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STRATEGY RESEARCH PROJECT

TRAINING THROUGH TECHNOLOGY
DISTANCE LEARNING IS MORE THAN HARDWARE

BY

LIEUTENANT COLONEL CAROL A. GADDY
United States Army Reserve

SENIOR SERVICE COLLEGE FELLOW
AY00

U.S. ARMY WAR COLLEGE, CARLISLE BARRACKS, PA 17013-5050

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by

LTC Carol A. Gaddy
United States Army Reserve

Dr. Jerry Davis
Project Advisor

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

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ABSTRACT

AUTHOR: Carol A. Gaddy

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As the Army enters the 21st century, forward-thinking Army leaders are preparing to change the traditional methods of training soldiers for battle. Technology will play an ever-increasing role in how the Army prepares to accomplish its mission in the future. Decisions on how to train and sustain soldiers for the *Army of the Future* must be carefully considered in light of both technology and organizational requirements. The Army must continue to stay on the leading edge of technology as a means to train the force through Distance Learning (DL) methods. With increased deployments, reduced force structure (both Active and Reserve Components), and continued integration of Reserve Component units with the Active Component (multi-component units), Army leaders can no longer afford to train the force in the traditional manner. Neither military commanders nor civilian employers can release soldiers to schools for months at a time and still prepare for multiple deployments, before it affects both their military mission and civilian occupation. With declining budgets, the Army must take advantage of training and other opportunities with external institutions that are beyond the boundaries of current Department of Defense-specific training methods. As the Army becomes more training technology based, it must ensure that courseware developers and instructors have the professional training and experience to understand what is needed to develop a fully-integrated DL course. The Army must provide these developers with the proper tools that will enable them to create a DL environment that will train the soldier of the future with the skills, both personal and technical, that will sustain the Army in the 21st century. This paper will trace the history of DL through its various phases, focus on the U.S. military's efforts to exploit DL in the 1990's, and explore in some detail the non-technological approach to developing a DL course and ensuring the successful training of the Army's soldiers.

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PREFACE

During my Army career, I have personally obtained training using nearly every method the military employs. Since my college Reserve Officer Training Corps (ROTC) classes, I have graduated from four Army resident school courses, the Combined Arms, Services, and Staff School (CAS^3) resident course, the Command and General Staff College (CGSC) correspondence course, and the Army Management Staff College (AMSC) resident course. Since my commissioning, I have witnessed both the downsizing and changing role of the military discussed in this paper. Having been operationally deployed in both Panama and "Desert Storm," I am aware of the need for training availability in forward areas. In these examples from my personal interface with military training, I had various problems, e.g., release from current duties, funding for travel, inability to receive forward area training, and others.

During my last assignment at the Army Medical Department (AMEDD) Center and School at Fort Sam Houston, I became aware of efforts to implement Distance Learning (DL) methodologies in the Total Army School System (TASS). Unfortunately, the overall Army focus was, is, and continues to be on technology as the future key to DL. Extraordinarily critical factors, e.g., understanding how/why humans learn, incorporating this understanding into courseware, creating a proper learning environment, and training instructors how to teach using DL methods, are either being ignored or given "lip service" while technology is championed. The next great revolution in DL will come from cognitive research and its application to courseware. This research paper calls attention to the urgency of increasing human learning research.

I would like to thank Dr. Rosemary Durica, Mr. George Paxson, Ms. Nita Lesjak, and Ms. Jan Bush for their cooperation and assistance in helping focus a topic of dissertation size down to a research project, and for providing sources of current and historical information on DL and its application in a military environment.

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TRAINING THROUGH TECHNOLOGY
DISTANCE LEARNING IS MORE THAN HARDWARE

> The Department of Defense's vision is to "ensure that DoD personnel have access to the highest quality education and training that can be tailored to their needs and delivered cost effectively, anytime and anywhere." In tomorrow's dynamic threat environment, we may have to deploy our forces on a moment's notice, often to conduct operations that we cannot predict beforehand. We must be able to train our forces effectively and rapidly, whether they are at home station, en route, or in the theater of operations. This is a lofty goal.
>
> —William S. Cohen, Secretary of Defense

Multiple factors are involved in making a Distance Learning (DL) program work. Much of today's literature and many expert opinions on DL, both inside and outside the Army, equate success with technology, e.g., synchronous/asynchronous communications technologies, video/audio streaming, and others. Although a suitable technological environment is necessary to enable DL, various environments could support DL, depending on multiple factors, i.e., subject complexity, class size, research requirements, and many more. However, producing a trained solider, capable of accomplishing his or her mission, through a DL program requires substantially more than fast Internet connectivity, access to a T-1 line, or more bandwidth. DL is much more than taking current resident courses and putting them on a Compact Disk (CD) or standing an instructor in front of a camera and having him or her present a class. The learning environment must be carefully considered, both technically and non-technically, as well as continually reviewing cutting-edge educational literature. This paper outlines DL's development over its 200+ year history and, analyzing Department of Defense (DoD) budget and other documents, provides insight into the DoD technology-oriented viewpoint on DL acquisition. It then explores the elements of learning research necessary to make a total DL program work and provides evidence that hardware advances do not constitute the next major step forward in DL. Finally, the paper presents its conclusions and provides recommendations to Army leaders as to the direction the Army must pursue in order to maintain the high level of skills (personal, hands-on, and technological) that are required to maintain a trained and ready force.

BACKGROUND

DEFINITION

Distance Learning can be defined as "structured learning that occurs without the physical presence of an instructor." There is nothing in that definition that can be construed to make DL synonymous with advances in technology. The United States Air Force Distance Learning Office at Maxwell AFB, AL, outlined the following as key attributes of DL:

- Physical distance between the learner and instructor
- Sponsored by an academic institution or functional organization
- Part of a structured curriculum with stated objectives
- Provides for two-way communication and feedback between institution and learner
- Deployed outside the confines of the resident schoolhouse
- Includes process to evaluate learning outcomes

If a program does not have these attributes, then it is not a DL program.[1]

HISTORY

Distance Learning has evolved over four phases that are depicted in Figure 1. As can be easily seen from the figure, the age of Distance Learning through electronic media is very short when compared to the long history of Distance Learning through print. Distance Learning, Phase I, goes back over 200 years. Offerors of Distance Learning in those early days used print media and the postal service to develop "correspondence education." For example, the Boston Gazette ran ads for shorthand lessons by mail in 1728 while the University of Queensland in Australia

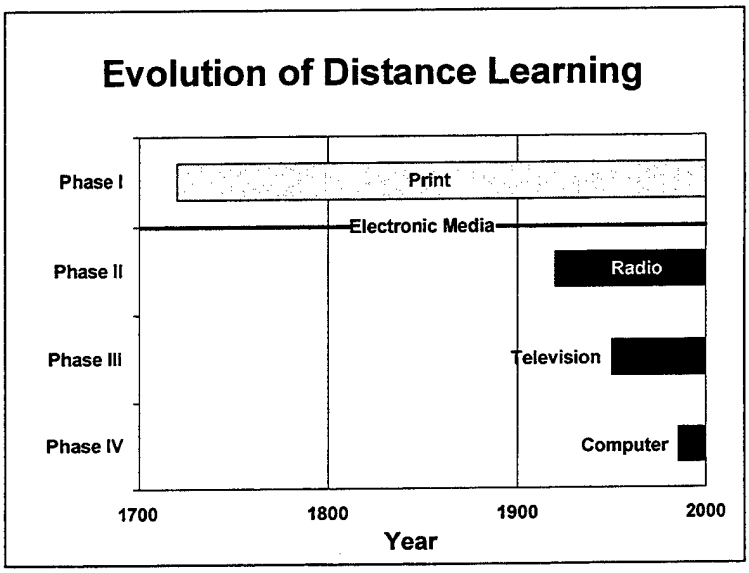

FIGURE 1. EVOLUTION OF DISTANCE LEARNING

offered an external degree program in the 1890s.[2] In the U.S., Columbia University was the first institution to begin offering extension programs through the mail in the 1920s.

DL progressed through the three electronic media phases in increasingly rapid order. In phase II, beginning in the 1920s, radio technology provided an exciting new direction in DL. Federal licenses to establish educational radio stations were issued to the Latter Day Saints University in Salt Lake City in 1921 and to the Universities of Wisconsin and Minnesota in 1922. Phase III began in 1950 when Iowa State University became the first educational television (ETV) broadcaster in the world.[3] As of 30 September 1998, according to the Federal Communication Commission's 1998 Annual Report, 2,000 licensed educational FM radio and 368 licensed VHF/UHF educational television stations operated in the United States.[4]

In the mid-1980s, revolutionary strides in computer technology spawned a new era in DL (phase IV), from reproducing textbooks on floppy disks and CD media to Internet-based technologies and futuristic designs. In spite of these technological advances, DL is not defined by the technology of the time. Technological advances enable the creation of useful tools that enhance the ability to educate through DL methodologies. However, as stated in the Office of Technology Assessment's 1989 report, *Distance Learning*, "If the teacher on the stem is good, the technology itself can become almost transparent. Conversely, no technology can overcome poor teaching; poor teaching is actually exacerbated in distance education applications."[5]

EFFECTIVENESS

One overriding question to be answered before plunging headlong into massive investments in DL technologies is, "Does empirical evidence exist to suggest that Distance Learning, regardless of the technology involved, is an effective educational methodology?" That is, can effective learning take place outside of a face-to-face teacher-student environment?

An extensive legacy of research literature exists on the effectiveness of DL. In his 1999 book, *the no significant difference phenomenon*, Thomas Russell compiled 355 research

reports, summaries, and papers over the period from 1928 through 1999 into a comprehensive research bibliography on technology for distance education.[6] Of the 105 observations quoted by Russell, 86.7% of them report that there were "no significant differences" in defined learning outcomes for courses offered at a distance when properly designed and delivered. Of the remaining 14 observations that document "significant differences," ten (9.5% of the total group) found positive differences, three (2.9%) found less positive learning experiences, and one (0.9%) found a more positive attitude toward courseware but a lower score than using traditional methods. Analysis of these observations indicates that attitudes toward learning and test scores often improve using DL methods because the student is more actively engaged in the learning process. The later studies (after 1990) lend considerably more credence to the increasing effectiveness of Distance Learning, especially through video and computer technology. For example, in their 1999 study Navarro and Shoemaker state, "...we see that Cyberlearners performed significantly better than the Traditional Learners. Mean score [final exam] for the Cyberlearners was 11.3 while the mean score for the Traditional Learners was 9.8. With a t-test statistic of 3.70, this result was statistically significant at the 99% level."[7]

Russell's compilation of studies, along with many other examples, provide an overwhelming body of evidence that DL can be not only equivalent but also superior to face-to-face instruction. The data gathered by these researchers refocused DL emphasis from technology, which has been determined as not a significant factor, to course instruction and design techniques, which when properly instituted provide an improved learning environment.

THE MILITARY'S HISTORY WITH DISTANCE LEARNING

The United States military has been involved in DL during all four phases of its evolution. Since before the United States Military Academy was established in 1802, training was conducted using DL methods. For example, a soldier in the Continental Army could have been instructed in bayonet drills, and then expected to practice on his own until he communicated with the instructor again. This is similar to asynchronous DL methodologies of today.

More recently, DL is a normal part of each military service's education and training programs. Using paper media, the services offered a variety of career development programs, e.g., Professional Military Education (PME), military specialty training, college, and other courses. The services now provide operations training, PME and continuing education using a multitude of media, e.g., floppy diskette, CD, satellite, teleconferencing, and the Internet.

DISTANCE LEARNING AND THE U.S. MILITARY IN THE 1990s

In the 1990s, a combination of factors has forced the military services to explore alternative methods of training its force. Declining military budgets, increasing weapons technology costs, significantly decreasing personnel availability, increasing missions and deployments, and greater reliance on the Reserve Component are several of the more compelling arguments that training could not continue at the *status quo*.

DL, with its enormous potential to reduce costs and increase the number of trainees, has become the leading candidate for change agent, appealing to leaders both inside and outside of the government sector. As discussed above, DL historically meant correspondence courses—volumes of sub-courses sent to individuals to work without mentoring or guidance from an instructor or interaction with fellow students. Today, audio, video, and computer technologies are common delivery methods.

DL has gained acceptance in the military departments for its capacity to save precious training dollars and reduce the amount of time a soldier spends away from his or her unit, and for its efficiency in increasing training readiness by providing training when and where needed. DL methods can reduce pre-deployment time by training and re-certifying individuals, teams, and units at their home or mobilization station.

