



**U.S. Army Research Institute
for the Behavioral and Social Sciences**

Research Report 1751

The Computer Background of Infantrymen: FY99

Jean L. Dyer

U.S. Army Research Institute

Geoffrey H. Martin

Auburn University

Consortium Research Fellows Program

December 1999

Approved for public release; distribution is unlimited.

20000131 012

**U.S. Army Research Institute
for the Behavioral and Social Sciences**

A Directorate of the U.S. Total Army Personnel Command

**EDGAR M. JOHNSON
Director**

Technical review by

Gene W. Fober
J. Douglas Dressel

NOTICES

DISTRIBUTION: Primary distribution of this Research Report has been made by ARI. Please address correspondence concerning distribution of reports to: U.S. Army Research Institute for the Behavioral and Social Sciences, Attn: TAPC-ARI-PO, 5001 Eisenhower Ave., Alexandria, VA 22333-5600.

FINAL DISPOSITION: This Research Report may be destroyed when it is no longer needed. Please do not return it to the U.S. Army Research Institute for the Behavioral and Social Sciences.

NOTE: The findings in this Research Report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

Preceding Page5 Blank

REPORT DOCUMENTATION PAGE

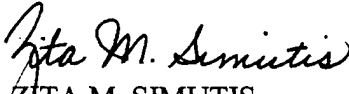
1. REPORT DATE (dd-mm-yy) December 1999		2. REPORT TYPE Final		3. DATES COVERED (from... to) April 1998 – April 1999	
4. TITLE AND SUBTITLE The Computer Background of Infantrymen: FY99				5a. CONTRACT OR GRANT NUMBER	
				5b. PROGRAM ELEMENT NUMBER 62785	
6. AUTHOR(S) Jean L. Dyer (U.S. Army Research Institute) and Geoffrey H. Martin (Auburn University)				5c. PROJECT NUMBER A790	
				5d. TASK NUMBER 2223	
				5e. WORK UNIT NUMBER H01	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Research Institute for the Behavioral and Social Sciences Infantry Forces Research Unit P. O. Box 52086 Fort Benning, GA 31995-2086				8. PERFORMING ORGANIZATION REPORT NUMBER Research Report	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Avenue Alexandria, VA 22333-5600				10. MONITOR ACRONYM ARI	
				11. MONITOR REPORT NUMBER Research Report 1751	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT (<i>Maximum 200 words</i>): The research determined the experience soldiers had with computers, their perceptions of their own skill, and their ability to identify icons representative of those in the proposed Land Warrior software. A survey was given to soldiers and leaders representing the rank and experience structure of an Infantry rifle platoon, as well as to Infantry platoons. The platoon leaders, the lieutenants who are recent college graduates, had the most computer expertise and were the most homogeneous on the indicators of computer skill in the survey. For the remaining platoon members, the picture was more diverse for both noncommissioned officers and squad members. Although a substantial portion of these groups had computer skills, a substantial portion had very limited skills. If training were to begin today on a digital system used by the rifle platoon, the results indicate that prior and special training on basic computer skills would be required for many of these soldiers. Although the focus was on the rifle platoon, the results should be typical of other soldiers throughout the Army of similar ages and ranks. The research will continue in FY00 and FY01 to determine changes in computer expertise in the groups studied.					
15. SUBJECT TERMS Computer skills, Rifle platoon, Infantry, Computer training, Land Warrior, Digital skills, Digital training					
SECURITY CLASSIFICATION OF			19. LIMITATION OF ABSTRACT Unlimited	20. NUMBER OF PAGES 51	21. RESPONSIBLE PERSON (Name and Telephone Number) Jean L. Dyer 706 545-5589
16. REPORT Unclassified	17. ABSTRACT Unclassified	18. THIS PAGE Unclassified			

FOREWORD

As digital systems are fielded within the Army, the training requirement associated with these systems must be specified. Because soldiers' prior knowledge of and experience with computers will influence this requirement, the extent of this prior knowledge and experience must be determined. The report presents a picture of the computer background of the Infantrymen who constitute the rifle platoon, ranging from privates to the platoon sergeant and platoon leader. The findings depict the status of these soldiers in FY99. The research will be continued in FY00 and FY01 to determine changes in computer status, and be expanded beyond the Infantry population.

Overall, the platoon leaders, the lieutenants who are recent college graduates, had the most computer expertise and were the most homogeneous on the objective and subjective indicators of computer skill in the survey. For the remaining platoon members, the picture was more diverse for both noncommissioned officers and squad members. Although a substantial portion of these groups had computer skills, a substantial portion had very limited skills. If training were to begin today on a digital system used by the rifle platoon, the results indicate that prior training on basic computer skills would be required for many of these soldiers. Although the focus was on the rifle platoon, the results should be typical of other soldiers throughout the Army of similar ages and ranks.

The findings were briefed to representatives from Directorate of Operations and Training, U.S. Army Infantry School, and TRADOC Systems Manager-Soldier in April 1999, and to the Assistant Commandant, U.S. Army Infantry School in October 1999.


