier will be highly trained and skilled, but not in the rigid way of mass armies. He will have to master technologies that are esoteric in the extreme—communications theory, sensor technology, and so on. As with the Special Forces, the small size of the unit will require each man to become an expert.¹⁸

The way that people will use technology is as important as the technology change itself. There are many examples of advances in technology that did not 'catch on'. For example in the 1950s it was predicted that we would soon be flying to work in our private helicopters. Or we would be living on the moon by the year 2000 and space travel would be common. You get the idea. So how is this case different? The information age revolution has taken root in worldwide commerce and is prospering. Moore's Law and Metcalf's Law have reached critical mass and are forcing the digitization of everything. We can no easier go back to the industrial age than our grandparents could go back to the agricultural based society of their grandparents. Nor would we want to. The world wide web has brought the world into our houses, people are adapting and finding that brain power has become a saleable commodity softening the differences that race, gender, physical ability and nationality make. The web future even brings into question the physical location of the worker. Will we need central offices when everyone can just as easily be linked from home?

In the net Future, work goes home and home goes to the office. Intranets will allow employees to work anywhere, anytime, all the time, and will require new management processes to monitor employee performance, create bonding mechanisms, and deal with offsite workers interactively and electronically.¹⁹

We will need to develop new methods of interacting with our workforce. How will productivity be measured? Time and attendance issues will need to be resolved. Telecommuting will allow much of the work to be done at home, 24 hours per day. The central office will start to become a thing of the past as our workforce can be located anywhere in the country (or in the world) via telecommuting. We will need to develop controls and methods to ensure support to troops deployed worldwide.

Take the most obvious substitution mechanism, that of electronic mail for paper, correspondence and documents. It is delivered instantaneously, i.e. usually without any perceptible lapse of time. But it is asynchronous. It can be read and acted upon at once or later. People at widely dispersed places can work on the same assignment at different times as long as their terminals are connected. The once pivotal role of the physical office is dwindling as more and more companies reduce their permanent staff and hire mobile and/or part-time workers instead.²⁰

The teleworker's earnings may exceed those that work in a fixed job, especially if corporate productivity means that there is no longer a fixed job. The overall gain is increased productivity and a gain of a livelihood. Far from being an esoteric concept, remote working might become an important driver of economic and social progress.²¹

It is the human factor, which decides the difference between success and failure in the implementation of Information Technology (IT); and it is precisely this human factor which has brought about the downfall of home computers. Forester appears to have discovered this factor for himself after seven years of working at home:

After an initial honeymoon period of 2-3 years which was accompanied by feelings of elation and productivity it was followed by feelings of loneliness, isolation and a growing desire to escape the same 'four walls'.²²

These quotes illustrate some of the real issues we will need to deal with. Technology can change rapidly, but human behavior takes more time and effort to modify. These concepts will have to be resolved and managed in our digital future. The military will face these challenges too, in some ways the challenges to operating in the digital future will be greater for military forces. Support to military systems will be via a combination of military, civilian and contract personnel, any of which may be provided remotely. The military will have to adjust in order to attract and keep a highly trained and effective workforce. As more and more logistics support is provided by the private sector, the military must find the right blend of military and civilian manpower to maintain systems. The military must prepare for a workforce that is a combination of teleworker, office worker, military, civilian and civilian contractor professionals, synchronizing efforts to provide the level of service needed to support our deployed forces.

The same technological capability that allows candidates to find jobs easily will allow them to change jobs easily. More pressure is placed on the organization to get the right people—and then to keep them happy.²³

SUMMARY

In 2030, everything has been computerized, digitized and is "on-line". Marketplace globalization has marched on at an increased pace, making the world more interdependent than ever thought possible.

Technology has made it so there are few places in the world where you cannot go on-line. Nanotechnology, biotechnology, and infotechnology advances have made the impossible, possible. Low cost computing is a part of everything we do.

Today's military operational tactics are limited by our ability to provide sufficient and timely logistics support. Technologies of the future will allow us to break those limitations – military operational tactics will emerge that take advantage of improved logistics support. Breakthroughs in bio, nano and info technologies will allow us to create an extremely lethal Supertroop as part of the small unit of the future. These Supertroops will be able to 'swarm' into battle areas, inflict damage on our enemies, and move out of harms way. The computer and communication systems capability inherent in a Supertroop will also provide the information needed for logistical support. The on-line systems of the Supertroop permit direct interface by logisticians to predict replenishment of critical supplies, ammunition, fuel, food and water to name a few. Logistics support will mimic military operations, swarming in to provide the logistics support as needed, directly into the forward battle when needed.

CONCLUSIONS

Succeeding at these early stages of digital strategy development requires substantial changes to the organization. In particular, it requires a new attitude toward technology itself. You can't build a wired organization if you still believe, like many of the executives in our digital strategies survey, that technology is essentially a tool to implement strategy rather than the basis of forming strategy. You can't unleash killer apps without aligning senior executives and I/S professionals with the new, common goal of unleashing killer apps. You can't live in the future without moving there first.²⁴

Given that we will be operating in a future world that will be computerized, digitized and "on-line", what steps should we take now to prepare for the digital future? There are many, and some may seem drastic, but the only way to make true change is by breaking from the past.

- Eliminate our existing logistics software systems. They are antiquated and cannot be patched to provide the support our soldiers deserve. We should work with industry to tie our logistics support needs into their systems and vice versa. By doing so we increase the value of our systems (Moore's Law and Metcalf's Law) and also increase the value to our commercial partners. More importantly, we lay the groundwork for direct delivery to our forces. Our systems should be web based, relying on commercial industry standards whenever possible.
- Consider methods to enhance delivery systems. Convergence of delivery – or swarming effect as described for small unit operations will be possible. Work with industry to develop one-way disposable or consumable packaging materiel and delivery containers. Much of commercial industry already has a worldwide presence -- we should capitalize on that aspect to reengineer our transport processes.

- Train and retrain our people to maintain currency with emerging technologies. Our Logistics managers will need to work with and to compete with our commercial counterparts.
- Increase emphasis on the potential for data tampering and hacker incidents. As we develop web based logistics support systems, we will become more vulnerable to computer attack. We will not prevent all, but we should be able to minimize the negative effects of malicious data attacks by continuous training.

WORD COUNT = 5991

ENDNOTES

- ¹ George Friedman and Meredith Friedman, The Future of War: Power, Technology, and World Dominance in the 21st Century (New York: Crown Publishers, Inc, 1996), 378
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