THE PAST

DECLINING BUDGET AUTHORITY

As shown in Figure 2, the Department of Defense's slice of the budget dollar has been steadily declining, relative to both federal outlays and net public spending since the mid-1960s. This trend is projected to continue through fiscal year (FY) 2005.[8] Consequently, funding for programs within the DoD has become increasingly harder to obtain. In its FY 1996/1997 Budget Estimate Submission (BES), the Army projected that its training budget for operating forces (Operations and Maintenance, Army (OMA), Budget Activity 1 (BA1), Operating Forces) would drop approximately 40% in FY 1996 and FY 1997 from the FY 1995 appropriated amount. At the same time, the Army's budget for training individuals (OMA, BA3, Training and Recruiting) was projected to grow by only 3%.[9] This was the existing environment when the Chief of Staff of the Army approved formation of the Army Distance Learning Program (ADLP) in April 1996 to leverage existing technologies and applications to modernize and make Army skill training more efficient. All hardware and software would be commercial off the shelf (COTS), and the communications infrastructure would be a nationally available commercial system. The first year of funding for the ADLP was FY 1998 when an initial budget of $25.238M was established. The ADLP plan for FY 1998 was basically technology insertion into existing classrooms, building a few new classrooms, and using video teleconferencing as a training methodology.[10]

DoD's SLICE OF THE DOLLAR

FISCAL YEAR	DOD OUTLAYS AS A PERCENTAGE OF FEDERAL OUTLAYS	DOD OUTLAYS AS A PERCENTAGE OF NET PUBLIC SPENDING
2000	14.8	9.1
1999	15.3	9.4
1998	15.5	9.5
1997	16.1	9.9
1996	16.2	10.0
1995	17.2	10.7
1994	18.4	11.5
1993	19.8	12.4
1992	20.7	13.1
1991	19.8	12.6
1990	23.1	14.8
1989	25.8	16.5
1988	26.5	17.0
1987	27.3	17.6
1986	26.8	17.9
1985	25.9	17.6
1984	25.9	17.5
1983	25.4	17.3
1982	24.7	16.9
1981	23.0	15.8
1980	22.5	15.3
1975	25.5	16.5
1970	39.4	25.4
1965	38.8	25.2

FIGURE 2. DoD'S SLICE OF THE DOLLAR

LIMITED NUMBER OF AVAILABLE SEATS IN RESIDENT COURSES

PME, especially at the senior level, has always been difficult to obtain in residence. The United States Army War College (AWC) at Carlisle Barracks, PA, states on its official Website

that for each selection board, approximately 740 Lieutenant Colonels and equivalent grade civilians are selected to participate in the AWC curriculum. Of these, 300 will attend the 10-month resident course, 40 will attend various other educational opportunities (universities, other services senior schools, international, etc.), and 400 will participate in AWC distance education.[11] Only 46% of those selected will have the advantage of participating in the classroom with its student-instructor and student-student interactions, lecture series, and field trips. The statistics for the U.S. Army Reserve (USAR) are even more critical. In its FY 1999 class selection, the USAR had 122 members selected for AWC. Of those, 20 are attending in residence[12], 6 are at various fellowships[13], and 96 (79%) are participating in AWC distance education.[14] In this era of downsizing, when the Reserve Component (RC) is being counted on to fill more roles and Joint PME is one of the cornerstones of the Joint Chiefs of Staff vision of the future in Joint Vision 2010[15], it is almost inconceivable that the USAR comprises less than 8% of the AWC resident students, while making up over 17% of the Army force structure.

INCREASED MISSIONS AND DEPLOYMENTS

Since the end of the Cold War, the Army's missions and deployments have rapidly changed and increased. In 1998, the Secretary of Defense (SECDEF) stated, "On any given day in 1997, we had, on average, over 31,000 active and reserve soldiers and civilians deployed in over 70 countries...In May 1997, worldwide deployment reached the 100-country mark for the first time in the Army's history."[16] Although the Army's primary mission is still fighting and winning major conflicts, today's Army is organized, trained, and equipped to respond to a full spectrum of crises, including peacekeeping and humanitarian efforts worldwide as well as responding to natural disasters, civil disturbances, and other national emergencies. Figure 3 shows the various regional locations of U.S. military personnel around the world as of 30 September 1998.[17] Additionally, training exercises are increasing in both number and

duration. The Reserve Affairs Policy Board Annual Report for FY 1995 listed over 140 exercises and operational missions in which the RC participated.[18]

Active Duty Military Personnel Strength by Regional Area						
Regional Area	Number of Countries	Total	Army	Navy	Marine	Air Force
United States/Territories	8	1,146,959	374,433	323,374	144,220	304,932
Europe	35	116,444	69,397	12,356	3,324	31,367
Former Soviet Union	9	89	27	19	36	7
East Asia/Pacific	15	95,680	29,840	21,612	21,530	22,698
North Africa/Near East/South Asia	23	27,869	3,688	17,220	545	6,416
Sub-Saharan Africa	27	515	279	4	218	14
Western Hemisphere	28	10,786	3,922	3,548	1,280	2,036
In Transit		8,488	2,294	4,205	1,989	-
Total	145	1,406,830	483,880	382,338	173,142	367,470

FIGURE 3. ACTIVE DUTY PERSONNEL STRENGTH BY REGION

DECREASE IN FORCE STRUCTURE AND PERSONNEL

The period since the collapse of the Soviet Union in 1991 has witnessed a phenomenal downsizing in the U.S. military. Since 1991, there have been several major assessments of the Armed Forces force structure necessary to meet U.S. defense requirements.

The 1991 "Base Force" assessment resulted in a 25% reduction in forces over the Five Year Defense Plan (FYDP).[19] The 1993 "Bottoms-Up Review" (BUR) extended the "Base Force" cuts for three years, resulting in a 33% force structure reduction.[20] In 1996, Congress directed the Quadrennial Defense Review (QDR) to perform a "...comprehensive examination of the defense strategy, force structure, force modernization plans, infrastructure, budget plan, and other elements of the defense program and policies..."[21] The QDR recommended reductions in active, reserve, and civilian strength by an additional 2.8%, 4.7% and 7.2% respectively, over the BUR, amounting to more than a 35% reduction from the total 1989 DoD force structure.

The effects of these reductions and mission redefinitions (Base Force, BUR, and QDR) on the U.S. Army strength have been staggering. Figure 4 depicts the actual and projected personnel strength changes by Active Component (AC), Army National Guard (ARNG), USAR, and Department of the Army civilians (DAC) from FY 1989 through FY 2001.[22] The Army is projecting a 36% decrease in total personnel over this thirteen-year period. This major

decrease in personnel, when viewed in light of the multiple changes in mission direction to a ready, flexible, and responsive force, serves to focus attention on the requirement for a new paradigm to train the force.

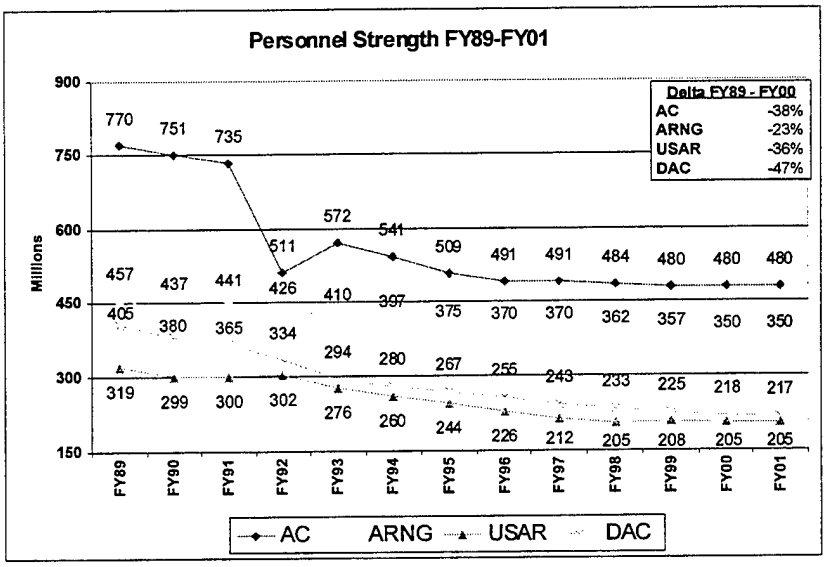

FIGURE 4. U.S. ARMY PERSONNEL STRENGTH, FY 1989-2001

Reserve Component training presents special challenges. When compared to their active duty counterparts, National Guard and Reserve members have limited time available to train and training is difficult to support because members are widely dispersed. For example, members of the 332[d] Medical Brigade (USAR), home-stationed in Nashville, TN, commute from varied locations, e.g., Memphis and Johnson City, TN (over 300 miles each direction); Paducah, KY; Birmingham, AL; Atlanta, GA; and Philadelphia, PA. It was difficult to conduct any type of training when the unit was not at either monthly drill or annual training.

The RC is examining innovative technologies with the potential to meet these challenges and to leverage scarce training resources. DL techniques have demonstrated this potential. They involve using available instructional technologies—print, videotape, computer-based training, interactive videodisk, and video teletraining (VTT)—to deliver training to a student's training location or home. This is one cost-effective way to overcome RC geographical dispersion and limited training time[23]. When combined with current and emerging simulation technology, new and dramatic opportunities may occur. These include performing Virtual Brigade exercises, which involve unit headquarters located throughout the United States exercising electronically. The use of simulation devices, particularly at the Reservist's home or

reserve center training site on weeknights and weekends, has also demonstrated value. DoD's long-range goal is to provide simulation devices that focus on the specific training needed and are inexpensive enough to field at every required training site. Funding support for training simulators and related research and development has been critical to the progress in this area to date and will be needed to sustain future training readiness.[24]

THE PRESENT

In order to plan for the future, one must understand today's environment. This section addresses the current Army DL program in terms of budget, constraints, and implementation.

DISTANCE LEARNING TRAINING BUDGETS

In 1998, the Army reported the Army Distance Learning Program (ADLP) as a Major Automated Information System (MAIS) program to consolidate all DL efforts within the Army and leverage available technology to train to a single Total Army standard. ADLP was technology insertion by converting classrooms and existing courses to DL format. Course conversion to DL technology consisted of reproducing existing training manuals on CD media for distribution to the field. Additionally, hardware was to be purchased and installed to make available new classrooms and VTT facilities. Nothing addressed a need for instructor or student facilitation. The initial budget projection for ADLP was $25,238M in FY 1988 and $40,065M in FY 1999.[25]

In 1999, ADLP had been transformed into the Total Army Distance Learning Program (TADLP), which expanded the very limited goals of ADLP to begin to focus on areas outside of technology insertion. TADLP goals included reduction of TDY and other costs and improved service member morale, efficiency and effectiveness of Army instructors and unit readiness. TADLP also emphasized extensive teaming between DL experts from the Army, federal government, industry, and academia, to share knowledge and incorporate standards that are effective and efficient both inside and outside of the DoD. TADLP would "...emphasize the

redesign of courses to take full advantage of technological advances and the application of modern learning theory." However, the methodology was not included.[26]

In February 2000, TADLP had matured as a program. Figure 5 shows the projected budget for TADLP through FY 2005. Currently, TADLP is scheduled for two phases, plus follow-on. Phase I consists of limited capability DL classrooms composed of COTS infrastructure and leased VTT services. Phase II provides enhanced telecommunications capabilities to use the inter/intranet-based training and will be integrated with existing Army personnel training and management systems. The goals of TADLP are:

	Dollars in Millions					
	Cum Total FY 1998 and prior	FY 1999	FY 2000	FY 2001	Cum total FY 2002 through FY 2005	Total
Full Acquisition						
OPA	14.5	24.5	21.3	36.0	101.0	197.3
OMA	10.9	42.1	46.0	42.1	232.5	373.6
RDT&E	0.0	0.0	0.0	4.9	19.1	24.0
Total Dev Mod	25.4	66.6	67.3	83.0	352.6	594.9
Current Services/Maintenance						
OMA	0.0	2.4	14.9	14.2	59.0	90.5
Total Current Service	0.0	2.4	14.9	14.2	59.0	90.5
Total Resources by FY	25.4	69.0	82.2	97.2	411.6	685.4

FIGURE 5. ARMY FY 2001 PRESIDENT'S BUDGET FOR TADLP

- Address AC and RC training requirements that have a readiness impact.
- Train soldiers anytime, anywhere.
- Maintain acceptable readiness levels in an era of declining resources.
- Train at dispersed facilities, armories, reserve centers, home station, and deployed.
- Put 95% of all soldiers within 50 miles of a digital training facility by FY 2006.
- Provide courseware media to include, computer-based training, video-teletraining, simulations, audio conferencing, Email, and video.
- Acquire non-developmental automation systems, leveraging existing infrastructure and COTS as much as possible.
- Support the DoD Advanced Distributed Learning (ADL) initiative to provide high-quality "learner centric" training and education.

However, the definition of TADLP still does not include direction on incorporating advances in learning theory.[27]

TODAY'S CONSTRAINTS ON DISTANCE LEARNING

There are many constraints on the implementation of DL in today's environment. Some are Army-specific while others are applicable to DL applications in industry or academia. A major constraint is the limited availability of the Internet throughout the United States. Data collected through December 1998 by the Department of Commerce's Census Bureau, provides the availability of the Internet to households by state. New Hampshire, the state with the highest Internet availability, has only 37.1% of its households connected. Nationwide, 73% of households are off-line while rural areas are an additional 50% further behind.[28] Even if Web-based DL courseware and delivery technologies were perfect, they would not be accessible by a majority of the country. Additionally, this information can be interpreted to indicate that the majority of the country may not be familiar or comfortable with computer technology—a very necessary requirement for student learning through DL methods.

More directly relevant to the Army, a survey by the U.S. Army Research Institute, depicted by Figure 6, revealed that U.S. Army officers and enlisted personnel have disparate access to personal computers, either at home or in the office.[29] They have access to computers with a widely varied set of capabilities and no approved standards, which makes the introduction of DL techniques very difficult.