ZITA M. SIMUTIS
Technical Director

THE COMPUTER BACKGROUND OF INFANTRYMEN: FY99

EXECUTIVE SUMMARY

Research Requirement:

The Army is introducing digital systems throughout the force. Although many systems are for battalion and higher-level leaders, others are for the individual soldier. The Land Warrior (LW) is a system designed for all Infantrymen as well as soldiers and units that support the Infantry such as medics, engineers, and field artillery. The ability to exploit system capabilities and learn system software quickly depends in part on the user's prior computer experience. The purpose of the research was to obtain a picture of the computer backgrounds of Infantrymen to determine future training needs.

Procedure:

A survey was developed that examined the experiences soldiers had with computers, their perceptions of their own skill, and an objective index of skill as measured by the ability to identify icons representative of those in the proposed Land Warrior software. The survey was given to soldiers and leaders representing the rank and experience structure of an Infantry rifle platoon: rifle platoons themselves, Infantry one station unit training (OSUT) soldiers, and leaders in the Basic Noncommissioned Officer Course (BNCOC), the Advanced Noncommissioned Officer Course (ANCOC), and the Infantry Officer Basic Course (IOBC).

Findings:

The IOBC soldiers had the most computer expertise and were the most homogeneous on both objective and subjective indicators of computer skill. In the other groups the picture was more diverse; about half the soldiers had limited skills. These groups ranked in order from high to low as follows: ANCOC, BNCOC, and then OSUT and the rifle platoons. Computer experience was gained in different ways. The youngest soldiers (OSUT) were most likely to have used computers in high school. IOBC soldiers had used computers in high school and in college. The IOBC and ANCOC soldiers were the most likely to own computers. All soldiers indicated they typically used computers at home, but a high percentage of ANCOC soldiers also indicated using computers in their duty position. Self-ratings of computer expertise correlated with the icon scores.

Utilization of Findings:

The findings apply to other Army soldiers and leaders with similar educational and military experience. In many ways the picture of skills reflects the prevalence of computers

within society as a whole, that is, the younger soldiers tended to have more formal school experience with computers. Yet the findings also show that many soldiers gained skill on their own, particularly those in the noncommissioned officer corps. The surveys will be continued over the next two years to determine shifts in the groups surveyed in Year 1, and will also be extended to non-Infantry populations. The extent to which a training package for the Land Warrior and similar software should include special training on basic computer skills will depend on stability of these initial findings. However, if training were to begin today, the findings indicate that special training would be required for many Infantrymen who will use the Land Warrior system.

THE COMPUTER BACKGROUND OF INFANTRYMEN: FY99

CONTENTS

	Page
Background.....	1
Method	2
Participants	2
Survey Instrument.....	3
Results	4
Computer Use.....	4
Subjective Indices of Computer Skill and Expertise.....	7
Icon Test Scores.....	11
Relationships Among Indices of Computer Skill.....	14
Conclusions	16
References	19
APPENDIX A. Data Tables.....	A-1
B. Survey Forms.....	B-1
C. Scoring of Computer Icons.....	C-1

List of Tables

Table 1. Number of Soldiers by Rank in Each Group Surveyed.....	2
2. Correlations with 12-Icon and 18-Icon Tests	14
3. Correlations with Usage Frequency of Computer Features.....	15
4. Use of Computers in High School: Comparison With U.S. Census Bureau Figures	17

List of Figures

Figure 1. Box plot of soldier age in each group surveyed	3
2. Percentage of soldiers using a computer in grade school, junior high, high school, and college.	5

CONTENTS (continued)

	Page
Figure 3. Relationship between mean age of the groups surveyed and use of computers in high school	5
4. Number of educational settings where soldiers used computers.....	6
5. Current use of computers and usage locations	7
6. Typing ratings for each soldier group.....	8
7. Interaction between soldier group and use of computer features	9
8. Self-ratings of computer skill	10
9. Icon scores by soldier group.....	12
10. Icon difficulties for all soldiers, by high and low self-ratings, and by high and low use of computer features	13
11. Relationship between computer ownership and frequency of use of computer features	16

The Computer Background of Infantrymen: FY99

Background

The purpose of the research was to describe the status of computer skills and knowledge of the Infantrymen who will use the Land Warrior (LW) system. In turn, these data will help determine the need for basic computer training prior to training on the Land Warrior software itself. As pointed out by Van Vliet, Kletke, and Charkraborty (1994), when experienced individuals are exposed to introductory-level training, new learning will not occur, and when novices are exposed to advanced-level training, learning is likely to be minimal. In both cases, valuable training time is wasted. In addition, despite expertise within a specific domain, the ability to solve problems in that domain when computer software must be employed as a problem-solving tool, can be hindered when software skills are limited (Mackay & Elam, 1992).