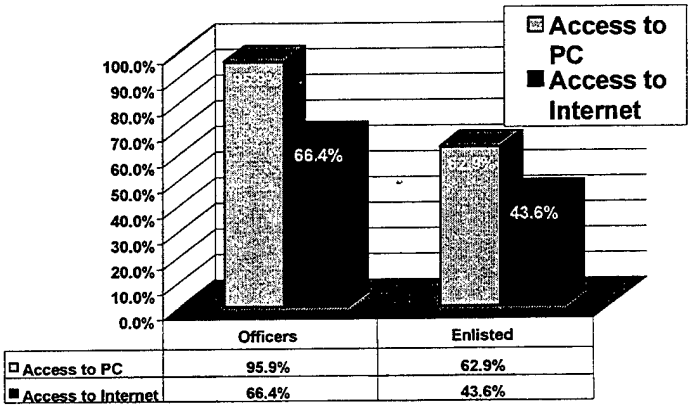

FIGURE 6. OFFICER AND ENLISTED ACCESS TO PC

Additionally, constraints exist based on the level of technological development outside the United States. One of the tenets of DL is that it should be capable of being delivered anytime, anywhere. In order to accomplish this, the level of technological development in forward-deployed areas needs to be advanced enough to support the DL delivery method

chosen for that region. Figure 7 depicts the current technology assessment by region.[30] As can be seen, access outside the U.S. is a critical component of establishing a successful DL environment. Providing DL capability to forward-deployed soldiers in these regions could be solved through use of CD media to distribute course material into these regions until the electronic capabilities come up to speed.

Current Technology Assessment—Synopsis By Region				
	Telecomm Infrastructure	Computer Equip	E-mail Capability	WWW Access
Balkan Region	Minimal	Minimal	Minimal	Very Minimal
Baltic Region	Good	Fair	Good	Fair
Central Asia Region	Very Minimal	Minimal	Minimal	Very Minimal
Russian Region	Good	Good	Good	Good
Transcaucasus Region	Minimal	Minimal	Minimal	Very Minimal
Ukraine Region	Fair	Fair	Good	Fair
Visagrad Region	Fair	Fair	Fair	Minimal

FIGURE 7. CURRENT TECHNOLOGY ASSESSMENT

Finally, there are the challenges of Web-based training within current technology. Several issues were raised to the Secretary of the Army's Distance Learning subcommittee in January 1999. The three major areas of concern were firewalls throughout the DoD, limited bandwidth, and plug-ins needed for audiovisual files. Firewalls are not friendly for DL, yet network security must be addressed due to the increased presence of hackers, viruses, and the like. Fundamental conflicts exist between high-resolution graphics and course size and speed. This is currently resolved by delivering the course as text-based information. When courses run slowly, students lose interest and do not learn. If the new page is received within 1/10th of a second, the learner feels that the system is reacting simultaneously. After a 1-second interruption, the learner's flow of thoughts is uninterrupted even though he notices a delay. However, after ten seconds, the learner's attention wanders. Finally, unless students are experienced Internet users, most will not be able to install and set up their plug-ins correctly.[31]

EXAMPLES OF CURRENT DL IMPLEMENTATION IN THE ARMY

DL is especially critical in training the Reserve Components. George Paxson, Office of the Chief, Army Reserve's (OCAR) Operations Division, says that about 40 percent of courses will be for Reserve Component military occupational specialty (MOS) reclassification. During a recent interview, Mr. Paxson said, "Distance learning will help the Army Reserve accomplish its

mission despite limited training dollars and a limited number of training days."[32] The 84th Division is the first of many Reserve units that will eventually use Distance Learning as a regular training asset. For the next five years, the Department of the Army is earmarking roughly $55 million per year to fund the program. By 2010, the Army plans to have 745 classrooms at more than 200 sites, able to teach 525 courses to soldiers at their home stations.[33]

The Army is investing in simulators and simulations to enhance training and produce more capable units in the future. In 1997, the Army established a Total Army School System (TASS) with fully integrated schools to leverage information technology in its DL program. TASS allows the Army to deliver training and education to widely dispersed geographical areas where and when needed. Each component is expanding efforts to reduce duplication, share information and resources, and make tough decisions on necessary organizational change.[34]

The DL program has moved at a rapid rate throughout the Army as proponent schools tried to align themselves with the requirement to convert courseware. In February 1999, there were 420 courses at a multitude of proponent schools that were listed as candidates for redesign as DL courses.[35] DL professionals are now just learning and understanding the critical steps that were missed in the implementation process. The Army must stop, take a breath, and reexamine the process of courseware and the competencies required for DL professionals.

THE FUTURE

In its FY 2001 President's Budget submission, the Army continues to emphasize DL based on readiness requirements. Between FY 1999 and FY 2002, the Army will redesign 31 DL courses annually; in FY 2003, this increases to 47 annual redesigns. At that rate, course redesign will not be complete until FY 2009. However, the future of Distance Learning, both within and outside the military services, lies in the final bullet from the Army's FY 2001 President's Budget submission—"support the DoD Advanced Distributed Learning initiative to provide high quality 'learner centric' training and education."[36]

DoD's Advanced Distributed Learning Initiative

In FY 1999, Congress directed the Department of Defense to develop a Strategic Plan and an Implementation Plan for applying advanced distributed learning technologies on a broad scale. In April 1999, DoD provided Congress with the *Department of Defense Strategic Plan for Advanced Distributed Learning,* based on the DoD Advanced Distributed Learning (ADL) Initiative.[37] Five major strategic elements were outlined to accomplish this plan:

- Common industry standards.
- Interoperable tools and content.
- A robust and dynamic network infrastructure for distribution.
- Supporting resources.
- Culture change at all levels of command, recognizing that learning is an official requirement of the duty day.

DoD is currently establishing and coordinating the specific programs, schedules, and resources that the Department has allocated to implementing the ADL initiative. The Under Secretary of Defense for Personnel and Readiness (USD(P&R)) has requested that each military component provide detail for each planned course conversion. This will provide a basis to report to Congress the best estimate of actual expenditures on and schedule for the ADL initiative.[38]

To bring the promise of the five strategic elements outlined in the ADL report to Congress to full fruition requires involvement beyond the Department of Defense. One of the major concerns that instigated the Congressionally mandated report was the proliferation of DL initiatives within the DoD and its components. The Office of the Secretary of Defense, Army, Air Force, Navy, Army National Guard, Army Reserve, Air Force Reserve, and many others, had begun to consolidate the various DL efforts within each of their respective areas. As usual within the DoD, each component was off "doing their own thing,"—bringing their vision of DL to reality without any crosscheck with other components. Other federal government agencies were involved in DL programs on their own. Finally, industry and academia were heavily

engaged in bringing various DL strategies to life, mostly within their own organizations. As a result, no standards existed across the various organizations working on DL technologies, not only within the DoD but also the federal government, industry, and academia. The basic tenets of a DL program should be transportable irrespective of the organization to construct the most efficient and cost-effective training methodology.

Through ADL, the DoD is forming partnerships with private industry, educational institutions, and the training community to formulate voluntary guidelines to meet common needs. The DoD and other federal institutions are looking for a distributed learning solution that will allow them to train vast, heterogeneous groups of people on a continual basis. The DoD, in particular, is looking for the ability to reuse content and provide on-the-fly training. In a recent interview, Mr. Michael Parmentier, DoD Director of Readiness and Training Policy, stated, "The ADL Initiative will allow one organization to develop training that another organization can either use directly or adopt for their purposes."[39] To assist in establishing the connections needed with industry and academia, DoD has established the ADL Co-Laboratory (Co-Lab) to provide an open testing environment for the collaborative development of technical standards, learning prototypes, and tools. The Co-Lab will facilitate resource sharing and research across the government and non-governmental entities.

"ADL IN 2012"

Currently, the Deputy Under Secretary of Defense for Science and Technology (DUSD(S&T)) funds basic research into Cognitive Readiness, which underscores the importance of the human dimension in war and pioneers research into understanding that advances in cognitive performance may become a revolutionary war-winning capability. The ongoing "Revolution in Military Affairs" suggests a need for a shift in focus in military training and education from relatively rudimentary skills associated with specific techniques and procedures to higher order cognitive skills involving collaboration, reflection, and articulation. The ability to seamlessly conduct operations ranging from military operations other than war

(MOOTW) to general warfare requires flexible and adaptable personnel. As articulated by *Joint Vision 2010*, "People are the Armed Forces; at the end of the day, our success, in war or in peace, will rest ultimately on the men and women of the Armed Forces."[40]

To address the recognized need for advances in training the force, the DUSD(S&T) established the vision and target date of 2012 to realize the potential of ADL.[41] The vision is:

> "*ADL in 2012*" will be a collaborative, affordable and adaptive instructional environment for the Department of Defense education and training. The environment will be interoperable, open and evolutionary, with a ubiquitous, distributed, standards-based infrastructure. "*ADL in 2012*" will have an integrated toolset to permit intelligent design guidance, continuous task analysis, learning and filed performance assessment and feedback, cognitive task analysis, insertion and modification of practice components, and automatic upgrades of training and performance support content and strategies. Adaptable to characteristics of learners and teams, "*ADL in 2012*" will account for aptitude, diversity, and culture, incoming skills and knowledge, and provide training and performance support anytime and anywhere for DoD missions. Individuals and teams will be supported by a system that promotes development of competencies such as collaboration, problem solving, analysis, evaluation, reasoning, critical thinking, and decision making. They will be supported by an instructor and peer-based dynamic mentoring environment. "*ADL in 2012*" will be sustainable through a policy and institutional environment that adapts to fully support and embrace this vision.[42]
>
> —Under Secretary of Defense for Science and Technology

"ADL in 2012" will support the Total Force and contain six important features:

- Accessibility: access instructional components from one remote location and deliver them to many other locations.
- Interoperability: use instructional components developed in one location with one set of tools or platform in another location with a different set of tools or platform.
- Adaptability: tailor instruction to individual and situational needs.
- Reusability: incorporate instructional components into multiple applications.
- Durability: operate instructional components when base technology changes, without redesign or recoding.
- Affordability: increase learning effectiveness significantly while reducing time/cost.

ADL is in the prototype stage, requiring experts to design and implement instructional programs. Lack of scientifically valid principles for course design and standards regarding content format and infrastructure are complicating ADL implementation. Current successes are typically labor intensive and not transferable from one subject to another.

A four-day workshop hosted by the DUSD(S&T) in October 1999 identified four key elements that need focused research in those areas to achieve the *"ADL in 2012"* vision.[43]

- Intelligent Computer Aided Instruction (ICAI): ICAI focuses on the development of an empirical foundation of how individuals and teams develop expertise, guide the selection of ADL instructional alternatives, and provide accurate assessment to enable appropriate follow-on and remedial instruction.
- Authoring Tools: Authoring tools look at the development of tools to quickly and appropriately retrieve and apply digitally coded knowledge and skills to the development of intelligent tutors and embedded assessment.
- Distributed Simulations: Distributed simulations look at the problem of generating realistically performing models of individual behavior, virtual team members, adversaries, friendly forces, and non-combatants in a realistic environment.
- Dynamic Learning Management (DLM): DLM addresses the infrastructure architecture needed to ensure ADL interoperability and security.

For the first time senior leaders are recognizing that how individuals and groups learn should be the focus of future research—the *"ADL in 2012"* vision is independent of the infrastructure and technology required to implement it.

The ultimate goal of ICAI is to obtain the 2 sigma improvement in learning demonstrated by Bloom.[44] More recent work indicates that machine tutoring can produce gains approaching the time consuming and expensive process of human tutoring[45]. To achieve these results, ICAI must duplicate the continuous assessment process (formative, ongoing, summative) inherent in

traditional tutoring. The ability of the instructor to recognize student understanding and predict behavior is directly related to selection of instructional approach and subsequent instructional effectiveness. Understanding a learner's cognitive state enables the instructor to choose corrective action that the student can process. Further insights into the process of individual and team learning are required for next generation military ICAI. Cognitive research has compiled a wealth of data regarding individual learner issues. Factors ranging from the learner's background and motivation to general intelligence are recognized components of sound course design. Less understood is the dynamic of team learning involving the interaction and collaboration of two or more individuals pursuing a common goal or outcome.[46]

Unfortunately, even though the "*ADL in 2012*" report contains the right words—human cognitive theory; assessment; collaborative, group, and team learning; intelligent tutors; and human-computer interface—the recommendations in the report do not carry through with this theme. Only one recommendation discusses the need to convene a panel of experts from multiple disciplines, both inside and outside the government, to understand human cognition. This is tacit recognition that actually understanding the human cognitive and learning process is still in the very early stages and research into this area is not as well funded as others.

As can be seen from Figure 8, of all DoD money spent on Basic Research (Budget Activity 6.1), only four percent is spent on cognitive and neural research, the second lowest total of any area.[47] It is easy to fall back on technology as the "great enabler"; however, hardware development and advocacy will not accomplish the vision *of "ADL in 2012."* As stated *in "ADL in 2012",* "Understanding human cognition forms the basis for

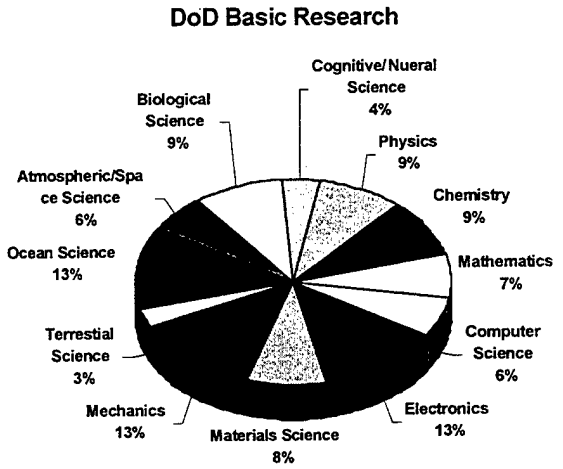

FIGURE 8. DOD BASIC RESEARCH PERCENTAGES

developing effective learning and practice environments." If this objective is not achieved, then DL cannot progress very much past its current state of CD and video media, regardless of the technological improvements.

The current state of DL in the DoD was, is, and remains hardware-centric. Although how and why humans learn has been identified as extremely important, DL budget requests continue to be directed toward hardware acquisition and transferring current courses to CDs. The study of human cognition is a tenuous, difficult-to-define area, which does not lend itself to simple budget justification or defense. However, this is the area that will provide the "next great leap" forward for DL, and desperately needs to be championed. The remainder of this research paper will outline why the cognitive process is so important, cultural problems affecting implementation of a DL program, attempts to integrate technology and cognitive research into a total package, and several recommendations for future study direction.

THE TOTAL PACKAGE: DL IS MORE THAN HARDWARE

> The sophistication of learning produced by technology depends on the sophistication of the conversation surrounding its use, not the sophistication of the technology.
>
> —Stanley Progrow

Distance Learning is a total system integrating technology, support packages, instructor training, courseware and student expectations that must be built, trained, evaluated and updated as a whole—not as independent systems that are brought together after the fact.

Research indicates that DL programs are successful when organizations implement a "Total Program."[48] The Army DL process should not stop with installation of hardware and implementation of technology. The focus must shift to the development and continuous evaluation of a total DL package that includes integrating instructors, facility, support staff, and courseware development with current and future hardware and delivery systems.

> Without exception, effective distance education programs begin with careful planning and a focused understanding of course requirements and students. Appropriate technology can only be selected once these elements are

> understood in detail. There is no mystery to the way effective distance education programs develop. They evolve through hard work and dedicated efforts of many individuals and organizations. In fact, successful distance education programs rely on the consistent and integrated efforts of students, facility, facilitators, support staff, and administrators.[49]
>
> —University of Idaho, Engineering Outreach

This cannot be accomplished until the competencies required for DL instructors, what motivates students to learn in different learning environments, and how to present learning materials in a way that learning can occur are first understood.

DEVELOPING A DISTANCE LEARNING PROGRAM—NEW PARADIGM

COURSE DEVELOPMENT

The conversion of current resident courses to Army Distance Learning courses must be viewed as creating a course with unique requirements concerning the learning environment, how adults learn, how to maintain hands-on training skills, student-to-student interaction and a strong student-to-instructor mentor relationship. These new requirements are in the form of materials, presentations, unique mentoring, and evaluation considerations. Not all adults learn using the same internal methods. The Army must look much more closely at courseware development as it relates to human behavior and learning. As the number of DL courses increase, DL professionals are beginning to understand that traditional teaching techniques will not work in a Distance Learning environment. Lecture-based instruction is not as effective when it is simply converted and communicated through technology.[50] Faculty and staff involved in Distance Learning instruction need detailed training to learn the new roles and competencies they must acquire if they are going to be successful in a Distance Learning environment.[51] In developing or adapting instruction, the core content remains basically unchanged, although its presentation requires new strategies and additional preparation time. However, when reviewing existing material, instructors should not use it just because it is readily available and was effective in the traditional classroom.[52] One of the greatest challenges facing Distance Learning

instructors is creating student-relevant examples and remembering that they may not be there to explain them. Instructors and courseware developers must analyze and understand the strengths and weakness of delivery systems available to them (e.g. audio, video, data, print) not only in terms of delivery, but also in terms of learner needs and course requirements before selecting a mix of instructional technology.[53]

In order to develop effective DL courseware, developers must understand the difference between education and training. In its most simplistic form, training is about performance, and education is about knowledge. Alan Rogers describes learning (training) as a process of making changes in things the learner knows, i.e., skills, value systems, and attitudes. He describes education as episodes of planned learning —a planned process performed by intent.[54] The difference is critical in developing effective DL courses. Most senior managers feel that training is similar to education and anyone who knows the subject is qualified to design training materials. They are focusing on knowledge rather than on improving performance. The power in this relationship resides with the trainer and not the learner. Less experienced trainers will fall into this educational style for several reasons, e.g., this is the method they have been taught and that is what their superiors expect. Training, on the other hand, is about the application of knowledge and performance of skills. The two most critical elements of training are people and performance. Training is helping students to perform better.[55]

The Army's main training focus is to provide knowledge to encourage a soldier to perform some task better than before. However, education is often provided where the power is with the instructor and not the learner. Knowing and understanding the difference is critical to the design of Distance Learning materials. In the lecture hall environment, still used in some teaching situations, instructors throw viewgraphs in front of or lecture to students for hours and expect them to not only stay focused, but also retain the lesson being presented.

LEARNING STYLES

Learning styles have been the focus of studies for many years. As advancing technologies affect the area of instruction in the classroom, the focus of these studies has shifted from the traditional classroom to the cyber classroom. Learning is an interactive process—the product of student and teacher, focused on a specific learning environment. As student populations become more diversified, it is important to develop and refine training and learning strategies that are sensitive to student differences. People learn at different rates and in many different ways. Some students need to have everything written on the board, while others like to listen, and still others prefer small group discussions. Then there are those who prefer to write it all down and review it later. Difficulties with learning are not frequently related to the difficulty of the subject but rather to the type and level of cognitive process required to learn the material.[56] Simply juggling the requirements of courses without attention to what needs to occur between teachers and students inside the classroom will not automatically produce better-prepared students. In their 1969 *Journal of Educational Psychology* article, Talmadge and Shearer determined that learning styles do exist. Their study shows that the characteristics of the content and the learning experience are critical factors affecting relationships that exist between learner characteristics and instructional methods.[57] In her 1992 article for the National Education Association, Reiff claims that styles influence how students learn, how teachers teach, and how they interact. Each person is born with certain preferences toward particular styles, but culture, experience, and development influence these preferences. Faculty can employ students in various learning opportunities by increasing the number of styles through which students can engage in learning.[58]

Technology provides the instructor with new capabilities to reconstruct learning environments around the multitude of learning styles.[59] It is important that the instructor not only understand the delivery systems within this new technology, but also learning styles and

which methods work best with different students. In Distance Learning, this becomes an even greater issue because instructors do not always have the luxury of face-to-face interaction to determine if an individual is processing the data presented, and the student may not be completely comfortable with the new technology. People are inclined to use new technology the same way they used older technology. In this context, the tendency is to use Distance Learning technology to deliver the same kinds of instruction that is offered in the traditional classroom. Eventually, the new technology will challenge the instructor to try new methods of delivering and presenting information.[60] When the opportunities offered by new advances in electronic information processing technology are combined with the new view on how learning styles affect the learning process, teaching will begin to gain new direction. If used correctly distance instruction can provide an array of opportunities for all students outside the traditional classroom.

LEARNING ENVIRONMENT

> To know someone here or there with whom you can feel there is understanding in spite of the distances or thoughts expressed, can make of this earth a garden.
>
> —Goethe

As technology is used to a greater extent, faculty and students alike are grappling with the changes it brings to the educational environment. Regardless of which instructional method is used, a transition must be made from the traditional classroom to the cyber classroom.

REDEFINING THE LEARNING COMMUNITY

Instructor and students continue to have problems in the different classrooms in realizing that learning outcomes differ depending on which classroom is being used.[61] This has motivated us to better define a learning community. In June 1992, Howard Rheingold wrote an article that stated:

> "Computers, modems, and communications networks furnish the technological infrastructure of computer-mediated communication (CMC); cyberspace is the conceptual space where words and human relationships, data and wealth, and power are manifested by people using CMC technology; virtual communities are

> cultural aggregations that emerge when enough people bump into each other often enough in cyberspace."

Although very simple, this concept indicates that there is such a thing as a virtual community.

In the past, people having common and shared interests would form groups or communities in order to further pursue their interests. These common and shared interests distinguished them from other groups. Belonging to a community (obtaining membership) meant individuals had to adhere to the norms of the community that allowed them to retain their membership.[62] People who grew up in a small town environment came from a community where they felt comfortable, welcome, and safe. Community is no longer a place-based concept, however, what it is and is not must now be defined. Because people correlate communities with strength, guidance, reassurance, and group acceptance, it is important to understand communities' roles in cyberspace. Electronic communication has made it difficult to define exactly what the word community means. For one to obtain membership in a virtual community entails a very different process and may be more difficult for some to achieve. In his 1995 book, *Cybersociety*, Steven Jones states, "The extent to which people use CMC as a means to invent new personas, to recreate their own identities, or to engage in a combination of the two, and the way which they do so, are issues central to the construction of a computer-mediated social world." He is describing what has been termed *the electronic personality*, that is, the person you become when you are communicating online.[63] People who are introverts are more adept at creating a virtual personality because they process information internally and are less comfortable in social settings. Extroverts have more difficulty interacting this way because they are very comfortable processing verbally. "Extroverts choose higher level of noise in a learning environment and perform better in the presence of noise, introverts perform better in quiet".[64] In a virtual community, educators must realize what they use for the medium depends mostly on individual human needs, and that these needs are the prime reason that electronic communities are formed. This means that if an instructor is an extrovert, he or she

may have to focus on keeping the online written community intact, while providing a community that can create learning for all students.

PROMOTING INTERACTION AND MOTIVATION IN LEARNING

In his 1999 book, Raymond Wlodkowski stated, "Motivation is important not only because it apparently improves learning but also because it mediates learning and is a consequence of learning as well."[65] Historically, instructors know that when a student is motivated during the learning process, things proceed more smoothly. The challenge is how to maintain motivation in a DL environment.

MOTIVATION

Motivation is not easily defined. However, it affects the way people act and is a major factor in what makes them want to learn, retain what they have learned, and complete the learning process. One of the problems with understanding motivation is that it can neither be seen nor touched. Wlodkowski indicated that every instructor from the earliest time has had to ponder the question: "What can I do to motivate learning?"[66] When developing Distance Learning courses, developers must keep in mind that individuals at different stages in their lives are motivated for a variety of different reasons. The Army integrates soldiers from many diverse cultures and experiences, which makes motivation, both as individuals and groups, a greater challenge. It is not easy to ascertain what motivates an individual at any given time. If two students with identical abilities are given the identical task and conditions, the motivated student will out-perform the unmotivated student.[67]

Research has determined that adults want to learn for a definite reason, such as learning new skills, advancing in their jobs, or potentially making new friends. This is often true with soldiers, who may be motivated to take courses for promotions or career enhancements, but may become unmotivated if enrolled by outside influences. From the moment an individual enters the Army, he or she is "assisted" in staying motivated. From the first drill sergeant he or

she meets, the soldier is continually kept motivated to learn, train, and "be all they can be." As more courses are transferred to Distance Learning methods, the requirement for instructors and leaders to keep soldiers motivated will become even greater.

Instructors will have to be taught new motivational methods that may be subject to change, depending on the Distance Learning delivery method utilized. How many of us have been told "pay attention or you will not learn anything." Even though this is true, demanding attention from adults does not work. Demanding that someone listen to a lecture when they are not in the mood may only make them less interested in listening, learning, and retaining what is being said.[68] In a Distance Learning environment, it will be even harder for the instructor to get and keep the students motivated.

Instructors must be given every possible tool to promote motivation and mentoring in a virtual classroom. Varying presentation styles is an excellent method to stimulate students to remain focused. Body movement, gestures, voice tone and pitch, and pauses in the right places are all tools that are used regularly by instructors. However, learning how to use them appropriately in the Distance Learning environment may be a challenge. A second method to enhance motivation is to use variety in both the mode of instruction and the learning materials.[69] Using different DL delivery methods, e.g., video, text, and computers, are other ways to diversify the learning process and keep students motivated.

COLLABORATIVE LEARNING

Collaboration is coordination and cooperation of two or more individuals who attempt to perform a task or solve a problem together. In a traditional classroom, the most powerful experiences happen when interaction occurs within the entire group and not just between one student and the instructor.[70] Collaboration is important in facilitating the development of a learning community. An important element to a community is shared goals. In a cyber community the shared goals may be more difficult to define than in a face-to-face classroom.

Distance Learning instructors must be taught how to develop these goals and promote collaboration in an online classroom.[71] One way an instructor can do this is by introducing real life experiences into the cyber classroom. The use of real life experiences makes it easier to motivate the group to share real life experiences they have in common. This is a method often used by senior military leaders when they present a briefing to a group of students. By integrating their real life experiences into the presentation they not only achieve the learning objective, but they also enable students to internalize the desired results. The instructor can use this technique to promote interaction among students, while maintaining control of the discussion without dominating it. The collaborative effort among learners helps them achieve a deeper level of knowledge generation while moving from independence to interdependence.