The research was not designed to measure computer skills in depth. Instead, a general picture was obtained of the computer backgrounds of the distinct segments of the Infantry population within the rifle platoon. The rifle platoon is composed of soldiers with considerable differences in Army experience. It has young soldiers, just out of initial entry training (Infantry One Station Unit Training or OSUT). The platoon leader, a lieutenant, may have just graduated from the Infantry Officer Basic Course with no Army experience (unless he was a prior noncommissioned officer) or may have served in this position for a maximum of 18 months. On the other hand, the noncommissioned officers who serve as team leaders may have from 3 to 5 years of Army experience, squad leaders from 8 to 12 years, and the platoon sergeant from 12 to 16 years. Concomitant with this diversity in Army background is a wide age range. And the educational background of the soldiers within the platoon is also diverse. The platoon leader must be a college graduate, unless commissioned through Officer Candidate School. However, no education requirement exists for the other positions, except that all must be high school graduates or have an equivalent degree. Given the varied backgrounds of the soldiers within a rifle platoon, it was expected that their computer skills could differ as well.

When the research began, only limited information was available on the nature of the LW software. What was known indicated that the software would be menu- and icon-based, require skills in sending messages (like e-mail), require graphic skills (map overlays), use a modified "mouse" as the soldier interface device, and incorporate many other Windows-like features (e.g., saving files, copying and pasting information). This information influenced the design of the survey instrument. To the extent that the LW software assumes basic Windows-like and other software skills, soldiers without this background will be at a disadvantage in learning the LW software itself. The research was designed to determine what proportion of soldiers might need preparatory training on basic computer skills. Other studies have used extensive self-appraisal and objective measures (Van Vliet, et al., 1994; Vaubel & Gettys, 1990). However, we had only one self-appraisal item, and the objective measure was restricted to the ability of soldiers to name a sample of icons common to many software programs and the proposed LW icons.

Method

Participants

In FY99, five distinct segments of the Infantry population were surveyed. This included two Infantry platoons from an active Army unit, for a total of 60 soldiers. To get a more complete picture of the computer skills of the soldiers holding different positions within a typical platoon, the survey was given to soldiers in four institutional courses at Ft. Benning, GA. These courses were Infantry OSUT ($n = 150$, one company), IOBC ($n = 190$, two classes), the Basic Noncommissioned Officer Course (BNCOC, $n = 178$, two classes), and the Advanced Noncommissioned Officer Course (ANCOC, $n = 181$, one class). The distribution of ranks within each population is shown in Table 1. Except for the ranks of specialist and corporal, all ranks within the rifle platoon were represented by the courses surveyed.

Table 1
Number of Soldiers by Rank in Each Group Surveyed

Rank	Soldier Group				
	Rifle Platoon	OSUT	BNCOC	ANCOC	IOBC ^a
Private	28	All 150	NA	NA	NA
Specialist/Corporal	14	NA	NA	NA	NA
Sergeant	8	NA	152	NA	NA
Staff Sergeant	6	NA	24	42	NA
Sergeant First Class	2	NA	NA	138	NA
Lieutenant	2	NA	NA	NA	All 190

Note. NA means "not applicable." Missing data on 2 NCOs in BNCOC; 1 NCO in ANCOC.

^a Source of commission was available on one IOBC class ($n = 89$): 15% were prior noncommissioned officers being commissioned through Officer Candidate School (OCS); 82% were commissioned through Reserve Office Training Corps (ROTC), and 3% from the US Army Military Academy.

Figure 1 illustrates the overall trend in ages of the different groups as well as the age spread within each group. Obviously, the youngest groups were the platoons ($M = 23.50$, $SD = 5.20$), Infantry OSUT ($M = 20.99$, $SD = 3.22$), and IOBC ($M = 24.06$, $SD = 2.50$). The oldest group was the ANCOC class ($M = 34.96$, $SD = 3.63$), with BNCOC about 7 years younger ($M = 27.78$, $SD = 3.27$). However, as illustrated in Figure 1 and documented in Table A-1, there was considerable variability in age within each group. The difference between the youngest and oldest soldier was greatest within the platoon (23 years) and in ANCOC (22 years). This age difference was least within IOBC (12 years).

Because OSUT soldiers were not asked how long they had served in the Army, and the responses from IOBC were inconsistent across soldiers, no data are presented on time in Army for these two groups. But as would be expected and as shown in Appendix A (Table A-2 and Figure A-1), the months served in the Army was lowest for the platoon members ($Mdn = 25$ mons, 2.1 yrs), next highest for BNCOC ($Mdn = 88$ mons, 7.3 yrs), and highest for ANCOC ($Mdn = 179$ mons, 14.9 yrs). The spread in time served was also substantial, particularly within

the platoons, with the greatest values reflecting the time served by the senior NCOs within the platoon.