Both students and instructors must make extra effort to encourage interactions from all participants. Palloff and Pratt provide an example from one of their first DL courses to show the importance of this interaction. They asked each student to post an introduction online that would be available for all in the course to read. Ten of the participants then shared their introductions with the group. After submitting her introduction to the group, one participant disappeared from the online conversation for some time. When she finally rejoined the online conversation she said she had not been "speaking up" because she had not received comments from anyone on her introduction and felt hurt and left out of the group. This experience taught the instructors several lessons:

- In a cyber classroom it is much more difficult to tell how students are reacting.
- It is critical to interact with all participants on a continuing basis.
- Some students may require more attention than others.

It is extremely important to encourage students to begin a dialogue with the instructor and other students.

MENTORING/COACHING (VIRTUAL VERSUS HUMAN CONTACT)

In a learning environment, the amount an individual interacts with their instructor or peers will have an important effect on the amount of attention they give to the learning activity. Knowing they will have to respond and interact will encourage students to pay attention to what is being taught. In Distance Learning, this becomes even more important, because there is a physical separation between the instructor and students. Instructors must ensure that this interaction is taking place regardless of the technology used to deliver the course. They must learn to use the technology available to promote interaction.[72]

TRAINING AND CERTIFICATION PROGRAMS FOR DL PROFESSIONALS

As more experience is gained with courses that have been converted to DL courseware, DL professionals are realizing that traditional teaching techniques will not work in the DL environment. Placing the focus on delivery of content in a lecture-based format does not come across as effectively when delivered through technology.[73]

ROLES AND RESPONSIBILITIES

Personnel involved in the DL environment need guidance in identifying the new roles they must assume to be successful DL professionals.[74]

COMPETENCIES FOR DL FACULTY

An article by Elizabeth Thach and Karen Murphy discussed the importance of competencies for DL professionals. Based on their research, they came up with the top ten competencies that have a dual role in the importance of communication and technical skills in Distance Learning. These competencies, in order of importance, are:

1) Interpersonal Communication
2) Planning Skills
3) Collaboration/Teamwork Skills
4) English Proficiency

5) Writing Skills

6) Organizational Skills

7) Feedback Skills

8) Knowledge of Distance Learning

9) Basic Technology Knowledge, and

10) Technology Access Knowledge

They identified the key roles, outputs, and competencies for Distance Learning professionals, how DL instructors rated the importance of outputs and competencies by role, and which competencies they rated as being used most. They then grouped the roles, outputs (product, service condition, and/or information resulting from performing the role), and competencies (an area of knowledge or skill critical to production of outputs) into a descriptive model that portrays the top ten competencies that are important to all roles. This competency model can then be used as a foundation for faculty development programs for Distance Learning. Each of these competencies is a critical part to developing and producing a quality DL instructor program.[75]

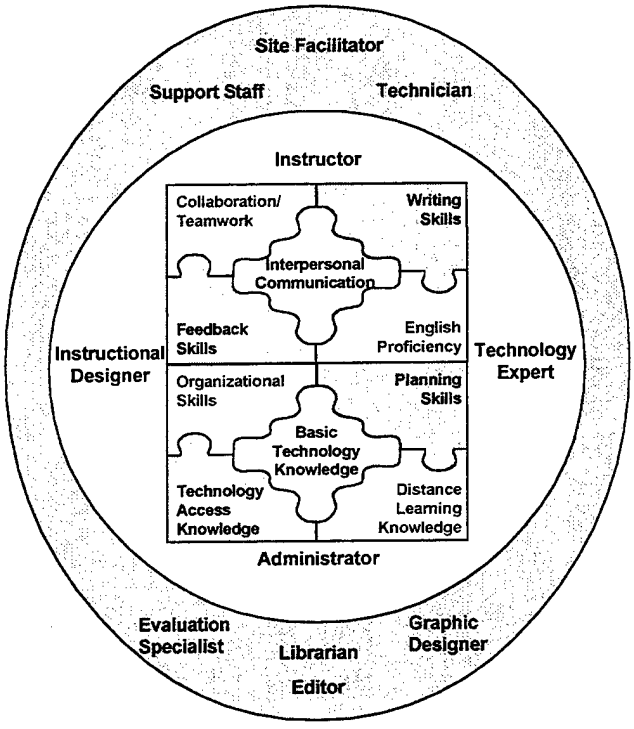

FIGURE 9. DISTANCE LEARNING ROLES AND KEY COMPETENCIES MODEL

The model at Figure 9 shows the relationship of the roles as major and supporting functions, and illustrates the top ten competencies important to all roles. "The center box represents the interlocking components of the top ten competencies—the top half of the box illustrating the communication skills and the bottom half representing the technical skills. The ring surrounding the

competency box highlights the four major roles of instructor, technology expert, administrator, and instructional designer. The outer ring represents the seven supporting roles of the site facilitator, librarian, editor, technician, graphic designer, evaluation specialist, and support staff."[76] The model highlights the roles and critical competencies for Distance Learning professionals. To be most effective, the model should be used in conjunction with the table of outputs and ranked competencies for each individual role outlined in Appendix A. Use the following hyperlink to go the table: Appendix A. Although this is an excellent model to use as a foundation for faculty development programs in Distance Learning, it will need to be revised and updated as the Distance Learning field grows and also to account for new information technology. Using a standard model will ensure that all instructors are being trained to the same core standards. Individualized faculty development courses may be required based on the individual branch requirements.

EVOLUTION OF DISTANCE LEANING COURSES/LESSONS LEARNED

Turning a current resident course into a high quality Distance Learning course takes more that just converting it to a CD or taking current instructional materials, e.g., slides, maps, and written tests, and presenting them during a video teleconference hookup. Described below are two resident courses, one military and one civilian, that evolved into Distance Learning courses along with some of the stumbling blocks and lessons learned from the conversion process. In order to keep up with the fast pace of technology changes and the ability to link new technology with the needs of the instructor in the cyber classroom, DL professionals must continually evaluate courses, instructors, classrooms, and hardware, making changes when required. Continuing refresher courses must be provided for instructors in both new technology and the way it affects learning behavior in a cyber classroom.

BATTLE STAFF EXERCISE—FORT HOOD, TEXAS

Fort Hood instructors began teaching the Battle Staff course in the DL format approximately three years ago. When the course was first fielded, it consisted of two phases.

Phase I was a "correspondence" course and phase II, a video course taught at several locations. In phase I, students were required to read and study several sections on their own and be prepared to take a test when they arrived for phase II.

One of the things the phase II instructors noticed early on was that the students were not "trained" when they arrived for phase two. The learning required to pass the test before going on to phase II had not taken place. They found they had to teach phase I in a classroom setting to assist students in the learning process. Students were required to come to the class prepared to discuss the phase I material they had read. The instructors covered key points in the material and allowed the students to review the material with each other, answering questions as needed. This helped students understand the material and assisted those who were having problems with phase I due to personal motivation and/or learning styles. What this shows is that not all students can learn by just reading prescribed material and that in order for learning to take place, an instructor needs to be in the loop in some form, e.g., face-to-face-, VTT, on going Email, etc. Instructors at other schools have had to make similar changes in order to make the course work.

LAUNCHING K-3 READERS—LOS ANGELES, CALIFORNIA

The autumn 1999 issue of Transforming Teaching with Technology discusses online learning environments—computer software that enables learning communities to convene and collaborate online. Online learning environments today have evolved considerably from earlier Internet technologies such as electronic mail, user groups, and topic-specific subscriptions. Now, chat rooms allow personal exchange to expand into real-time. One key element to remember is that new technologies may embody fresh approaches to online Distance Learning, but they rarely represent wholly new ideas about what online learning communities need to succeed. Learning communities still exist that are supported by a patchwork of older technology; however, users are forced to work with various programs. Online learning environments allow all to work within the same software.

The Los Angeles County Office of Education in conjunction with Star School Program conducted a test of Launching K-3 Readers, an online course for K-3 (kindergarten through third grade) teachers throughout the Los Angeles area. The leaders broke the large group into smaller groups of four students and two instructors who met weekly online in a multi-user environment that was also used to host guest presentations to the class as a whole. They found that because the group was small, the instructor was able to encourage each student to participate—no one had trouble keeping up with the real-time conversations. Students were then encouraged to continue their discussions with each other in an asynchronous environment using the course message board. A review of the course, including student feedback, found certain issues had not been anticipated nor planned for prior to conducting the course. Summarizing their findings:

- Firewalls initially blocked access for all students.
- Many students accessed the course from home using America Online and, because of certain features on the AOL browser, they were bounced out after 45 minutes. This was later corrected with AOL, but it taught the instructors not to assume anything.
- Send out a list of technical requirement prior to the course start date.
- Accomplish technology training beforehand—hold a "Technology Boot Camp."
- Use phone line to speak to individuals as they first come online—"hand holding."
- Hold an initial face-to-face meeting if possible to enhance the student's ability to share online and feel comfortable with each other.
- Do not assume individuals will feel comfortable "talking" online—this technology is not something they use everyday.
- Do not expect students to do something extra that gives them no value added.

In evaluating the course, the teachers who were the students in this case, found they enjoyed not having to travel and that, with additional training in the different technology and communicating online, they could learn as much online. However, it will not happen without

prior planning by and training for the instructors. This example demonstrates that even teachers had problems learning online when it was assumed they all had the same level of expertise concerning technology and their different learning styles were not taken into consideration prior to developing the course.[77]

DISTANCE LEARNING TECHNOLOGY AND DELIVERY SYSTEMS

This paper does not go into detail about the technology aspects of delivery systems, however, this is an important part of the "Total Distance Learning Package". Instructors and students must be familiar with the DL different delivery methods. In order to deliver a course, the instructor needs to know the capabilities and limitations of the equipment and the classroom, and have a general knowledge of several types of technologies used in DL. Students must feel comfortable in a virtual environment if learning is to occur. Technologies can be generally divided into four categories each with several subcategories, depicted by Figure 10.

Print/Text	Voice/Audio
Textbooks	Telephone
Study guides	Voicemail
Workbooks	Audioconferences
Fax	Audiotape
	Radio
Computer	**Video**
Email	Videotape
Web-based courses	Satellite delivery
Videoconferences	Microwave
CD-ROM	Broadcast video
Collaboration S/W	Desktop video

FIGURE 10. DISTANCE LEARNING TECHNOLOGIES

PRINT/TEXT

The Army has been using text for distancing learning in the form of correspondence courses for many years. Materials were mailed to students and subsequently returned to a correspondence branch or an instructor where the assignment would be graded and the grade returned to the student without any or with very little interaction on the assignment. Print technology can be useful in supplementing instruction by providing read-a-head material or supplemental readings. Fax machines can be used to transmit material between instructor and student in a timely manner

when the instructor is reviewing an assignment and wants to provide comments quickly. Some advantages in incorporating print material into a DL course are:

- The materials can be used in any location (on an airplane or in field conditions).
- Most students have a high comfort level in using print materials.
- The cost to create and reproduce these materials is relativity low.
- Print materials can also be transmitted via the Internet or Email, thus giving the option to the student as to whether they want a hard copy or not.

Massive volume of print material, either in paper or Email format, can be a disadvantage to students who are poor readers or whose language skill may not be as developed as others.

VOICE/AUDIO

Audio is one of the simplest, most cost-effective technologies used to enhance DL. Telephone conversations can be used to monitor individual students or to reach a large number of students simultaneously via a conference call. Many telephones have conference-calling features that make it easy to connect multiple locations. A telephone bridge can be used to connect multiple telephone lines.[78] The audio method works when an instructor needs to provide clarification on an assignment or discuss issues that require interaction form the entire group. Individuals are able to connect in during their lunch hour or after work without having to travel to a learning facility. Audio-conferences are relatively easy to set up and conduct; however, maintaining the student's interest for a long period without visual elements may be difficult. Some students may have various degrees of difficulty in focusing and learning from audio. Audio is most effective when it is used to supplement other methods of DL.

VIDEO

Video offers the student the ability to see and hear an instructor, which provides opportunities for behavior modeling, demonstrations, and instruction of abstract concepts. Often video techniques for DL are characterized by the transmission media used (videotapes, satellites, television cables, computers, and microwave). Videotapes can be used for

demonstrations of skills a student may need to review multiple times. A large disadvantage is that videotapes are not interactive. Two important rules to remember when using videotapes are 1) be sure to use the best equipment to record the tape and 2) that the presentations do not come across as dry and boring.[79] Videotapes are good alternative for providing instruction to students who have missed a session or for individuals who are forward-deployed. Deployed troops can continue with courses by reviewing the tapes as time permits. This lends it self to the concept laid out in Joint Vision 2010 of providing training anytime, anywhere.[80]

Satellite videoconferencing is another method of video delivery and is the next best thing to being there in person. In most cases today, satellite delivery offers one-way video and two-way audio. Although satellite videoconferencing can be very expensive and cannot be spontaneous, it provides the most realistic training without the added travel costs and time lost from unit and civilian jobs. The advantage of video technologies is that it can be used to transmit courses from educational institutions to Reserve Component DL sites as well as to troops deployed overseas, providing audio realism of face-to-face interaction between student and instructor as well as student-to-student. It also allows the instructor and students to see facial expression and body language, which can aid the instructor in maintaining motivation and interaction throughout the course. One very important factor for the instructor to remember when incorporating video technologies in their DL program is to avoid the "talking head." This refers to simply videotaping the instructor while she or he is talking. Many of the early Army instructional tapes used this method. It did not hold the interest of the students and was more disruptive than beneficial to the learning environment.[81] It is imperative to ensure both using the best possible quality equipment and maintaining quality audio. Losses in audio clarity will be more noticeable and more annoying long before the loss of video quality.

COMPUTER

As computers become increasingly more popular, the use of the Internet, Email, online collaborations, and Web-based education is growing as a means to deliver DL. Sending Email messages is a common way for instructors and students to interact both as often as necessary and in a non-threatening mode. Faculty can establish bulletin boards for DL classes to help facilitate interactions among the students. Online collaboration, e.g., Internet chat and conferencing, can be used to turn asynchronous Email communications into synchronous communications through online chat and shared whiteboards. These provide a means for interactive exchange on the Internet. Students and instructors can then communicate in "real-time". Computer technologies allow for high interactivity, provide a written record of discussions and instructions between students and the instructor, and allow students to proceed at their own pace and receive feedback as often or as little as they need it. One of the biggest problems with computer-based DL is that there is no guarantee as to the students' performance. Students have to be self-motivated to check Email for messages and have enough computer knowledge to visit Websites for information. Website may change addresses, leaving the student frustrated. Two keys to providing high quality computer-based training are ensuring 1) instructors get to know their students and 2) sufficient technical support is available to students who may require it.

NEED FOR A CULTURE CHANGE IN TRAINING

As with any new technology, DL has been met with skepticism from those who do not have a clear understanding of the benefits it can provide. For many years the AC has looked at correspondence courses as RC courses. The elite AC soldiers (future leaders) received the vast majority of the quotas to the resident courses. Improving military readiness and performance and achieving the significant savings anticipated by using DL technologies will require culture changes across the spectrum of the military Services.

LEADING CULTURAL CHANGE

Leaders play a critical role in implementing change. Leaders must have a positive attitude toward the change occurring within his or her organization. It is their responsibility and they must play an active role in getting the personnel and organization into the future. They must provide personal leadership to direct the change process to achieve the desired end state.[82] Leaders need to understand the organization will become customer-driven rather then technology-driven. These leaders must ensure a clear understanding of what is required from the learner's viewpoint and make a conscious decision to move forward before they introduce new technology or processes.[83]

All military leaders, from Sergeants to Generals, need to not only become aware of DL but also understand that it has changed the training vision for the future military. They can no longer train the way they did three years ago. Soldiers will not necessarily be geographically displaced when participating in "formal" training. Trainers must also understand the effect that this new training paradigm will have on their organization. Commanders must learn that even though soldiers may not be physically absent from the organization, the commander must ensure that the requirements to aid learning are met. Soldiers have to be given the time and privacy required for learning and an environment that fits their learning style. "Change is a learning process and learning is a change process."[84] The learning process requires that one let go of currently held beliefs and attitudes and learn new beliefs and attitudes. There must be continuous communication between commanders and solders if change is to happen smoothly.[85]

Leaders are not the only ones who are confronted with the turmoil of change. Distance learning is presenting students with new challenges as well as opportunities. Students must now learn to be self-disciplined, managing their own time and creating the condition to communicate with instructors and peers outside of a face-to-face learning environment. As

shown in previous statistics on households with computers, students are not necessarily as computer literate as leaders may have assumed. Leaders and soldiers must view Distance Learning as an opportunity to train, gain new skills, and move ahead, regardless of their component. No longer can non-resident courses be viewed as a consolation prize for not being selected for a resident course or as something that only Reserve Component soldiers attend. Credibility is often associated more with respect than with reputation. While having a high level of credibility may not assure that others will follow your lead, lack of credibility in subordinates' eyes will guarantee that others will not work with you.[86] Therefore, the method of training, whether in residence or through DL, should not have a bearing on future progression in the military or any other organization. Future promotion should be based on individual accomplishment as a result of training.

CONCLUSION

As the Army enters the 21st century, it is experiencing many changes in how it views, conducts, and trains its force. As the Army moves farther into the future, change, and transition into that change, will be readily accepted by some, and steadfastly resisted by others. The United States Army, because of its long history of tradition and rigid rules and regulations, does not always accept change as easily as it may appear on the surface. In order for the Army to meet the goals enumerated in DoD's *"ADL in 2012"* vision, its leaders must immediately begin to revamp the way they think about, develop, and deliver DL courses. As training shifts from in-house "resident" courses to the multitude of Distance Learning methodologies discussed above, it is essential that the soldiers of 2012 and beyond be trained as well as, if not better than, the soldiers of today. The "Army After Next" will be a very different Army than today's. A much reduced force structure must be prepared to fight in many diverse areas of the world, filling multiple missions outside their main mission of winning America's wars. To accomplish that transformation, Army leaders must be prepared to provide training anytime, anywhere. This means adjusting the way DL is currently viewed.

During Distance Learning's 200+ year history, all major milestone changes in its methodology have been marked by new technologies, e.g., post office, radio, television, and computers. But the next "great leap forward" in DL will be driven, not by technological marvels, but by understanding the basis of human learning, both individually and in groups, and incorporating that understanding in instructors and courseware. Today, most "real life" discussions about DL center around advances in technology. Even though *"ADL in 2012"* discusses cognitive research and other key concepts in the advancement of DL, the recommendations of the August 1999 ADL conference mainly address technology. Why? Because its easy to talk about understanding how a human learns or how groups learn, but it is extremely difficult to empirically study and incorporate these concepts into courseware. However, this is the future and Army leaders ignore or pay "lip service" to it at their peril. Although technology improvements are certainly important to DL in the future, technology cannot continue to be the first priority. Developing courseware and training instructors, incorporating new understanding of human cognitive theory, team collaboration and intelligent tutors are essential precursors to selecting the method of delivery.

In order to accomplish this, the Army must provide a highly diverse team of skilled individuals at each location where DL courseware is being developed. It must also continue to increase its partnership with industry and academia, enabling the Army to incorporate new successes in Distance/Distributed Learning into its planning efforts. All new technology must be integrated and interoperable with existing and future systems in the DoD, the civilian community, and the soldier's home. The Army must be provided the additional resources it is seeking in its current outyear budget submissions to build on the TADLP successes. Most importantly, senior Army leaders must fully support the change process for its effects on individual commands and the Army as a whole to achieve the goals of *"ADL in 2012."*

Conceiving, constructing, and maintaining a world-class Distance Learning program is a challenging task. While some steps have been made, the Army must continue to be proactive

and forward thinking, maintaining pace with rapidly changing initiatives in hardware, software, and learning theory. This must be done while continuously revising and upgrading courseware and lesson plans. Finally, instructors must be trained and retrained in the latest DL techniques as they evolve in the 21st Century.

RECOMMENDATIONS FOR FURTHER STUDY

There are several areas of research that I consider critical to developing a strategic plan to accelerate large-scale development of dynamic and cost-effective Distance Learning systems, authoring tools, and supporting infrastructure to support the Total Force. The Army must develop future DL programs as a total package, involving instructors, students, courseware developers, latest hardware and delivery systems.

- Develop a rigorous evaluation process for DL courses, which includes evaluating current courseware and lesson plans. This process should also include evaluating students' learning processes and qualifications of DL instructors. As research is accomplished and more is understood about human cognitive skills as they relate to DL and as technology advances, senior leaders must be ready to change the way courses are taught and the technology used, as well as provide ongoing training for DL instructors in a timely manner. The evaluation team must consist of highly trained individuals in all areas of learning theory and technology.
- Establish and institute a standard "team" structure for courseware development. Developing new courseware and transitioning current courses into viable DL courses is a vital part in ensuring the ultimate success of the DoD and Army Distance Learning program. Additional research on the proper mix of people for the courseware development team, including their necessary skill set is required.
- Additional research is also required in the area of providing soldiers access to computers and cheap Internet services. If the leadership wants to ensure that soldiers have high technology skills and access to training "anytime, anywhere," they must look beyond the

classroom environment. As discussed in the above paragraphs, access to computers and the Internet within the U.S. is considerably less than current leaders imagine. Especially in the USAR, where many of the soldiers are from rural areas, access to home computers and the Internet is quite tenuous. Also, the current ADLP standard of providing a computer and Internet access within 50 miles of each soldier is extremely inadequate. In the 3 February 2000 issue of *USA Today*, there was an article describing how Ford Motor Company is teaming with Hewlett-Packard, PeoplePC, Inc., and UUNET to provide computers and Internet access to its entire base of over 350,000 employees at a cost to employees of $5 per month[87]. The article is available at http://www.usatoday.com/life/cyber/tech/review/crg872.htm. Ford stated this would help "train the workforce ... for online business." The USAR should look into a similar arrangement as its goal to connect 100% of the USAR personnel to the Internet. In the long run, this step could not only offset the cost of the DL classrooms, but also alleviate some of the problems associated with lack of computer skills.

- Standardize core-course DL instructor course and certification that can be used as a base upon which to tailor individual programs.
- Continue/accelerate research in leadership styles, changing cultures, communications, and mentoring in a DL environment. Professionals working in the DL environment need to have a clear understanding of what makes a good DL program work from courseware to hardware if DL is going to provide soldiers top-quality education.

This paper has attempted to highlight and call leadership attention to the fallacies that currently surround Distance Learning, especially that technology is the "be all, end all" of DL. Focusing on the total package will enable the military to stay on the cutting edge of technology, train soldiers to standards, and maintain unit readiness by bringing the training to the soldiers.

APPENDICES

A. OUTPUTS AND COMPETENCIES IN DISTANCE LEARNING ROLES

Roles (Major function or duty in a profession)	Outputs (Product, service, condition, and/or information resulting from performing role)	Competencies (An area of knowledge or skill critical to production of outputs)
Instructor	Be clear and well organized Plan and prepare before DL class sessions Be competent in the subject matter Establish learning outcomes/objectives Be personable & enthusiastic about teaching Provide students with timely feedback Facilitate information presentations Utilize technology in a competent manner Monitor & evaluate student performance Collaborate with technical/support staff Provide a variety of learning activities Initiate & maintain interactive discussions Know audience learning styles/needs Encourage peer learning Advise and counsel students Lead instructional design effort Introduce student support services Facilitate guest "experts" at a distance Return to Competency Model	1. Planning Skills 1. Instructional Design 2. Content Knowledge 3. Modeling of Behavior Skills 3. Interpersonal Communications 4. Feedback Skills 5. Presentation Skills 6. Basic Technology Skills 7. Evaluation Skills 8. Collaboration/Teamwork 9. Teaching Strategies 10. Facilitation & Group Process Skills 11. Needs Assessment Skill 11. Questioning Skills 11. Learning Styles & Theory 12. Adult Learning Theory 13. Advising/Counseling 14. Support Services Knowledge
Instructional Designer	Work with instructors to design courses Ensure course design works with technology Ensure course design fits DL environment Incorporate variety & interactive segments Ensure evaluation methods are included Promote teamwork in course design process Revise existing courses to fit DL environment Integrate support services into design Conduct needs assessment of students Present workshops on DL instructional design Return to Competency Model	1. Collaboration/Teamwork 1. Instructional Design 1. ID for Interactive Technologies 2. Media Attributes Knowledge 3. Knowledge of DL Field 4. Teaching Strategies 5. Evaluation Skills 6. Group Process Skills 7. Writing Skills 8. Support Services Knowledge 9. Needs Assessment Skill 9. Learning Styles & Theory 10. Presentation Skills 10. Training Skills
Technology Expert	Work cooperatively with instructors & instructional designers Assure smooth operation of technology Advise in selection of technology for DL Manage technology set-up and linkages Evaluate effectiveness of technology	1. Collaboration/Teamwork 2. Managerial Skills 2. All Technology Skills 3. Evaluation Skills 4. Interpersonal Communications 5. Learning Styles & Theory

Roles (Major function or duty in a profession)	**Outputs** (Product, service, condition, and/or information resulting from performing role)	**Competencies** (An area of knowledge or skill critical to production of outputs)
Technology Expert (continued)	Translate technical terminology to lay terms Analyze instructional advantages of media Assess future changes in technology Provide orientation/training on technology Return to Competency Model	5. Teaching Strategies 5. General Education Theory 6. Strategic Planning
Technician	Keep equipment in running condition Provide demos, manuals, & training for users when needed Respond to users' questions & problems Return to Competency Model	1. Technology Operation/Repair 1. Engineering Skills 2. Training Skills 3. Basic Technology Knowledge 3. Interpersonal Communications
Administrator	Manage/supervise DL staff & operations Balance budget Advocate & market DL programs Build collaborative models and promote teamwork Contribute to DL policy/standards Ensure evaluation processes are in place Plan for optimal & future use of technology Act as an organizational change agent Ensure all support services are in place Select & hire DL personnel Ensure students receive learning materials & resources Monitor program development/compliance Coordinate with academia and industry Act as a liaison with other groups Inform students of available classes Posses basic understanding of technology Ensure needs assessments are conducted Provide faculty/student orientation to DL Communicate results to DL community Supervise selection of DL courses Oversee registration & scheduling Return to Competency Model	1. Managerial Skills 2. Budgeting Skills 3. Marketing Skills 3. Public Relations Skills 3. Change Management Skills 4. Collaboration/Teamwork Skills 5. Policy Making Skills 5. Writing Skills 6. Evaluation Skills 6. Strategic Planning Skills 7. Project Management Skills 7. Basic Technology Knowledge 8. Organizational Skills 8. Support Service Knowledge 9. Negotiation Skills
Site Facilitator	Serve as liaison between central organization & remote site Ensure equipment is operational Ensure remote site is properly prepared Assist students in learning at remote sites Distribute & collect material/assignments Proctor tests & exams Return to Competency Model	1. Collaboration/Teamwork 2. Basic Technology Skills 2. Technology Operations/Repair 3. Training Skills 3. Interpersonal Communications 3. General Education Theory