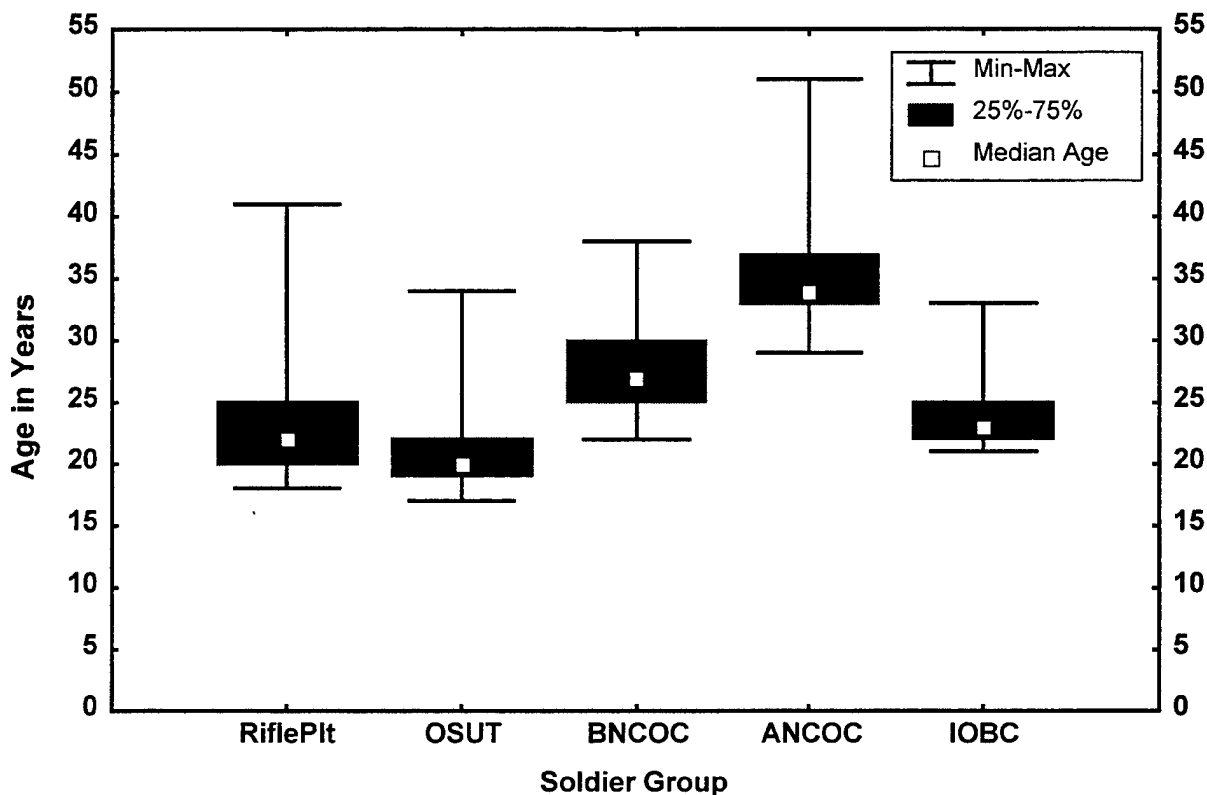


Figure 1. Box plot of soldier age in each group surveyed.

Survey Instrument

The survey instrument is presented in Appendix B. It was modified twice during the course of the year. One IOBC class and all the ANCOC, BNCOC, and OSUT classes received the full survey as presented in Appendix B. However, both rifle platoons and one other IOBC class responded to only 12 icons as opposed to the final 18-icon version, and they were not requested to write-in the specific software packages and programming languages they had used. In addition, the first rifle platoon was given a shortened version of Item 3 that focused on computer features used.

In addition to demographic information, the survey focused on seven areas:

- Where soldiers had used computers in their formal education.
- Where they currently use computers.
- Whether they owned a computer.

- How often they use specific computer features: a mouse, computer games, icon-based software, pull-down menus, graphics/drawing features, e-mail, and the Internet.
- Self-ratings of typing skill.
- Self-ratings of computer skill and what computer software/languages they use.
- An icon test where icons common in current software programs were presented and soldiers had to name the function of each icon. The initial version of this test had 12 icons; the later version had 18 icons. The icons were: spell check, cursor, zoom, open file, save, print, cut, copy, paste, undo, new file, arrow, recycle, help, center, fill, close, and group.

A coding scheme was developed for scoring the icon responses. It is presented in Appendix C. Some latitude was given to scoring answers, as the icons have slightly different meanings within various software programs.

Results

Computer Use

The degree to which soldiers used computers in their formal education varied with the groups. As illustrated in Figure 2, as soldiers progressed from grade school through high school, there was a steady increase in the percentage of individuals who used computers, regardless of the group surveyed. Obviously, the percentage using a computer in college does not apply equally to all the populations surveyed. Of note, however, is that almost all IOBC students (84%) used a computer in college. The IOBC students had the most experience with computers; the ANCOC students, the least. The percentage that used computers in high school paralleled the average age of each group. Going from the youngest to the oldest group, the percentages of soldiers using computers in high school were as follows: OSUT (83%), Platoons (70%), IOBC (72%), BNCOC (52%), and ANCOC (20%). The very strong negative linear relationship ($r = -.998$) between the groups' mean ages and their use of computers in high school is shown clearly in Figure 3.

Another way of summarizing the extent of computer use in education was the number of educational settings where soldiers used a computer. Because few soldiers indicated technical school use (see Table A-3), these data were combined with the college category. The results are illustrated in Figure 4 and tabulated in Table A-4. A critical point shown in Figure 4 is that 46% of the ANCOC soldiers and 29% of the BNCOC soldiers had never used a computer in school. Of those who had used a computer, it was typically in only one of the settings covered in the survey. This percentage ranged from 29% to 45% across the five groups. The youngest groups (platoons, OSUT, and IOBC) used computers in several settings, illustrating more continuity in computer use throughout school. In fact, for OSUT soldiers, 27% had used a computer in three settings; for IOBC soldiers, 28% had used computers in four settings. In other words, for both these groups, a fourth of them had used computers continuously in their education (grade school through high school for OSUT; grade school through college for IOBC). The difference in the number of settings where the groups used computers throughout their education was statistically significant, $\chi^2(16) = 268.50, p < .0000$.

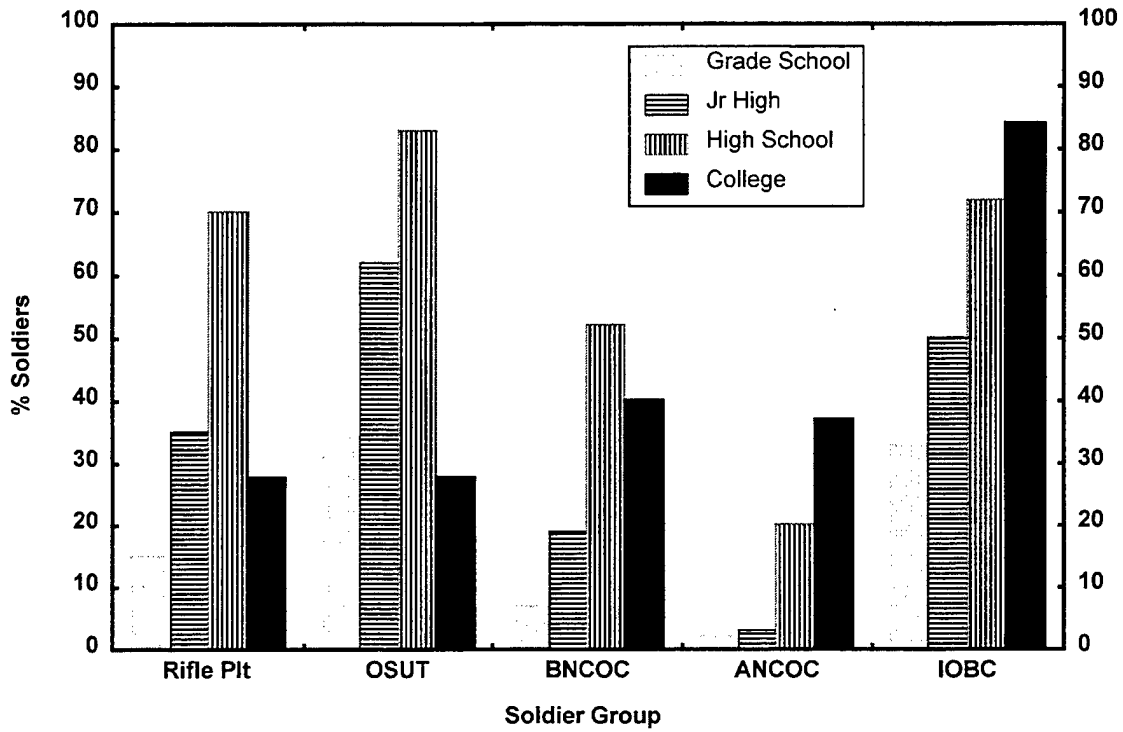


Figure 2. Percentage of soldiers using a computer in grade school, junior high, high school, and college.

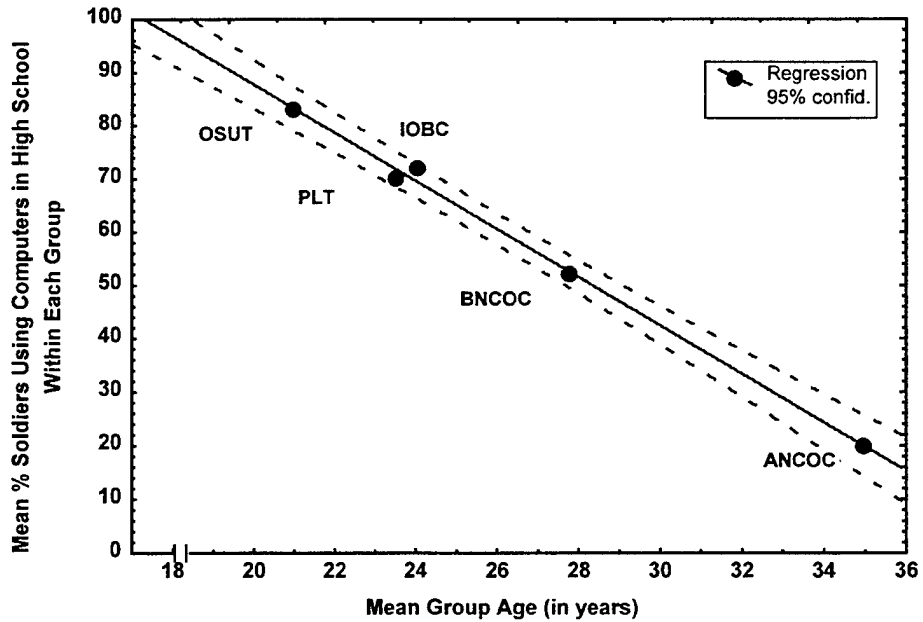


Figure 3. Relationship between mean age of the groups surveyed and use of computers in high school.