Roles (Major function or duty in a profession)	Outputs (Product, service, condition, and/or information resulting from performing role)	Competencies (An area of knowledge or skill critical to production of outputs)
Support Staff	Coordinate support service issues Communicate class schedule to students Register students for DL classes Return to Competency Model	1. Support Service Knowledge 1. Knowledge of DL Field 2. Marketing Skills
Editor	Edit for style, clarity, grammar, & structure Edit for reading level of audience Proofread and edit instructor's work Arrange text layout for presentations Return to Competency Model	1. Editing Skills/English Proficiency 2. Text Layout Skills
Librarian	Provide library assistance to DL students Provide library skills training for students Assist with library searches/research Return to Competency Model	1. Library Research Skills 2. Training Skills 3. Support Services Knowledge
Evaluation Specialist	Provide tools & evaluation instruments Monitor program successes/problems Consult with instructor on evaluation Return to Competency Model	1. Data Analysis Skills 2. Evaluation Skills 3. General Education Theory
Graphic Designer	Design attractive, clear layout Ensure materials facilitate learning Return to Competency Model	1. Text Layout Skills 1. Graphic Design Skills 2. General Education Theory

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B. GLOSSARY

Item	Definition
'Net	Shorthand for "Internet."
Army modernization training	Training required to support the modernization of Army materiel systems. Such training includes new equipment training, displaced equipment training, doctrine and tactics training, and sustainment training. The Army Modernization Training process identifies training requirements for new, improved, or displaced materiel systems.
Analog	See "digital." Measured or expressed continuously, the way a watch with a sweep-second hand measures or expresses time. Vinyl records store analog recordings of music.
Asynchronous	See "synchronous." Literally, "apart from time." Asynchronous communication technologies are effective even when speakers and listeners do not participate at the same time. Electronic mail and books are examples of asynchronous technologies; both allow the sender to deposit information into the future.
Bandwidth	Originally, "bandwidth" referred to the capacity of a transmission system, expressed as the amount of digital data that could be moved through it per unit time. Prefixed with "high-" or "low-," bandwidth now also describes a net-based resource in terms of the demand its content or functionality places on the transmission system: "high-bandwidth" applications like real-time video conferencing are data-intensive. Low-bandwidth" content like plain text puts less strain on the transmission capacity of a network connection.
Banner advertising	Advertisements that display as banners at the top or bottom of a web page. Host companies that provide free web space; scripting or message boards to end-users derive revenue by selling advertising to third party clients who pay for the exposure they get when users call on sites that use the free resources.
Blocking software	Software that blocks browser or newsreader access to specified sites on the internet.
Browser	A computer application that fetches Web pages from servers on the Internet and displays them on the user's machine. Text-based browsers, such as Lynx, support text display and hyperlinks only. Graphical browsers, such as Netscape, Internet Explorer, and Mosaic, support image displays. Browser functions may be enhanced by installing optional software components ("plug-in") to support the display of other web elements including sound, animation, video and virtual reality. Modern browsers allow users to keep lists of Websites they want to revisit, integrate messaging technologies such as electronic mail and newsreaders, and include features for managing these functions.
Bulletin board system (BBS)	A BBS is an electronic venue typically accessible via direct modem/dial-up connection, using relatively simple telecommunications software. Once admitted, the BBS user has access to file archives and messaging systems provided by the BBS. BBS communities are the oldest species of online community, existing a decade or more before the Internet spread to become the vast, populist, global system known today. Internet-based communities, particularly those that utilize the Web (see also "message board"), have largely displaced BBSs, but some still exist for special interest groups.
Chat	As a noun: synchronous (real-time) communication over a computer network, involving at least two users. Text-based chat users "talk" to each other by typing messages on

Item	Definition
	their respective keyboards and monitor the flow of discussion as a scrolling dialog on the computer screen. As a verb: to participate in such communication.
Cognitive load	A measure of how hard it is to make sense of a stimulus. Cognitive load refers to the aggregate demand that a stimulus places on the sense-making capacity of the human mind. The higher the cognitive load of the stimulus, the more of a challenge it is to master. As familiarity increases, the cognitive load of the stimulus decreases. For example, Websites with clear and consistent navigation systems place a lighter cognitive load on users than do Websites with confusing or inconsistent navigation systems.
Collective training	Training either in institutions or units that prepares cohesive teams and units to accomplish their mission on the battlefield and in operations other than war.
Computer-based instruction	A means of training delivery by which a computer is used to enhance, deliver, develop, or manage instruction. Computer-assisted instruction, computer-managed instruction, and computer-supported instruction are forms of CBI. See interactive multimedia instruction.
Dial-up	Describes a network connection via modem and telephone line.
Digital	See "analog." Measured or expressed at discrete intervals; sampled. Common digital watches express time in discrete intervals—no more often than once every second or every tenth of a second. Compact discs (CDs) store digital music—music that is sampled, or recorded at discrete intervals, more than 40 thousand times each second.
Discussion group	An online community in which participants communicate through an exchange of messages that are open to all.
Distance education	Learning and teaching that occurs when the student and teacher are not necessarily in the same place and/or interacting at the same time.
Distance learning	The delivery of standardized individual, collective, and self-development training to soldiers, Department of the Army civilian employees, and units at the right place and time using training-effective designs and provided through the use of multiple means and technology. Distance learning may involve student-instructor interaction in real time (two-way audio/video television) and non-real time (computer-based instruction) or it may use self-paced student instruction without access to an instructor (correspondence programs).
Distance learning classroom	A classroom located at a Distance Learning center or site that contains the hardware and software to deliver and receive diverse instruction from multiple locations in a multimedia environment. The classroom has capabilities to link with student management and control systems and to enable students to access authorized training courses.
Distance learning facility	One of four types of facilities established to support the delivery of training by Distance Learning means. The facility types are Distance Learning centers, Distance Learning sites, mobile Distance Learning sites, and deployable Distance Learning packages.
Distance medium	A means or method of communicating across distance. Distance media include broadcast television, radio, cable television, satellite transmission, the telephone, and

Item	Definition
	xxxx
Distributed learning	A student-centered approach to learning that incorporates the use of technology in the learning process and emphasizes four educational characteristics: 1) Supports different learning styles by using mixed media; 2) builds on the learner's perspective through interactive educational experiences; 3) builds learning skills and social skills through collaboration among learners and with the community; 4) integrates the learning into daily life by doing authentic tasks.
Download	Verb: to copy a file from a central storage place to a computer. Noun: any file so copied. Downloading can refer to the movement of components from a central machine to a peripheral device, i.e., "download fonts to a printer."
Email	Shorthand for "electronic mail."
Feedback loop	The path that carries information from the person who receives a communication back to the person who sent the communication.
Firewall	A system for preventing unauthorized users from gaining access to a local network. Firewalls may use hardware, software, or a combination of both. Three common firewall strategies: gateways restrict access to physical sections of the system or to particular software applications; proxy servers conceal the true network addresses of component machines; and packet filtering systems inspect every data packet entering or leaving the network, accepting or rejecting on the basis of system administrator-defined rules.
Flame	As a noun: a scorching rejoinder posted as Email, overly harsh and frequently unfairly personal. As a verb: to post such a message.
Graphic design	The branch of visual arts concerned with the aesthetics and production of layout, design and typography. In the context of Web resources, graphic designers are responsible for the look of a site and all its visual elements including page layout, background, and spot imagery, color scheme, typography, navigation buttons, etc.
Host	As a noun, a host is the server; that is, the word "host" refers to the computer in a network where (for example) Websites reside, or where the software that supports delivery of services like chat, Email, listserv, etc. is installed. As a verb, the term "to host" is synonymous with providing such services.
HTML	HyperText Mark-up Language can be thought of as the "code" in which Web pages are written. Technically, HTML is a "page definition language;" its elements (called "tags") are interpreted by browsing software as instructions for displaying or otherwise handling Web-page content.
Hyperlink	As a noun: graphics or text strings in web documents that respond to user selection by taking the user to a different location or presenting a different Web page or other resource. On Web pages, text links typically appear highlighted in an underlined font of some color that differs from the color of regular text. As a verb: to create a hyperlink; to make a hypertext connection with another page, passage or resource on the Web.
Hypertext	Text that is (a) organized so the reader has choices about the pathway of ideas followed while reading, and (b) supported by a technology that makes it easy to "jump"

Item	Definition
	or "link" to the next set of ideas along the chosen path.
Individual training	Training that prepares an individual to perform specified duties or tasks related to an assigned duty or for subsequent duty positions and skill levels.
Institutional training	Training, either individual or collective, that takes place in an Army service school, Army training center, or other TASS location.
Instructional design	The systematic process of creating or adapting instruction, including at least these steps: defining the problem or knowledge gap that the instruction is meant to address; defining the audience that the instruction is meant to serve; developing objectives and assessment strategies; selecting and sequencing content and learning activities; evaluating the instruction; revision.
Instructor-centered training	A teaching process in which the course content is presented by an instructor and the pace of training is controlled by the instructor. The instructional materials are geared to group instruction techniques.
Interactive	A system that responds to user input—i.e. that interacts with users.
Interactive multimedia instruction	A group of predominantly interactive, electronically delivered training support products. Products include instructional software and software management tools used to support computer-based instructional programs.
Interactivity	1) The quality of being interactive. 2) A particular type of instructional resource involving information exchange or dialog via the online medium.
Internet	A globe-spanning network of networks, the Internet grew out of a national data transmission system originally implemented in the 1960s by the US Department of Defense. The original system was put in place to give government scientists scattered around the country access to powerful computers without building a lot of the expensive machines. Today's Internet is a dense, redundant system made up of many autonomous parts managed locally by businesses, schools, governments, individuals and organizations. It utilizes the telephone wires, fiber optic links, infrared and satellite transmission and other telecommunications technologies to support the transmission of digitized signals.
Internet telephony	Systems consisting of hardware and software that enable users to make telephone calls over the Internet.
JavaScript	A web scripting language developed by Netscape. JavaScript shares selected attributes and data structures with the Java programming language, but was developed separately and is not Java. JavaScript works within an HTML page, and is supported by Netscape versions 3.0 and higher. A subset of JavaScript, JScript, is supported by the Microsoft Internet Explorer browser.
JavaScript-enabled	Describes a browser that can support JavaScript, and is configured to do so under User Preferences or Options.
Just-in-time (JIT) training	Training provided to individuals or units just before the skill or function taught will be used in a practical application. Typically used to teach perishable or infrequently used skills.

Item	Definition
Kill file	List of Email addresses from which the user does not wish to receive postings. The kill file is used by the bozo filter in your Email or newsreader software to screen incoming messages and reject those you do not wish to receive.
link rot	A colloquialism referring to the tendency of hyperlinks to "decay" as their destination sites are purged from host servers. Users encounter "link rot" as hyperlinks that lead nowhere, or the "Error 404: file not found" message.
Listserv	See also "majordomo." A commercial electronic mailing list server application, developed in 1986 and marketed by L-Soft International. The word "listserv" is sometimes (incorrectly) used to refer to the general category of electronic mailing list management application software.
Majordomo	A freeware automatic electronic mailing list server application. Mailing list servers automate the distribution of electronic mail to large groups of subscribers. The server automates the subscription process, by which users join a list to receive its postings. The server also forwards to all subscribers all messages sent to the list. Subscribers may also send commands to the list to retrieve specified text files stored in its archives.
Message board	A Web-based message center, where users post text communications. Messages so posted are converted into Web documents, and may be viewed with browsers. Message boards differ from Email the way a bulletin board at the supermarket differs from the postal service: in their basic form, message boards must be visited to be read. However, some message boards offer enhanced services, including the option of receiving Email notification of new postings, or even Email forwarding of the posted messages themselves. Web Crossing is an example of an enhanced message board system.
Messaging	Generic term encompassing several modes/methods of online communication between people (as opposed to machines). Asynchronous messaging technologies include electronic mail, newsgroup postings, and message boards. Synchronous technologies include chat and internet telephony.
Mobile distance learning site	Ground and air transportable classrooms equipped to deliver/receive training needed to support temporary increases in students at Army installations, to reach students in low population density areas, for use at combat training centers, and to support forward-deployed soldiers. The classrooms will provide access to synchronous and asynchronous training through links with the established Distance Learning communications infrastructure.
Modem	A device that connects a computer to the telephone network. The word "modem" comes from the phrase "MOdulate-DEModulate" and refers to the way the device manipulates an electrical signal in order to encode information for transmission via the telephone network.
Non-resident training	Individual training distributed to students for completion without an on-site instructor/facilitator, small group leader, or otherwise designated trainer.
Online	Strictly speaking, "online" implies a live connection to the Internet. The word is also used more casually to describe content and applications that are accessible via the Net.
Platform-	Describes software or other technology that "does not care" what kind of computer the