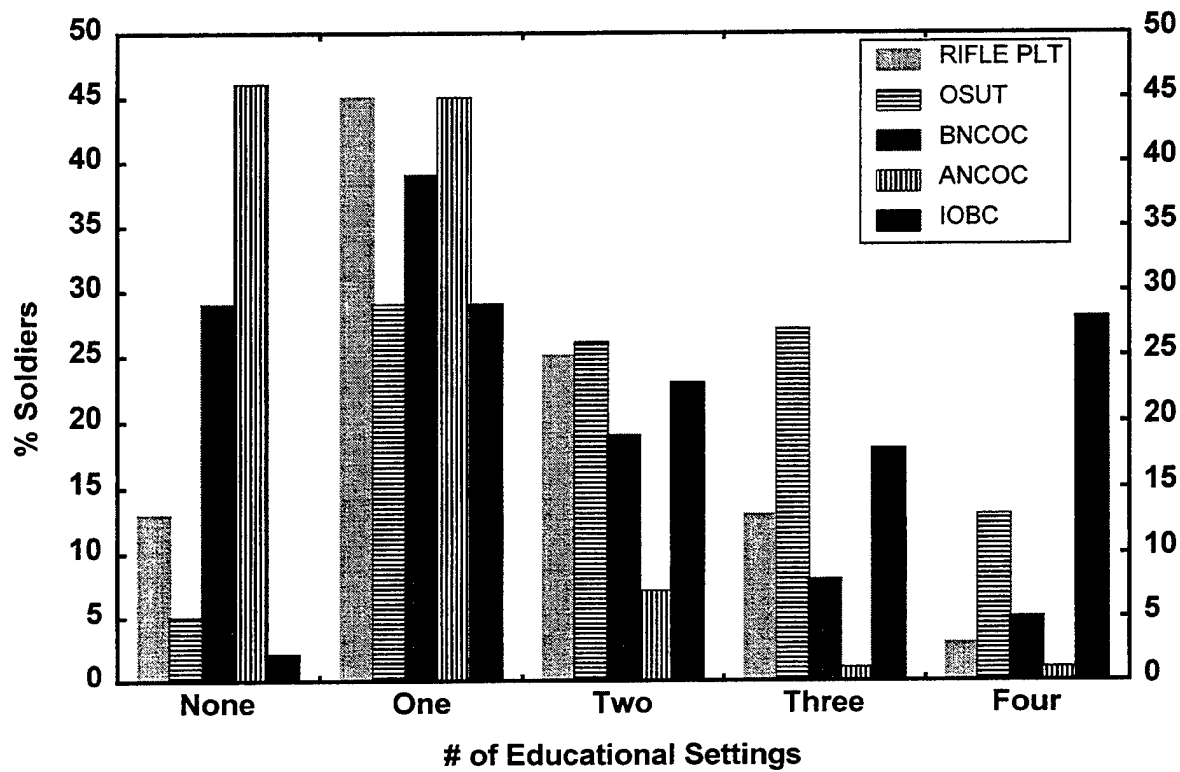


Figure 4. Number of educational settings (summed over grade school, junior high, high school, and college) where soldiers used computers.

A key question was whether soldiers owned a computer. Obviously, this could depend on whether they had a personal need for a computer, whether they could afford one, and other factors. These results are shown in Figure 5 and in Table A-5. The computer ownership percentages were high and similar for ANCOG and IOBC (78% to 81%), and lowest for the rifle platoon (35%). The differences among groups was significant, $\chi^2(4) = 77.03, p < .0000$.

We also asked where they used a computer now: at home (or in barracks or the bachelors officer quarters (BOQ)), in a training facility (library, learning center), and/or in their unit or work site. Obviously, the computer locations available to soldiers depended on where they were stationed and their status within the Army (e.g., OSUT and most IOBC students have not been assigned to a unit). From these responses, we also computed the percentage of soldiers that currently use a computer (see Table A-5). As illustrated in Figure 5, at least 65% in each group said they currently used a computer, but the difference between groups was significant, $\chi^2(4) = 38.75, p < .0000$. It is clear from Figure 5 that, for each group, the percentage of soldiers using a computer was higher than the percentage who owned a computer.

The most common location for using a computer was at home (in the barracks or BOQ). This percentage ranged from 55% to 85% across the five groups. Both BNCOC and ANCOG

students indicated they frequently used the computer at work/in the unit. Although this type of usage was expected, the percentage of ANCOG students (71%) who indicated using a computer in their unit was higher than expected.

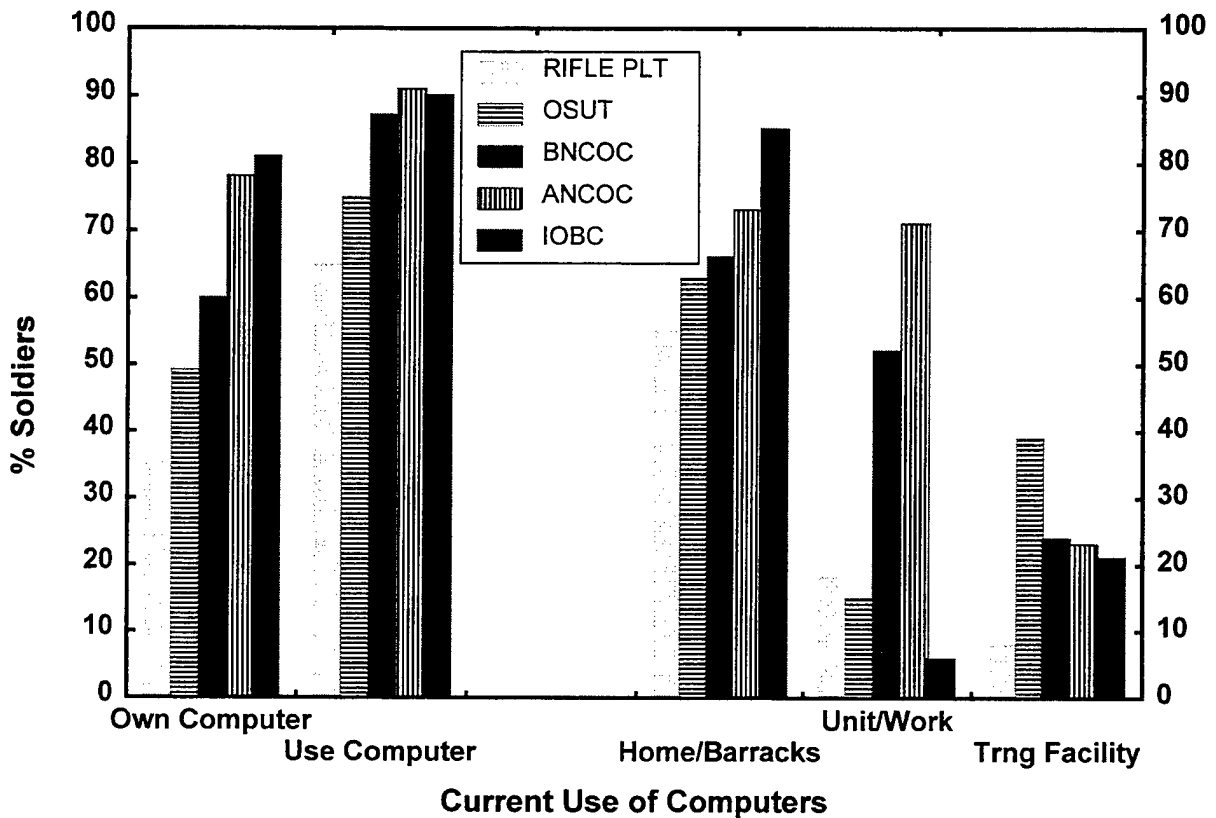


Figure 5. Current use of computers and usage locations.

Subjective Indices of Computer Skill and Expertise

The survey provided several subjective indices of computer skill: the frequency with which different software features are used, self-ratings of expertise with computer software, use of specific software packages, and self-ratings of typing skill. Obviously, typing skill is not a direct index of computer skill, but soldiers who use a computer intensively are facile with a keyboard, whether it be touch typing or fast hunt and peck skills developed on their own. And those who know a typewriter keyboard will not be intimidated by this particular hardware component.

Typing skill. The results on typing skill are presented first. Figure 6 shows that no more than 15% of any group indicated they had limited typing skills, i.e., could only hunt and peck slowly at a keyboard. There was a significant difference among the groups in their skill ratings, $\chi^2(12) = 63.93, p < .0000$. As reflected in Figure 6 and in the difference between the expected

and observed frequencies, the pattern of responses for the IOBC students differed from the other groups. For IOBC students, over half (63%) stated they could type vs. hunt and peck. However, for each of the other groups, less than half (37% to 48%) stated they could type. In fact, the IOBC students were very likely to say that they could type quickly (37% vs. 10% to 19% for the other groups).