Item	Definition
independent	end user has. Platform-independent applications may run on any kind of computer (example: programs written in the JAVA programming language), or may not rely on the end user's system for anything other than display and input (example: HTML pages on the Web).
Plug-in	Software module that adds enhanced display or rendering capabilities to browser software. Plug-ins enable view, hear, or interact with non-standard display formats, including those for video, audio, multimedia, and VR.
Real-time	See "synchronous."
Remote	Distant, residing on a network node or computer other than the users' own.
Resident training	Training presented, managed, and controlled by an on-site instructor/facilitator, small group leader, or otherwise designated trainer.
Search engine	A search engine is a Web-based software tool that enables the user to locate sites and pages on the Web-based on the information they contain. Hierarchical search engines organize known sites in "trees" that the user browses in order to find a site that deals with a particular topic. Yahoo (http://yahoo.com) is an example of hierarchical search engine. Free-form search engines typically present a form in which the user types words that specify the information sought. The search engine returns a hot list of pages containing those words. AltaVista (http://altavista.digital.com) and Excite! (http://www.excite.com) are examples of free-form search engines.
Server	See host.
Set-top box	A device that connects your television set to the Internet, either by telephone line or cable modem.
Shockwave ®	A trademark of Macromedia Inc., for a platform-independent technology it developed that allows Web pages to include multimedia (developed using Macromedia Director). Shockwave requires the user to install a plug-in.
Slow connection	Access to the internet that is characterized by low rates of data transmission. Once, a slow connection passed no more than about 25 characters per second (300 baud). Today, transmission rates of more than a megabyte per second are possible, so that a "slow" connection may be as "fast" as 28.8 kilobytes. The lower (or slower) the transmission rate, the more time it takes for the data (such as a web page) to download to the end-user. Designers of online instruction need to take end-user connections into account when constructing resource components.
Student-centered training	A teaching process in which the pace of instruction is controlled by the student working alone or in collaboration with other students. The role of the instructor is to help students to become self-directed, to facilitate student access to learning resources, and to provide information on their use.
Student multimedia workstation	A component of Distance Learning classrooms comprising a multimedia personal computer with peripherals, associated software, and furniture.
Surfing	"To surf" the Web is to browse around, with or (usually) without a clear objective. "Surfing" the Web suggests a shallow information-foraging behavior or a recreational

Item	Definition
	experience.
Sustainment training	Individual and collective training conducted in the unit or resident schools, units, and organizations to ensure continued expertise on the operations, employment, and logistical support of fielded systems or equipment.
Synchronous	See "asynchronous." Coinciding in time. (Also called "real-time". Synchronous communication technologies require the simultaneous participation of the communicating parties. Internet Chat and the bullhorn are two examples of synchronous communication technologies. Neither is very effective if no listeners are present at the moment that the speaker holds forth.
T1	A dedicated connection to the Internet, also known as DS1, that uses telephone lines and can support a data transfer rate totaling 1.54 megabytes per second by sending data across 24 discrete channels at 64 kilobytes per second. Individual users may purchase access via all 24 channels, or just some subset; this is called "fractional T1" access.
Task-based training	Training developed and implemented to train units and soldiers to perform critical tasks and supporting skills to established performance standards. Critical tasks focus training on what really needs to be trained.
Telementoring	The use of telecommunications technology, including the Internet, to support mentoring relationships.
Thematic units	Instruction that integrates multiple disciplines and subject areas around a common theme. A thematic unit on seabird migration, for example, might integrate language arts, zoology, meteorology, geography, and mathematics.
Threaded discussion	A threaded discussion is an online dialog or conversation that takes the form of a series of linked messages. The series is created over time as users read and reply to existing messages. Typically, messages in a given thread share a common subject line and are linked to each other in the order of their creation. Threaded discussion is particularly useful in online venues where multiple discussions unfold at the same time. Without threaded discussion, the reader would confront a chaotic, unsorted list of messages on many different topics. By hyperlinking messages that share a common subject line, threaded discussion makes it easy for the reader to focus on one conversation and avoid the distractions of unrelated postings.
Training materials	Materials developed as a result of the training design process and used to teach or evaluate training. Training materials include computer-based instruction, training literature, student handouts, and other products used to train to prescribed standards.
Training on-demand	Training provided to a unit at the commander's request to meet an immediate mission need.
URL	Acronym for Universal Resource Locator. The Internet address of a specific resource. All URLs have at least two components: one part identifies the host computer on which the resource resides, and another part identifies the destination that is the resource itself. An Email address is an example of a URL that includes only those two parts. But most URLs also include a third component—namely, the path of directories and subdirectories that must be traversed on the host computer to locate a destination file.

Item	Definition
	Web page addresses are almost always URLs of this more complex variety.
Video teletraining	Training delivered via audio/video communication links like satellites or cable. May be delivered as one-way audio/one-way video, two-way audio/one-way video, or two-way audio/two-way video. Includes broadcast and desktop.
Virtual reality	Artificial, computer-based environments in which users can have experiences that look and feel "real," or at least plausible. The most elaborate VR environments completely immerse the user in an artificial world, but today require expensive hardware and software. Less elaborate VR experiences may be offered over the Web to provide different perspectives on systems and phenomena that are not readily accessible in other ways.
Virus	A computer virus is a roguish snippet of software code that 1) rides around a network attached to "legitimate" software or document templates, and 2) can do at least two things. First, it can make copies of itself and so propagate to other machines and systems it encounters. Second, when it arrives at a target machine or system, it can make things happen there without the local operator's awareness or consent. Some viruses are merely impish, displaying, for example, cryptic phrases or dirty words on the target's monitor. But others are destructive, altering or obliterating critical data and even rendering the target system inoperative.
Web	See World Wide Web. Short for "World Wide Web." The Web is a global, networked system of dedicated host computers that serve documents (files) formatted in HTML(see "HTML"). These documents (or "web pages") can contain text, images and multimedia components, can include hyperlinks (see "hyperlinks") to other such documents on different servers, and can also act as interfaces, linking users with underlying special-function applications. The Web debuted in 1993, and its inception is commonly credited to Tim Berners-Lee of CERN in Switzerland. It was originally conceived as a platform-independent tool that scientists could use to exchange documents about their work. Many people incorrectly equate the Web with the Internet. The Web utilizes the Internet as its transmission medium; they are not the same.
Web page	A Web page is a document, the basic data storage and display unit of the World Wide Web. Stored as plain ASCII text, a web page embeds "tags" or function and formatting codes which govern its transmission and display on the end-user's computer screen. These tags are standardized as HTML, the hypertext markup language.
Website	Electronic venue consisting of a collection of thematically related and hyperlinked documents ("web pages") and component images, multimedia objects, etc. Websites are identified by their addresses, called URLs.
World Wide Web	Also known as the Web. One of many schemes for serving data via the Internet, the Web was created in the early 1990s by CERN in Switzerland to provide physicists around the world with rapid, easy access to each others written work, even though they all used different kinds of computers to create their reports. Invented by Tim Berners-Lee as a document serving and display system, today's Web can serve and display virtually any sort of digitized data including images, motion video, music and speech. Other recent advances in Web-based programming allow users to manipulate their own data using either remote computing resources or applications that reside online and download to the user's computer when needed.

C. ACRONYM LIST

Use the following hyperlinks to navigate the acronym listing.

[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M]
[N] [O] [P] [Q] [R] [S] [T] [U] [V] [W] [X] [Y] [Z]

Acronym	Description
[A]	Return to Top
AC	Active Component
ACES	Army Continuing Education System
ADL	Advanced Distributed Learning
ADLP	Army Distance Learning Program
ADLS	Army Distance Learning System
AEA	Army Executive Agent
AEC	Army Education Center
AIMS-R	Automated Instructional Management System-Redesigned
AIS	Automated Information System
ALC	Army Learning Center
AMT	Army Modernization Training
ARNG	Army National Guard
ARRTC	Army Reserve Readiness Training Center
ASAT	Automated Systems Approach To Training
ADTDL	Army Doctrine And Training Digital Library
ATEC	Army Test And Evaluation Command
ATE	Automated Test Equipment
ATIMP	Army Training Information Management Program
ATRRS	Army Training Requirements And Resources System
AWC	Army War College
[B]	Return to Top
BA	Budget Activity
BBS	Bulletin Board System
BES	Budget Estimate Submission
BUR	Bottoms-Up Review
[C]	Return to Top
C4I	Command, Control, Communications, Computers, And Intelligence
CAN	Campus Area Network
CBI	Computer-Based Instruction
CD	Compact Disk
CDi	Compact Disk-Interactive
CMC	Computer-Mediated Communications
CMI	Computer-Managed Instruction
COE	Common Operating Environment
Co-Lab	ADL Cooperational Laboratory
CONUS	Continental United States
COTS	Commercial Off The Shelf
[D]	Return to Top
DAC	Department Of Army Civilian
DCTN	Defense Communications Teleconferencing Network
DCST	Deputy Chief Of Staff For Training
DET	Displaced Equipment Training
DII	Defense Information Infrastructure
DISN	Defense Information System Network
DL	Distance Learning
DLM	Dynamic Learning Management
DMMC	Dual Multimedia Classroom
DMS	Defense Message System
DOC	Department Of Commerce
DoD	Department Of Defense

Acronym	Description
DSI	Defense Simulation Internet
DUSD(S&T)	Deputy Under Secretary of Defense for Science and Technology
[E]	Return to Top
EIRS	Engineering Improvement Recommendation System
Email	Electronic Mail
ETV	Educational Television
[F]	Return to Top
FCC	Federal Communications Commission
FM	Frequency Modulation
FOC	Full Operational Capability
FY	Fiscal Year
FYDP	Future Year Defense Plan
[G]	Return to Top
GIF	Graphical Interface File
GUI	Graphical User Interface
[H]	Return to Top
HTML	HyperText Mark-up Language
[I]	Return to Top
ICAI	Intelligent Computer Aided Instruction
ILSP	Integrated Logistics Support Plan
IMG	Image-Mapped Graphic
IMI	Interactive Multimedia Instruction
IS	Information Systems
IOC	Initial Operational Capability
[J]	Return to Top
JCS	Joint Chiefs of Staff
JIT	Just-in-Time
JPEG	Joint Photographic Experts Group
JTA	Joint Technical Architecture
JV 2010	Joint Vision 2010
[K]	Return to Top
KFOR	Kosovo Force
KPP	Key Performance Parameter
[L]	Return to Top
LAN	Local Area Network
[M]	Return to Top
MAIS	Major Automated Information System
MAISRC	Major Automated Information System Review Council
MANPRINT	Manpower And Personnel Integration
MC&G	Mapping, Charting, And Geodesy
MMC	Multimedia Classroom
MNS	Mission Need Statement
Modem	MOdulate-DEModulate
MOO	MUD, Object Oriented
MOOTW	Military Operations Other Than War
MOS	Military Occupational Specialty
MPEG	Motion Pictures Expert Group
MSP	Maintenance Support Provider
MTC	Multiple Training Classroom
MUD	Multi-User Domain
MUSE	Multi-User Simulated Environments
[N]	Return to Top
NDI	Non-Developmental Item
NTIA	National Telecommunications and Information Administration
[O]	Return to Top
OCAR	Office of the Chief, Army Reserve
OCONUS	Outside The Continental United States
OIPT	Overarching Integrating Product Team

Acronym	Description
OPTEC	Operational Test And Evaluation Command
[P]	Return to Top
P^3I	Preplanned Product Improvement
PB	President's Budget
PCS	Permanent-Change-Of-Station
PEC	Professional Education Center (National Guard)
PEO	Program Executive Officer
PM	Program Manager
PME	Professional Military Education
[Q]	Return to Top
QDR	Quadrennial Defense Review
[R]	Return to Top
RDL	Reimer Digital Library
RC	Reserve Component
REAL	Reserve Education And Learning
[S]	Return to Top
SATS	Standard Army Training System
SCO-RM	Shareable Courseware Objective Reference Model
SECDEF	Secretary of Defense
SME	Subject Matter Expert
SMMP	System Manprint Management Plan
STAMIS	Standard Army Management Information Systems
STC	Single Training Classroom
[T]	Return to Top
TASS	Total Army School System
TDA	Table Of Distribution And Allowances
TDALP	Total Army Distance Learning Program
TDY	Temporary Duty
TMA	Training Mission Area
TO&E	Table Of Organization And Equipment
TPIO	TRADOC Program Integration Office
TRADOC	U.S. Army Training And Doctrine Command
TSC	Training Support Center
TTHS	Transients, Trainees, Holdovers, And Students
[U]	Return to Top
UHF	Ultra-High Frequency
URL	Universal Resource Locator
USAR	U.S Army Reserve
USD(P&R)	Under Secretary of Defense for Personnel and Readiness
USMA	U.S. Military Academy (West Point)
[V]	Return to Top
VHF	Very-High Frequency
VTT	Video Teletraining
[W]	Return to Top
WWW	World Wide Web
[X]	Return to Top
XMIT	transmit
[Y]	Return to Top
Y2K	Year Two Thousand Z (Zulu time)
[Z]	Return to Top
ZIF	zero insertion force

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