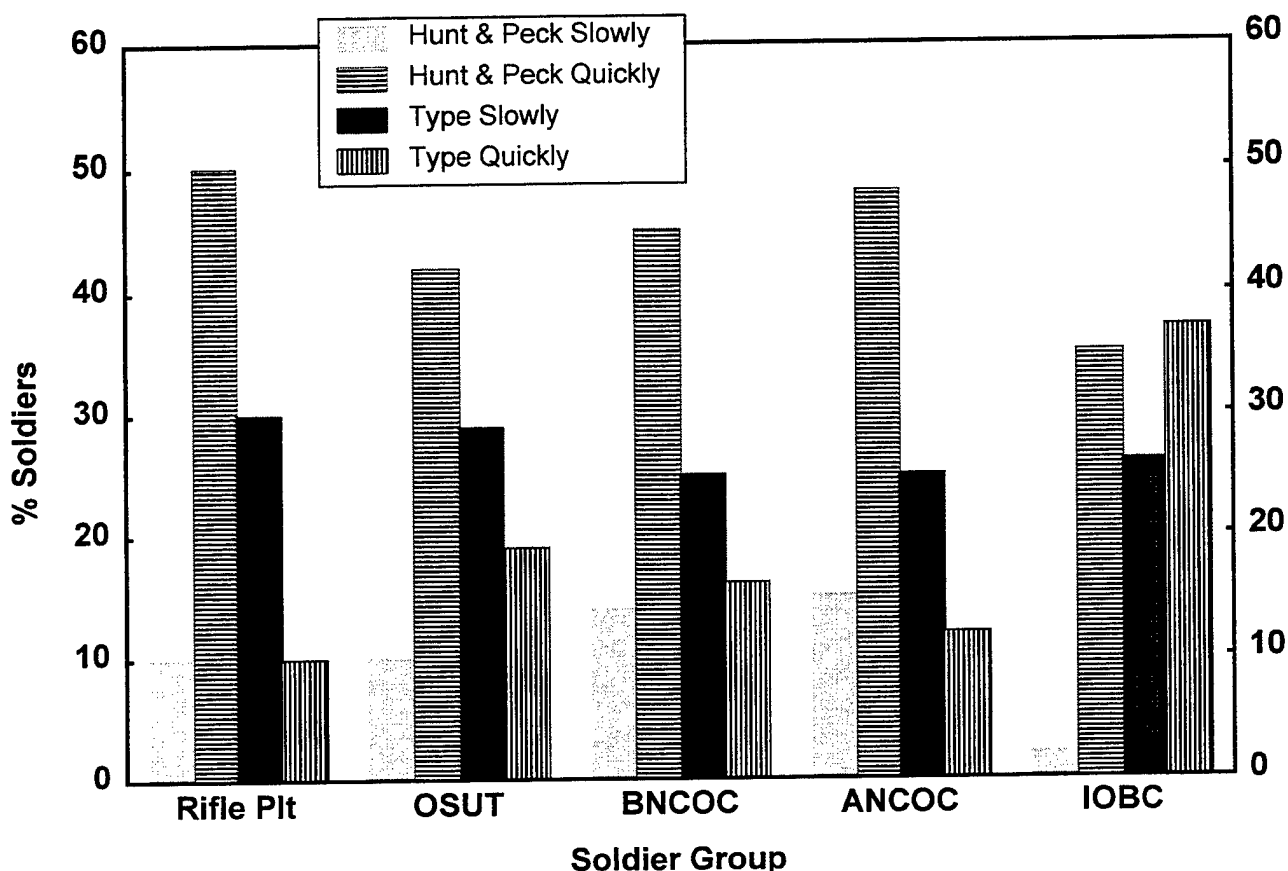


Figure 6. Typing ratings for each soldier group.

Computer features. Soldiers were asked how frequently they used seven computer features: mouse, games, software with icons, software with menus, graphics, e-mail, and the Internet. The frequency scale had five-points ranging from daily, weekly, monthly, less than monthly, to never (see survey in Appendix B). A complete tabulation of the responses by percentage of soldiers who responded to each category is in Table A-7. Means and standard deviations for each soldier group are in Table A-8. A 2 x 7 analysis of variance (soldier group by computer features with repeated measures on the last factor) was used to statistically compare the soldier populations on the scale scores. There was a main effect for group, $F(4, 692) = 8.09$, $p < .0000$, a main effect for features, $F(6, 4152) = 77.02$, $p < .0000$, and an interaction, $F(24, 4152) = 11.08$, $p < .0000$. Although the standard deviations for some groups were relatively

large compared to the mean and the feature distributions were not “normal,” the trends shown in the analysis of means are indicative of the specific usage category rates shown in Table A-7.

Post hoc comparisons (LSD test, $p < .05$) on the group main effect showed significant differences among all groups except for OSUT and BNCOC. IOBC and ANCOC tended to use the seven features most frequently, followed by OSUT and BNCOC, with rifle platoon members using the features the least. From highest to lowest usage, the features ordered as follows: mouse, menus, icons, Internet, e-mail, games, and graphics. Post hoc comparisons on the feature effect showed significant differences among all features, except for icons and menus. Finally, these overall effects were attenuated by the interaction. As reflected in the interaction shown in Figure 7, the groups generally ordered in accordance with the group main effect on mouse, icons, menus, icons, e-mail, and Internet features. Where this order shifted was on games and graphics. For instance, OSUT was highest on games and IOBC was low (where IOBC was highest on the other features). On graphics, all groups indicated relatively low frequency of use and were relatively similar, except use by rifle platoons was substantially lower than use by the other groups.

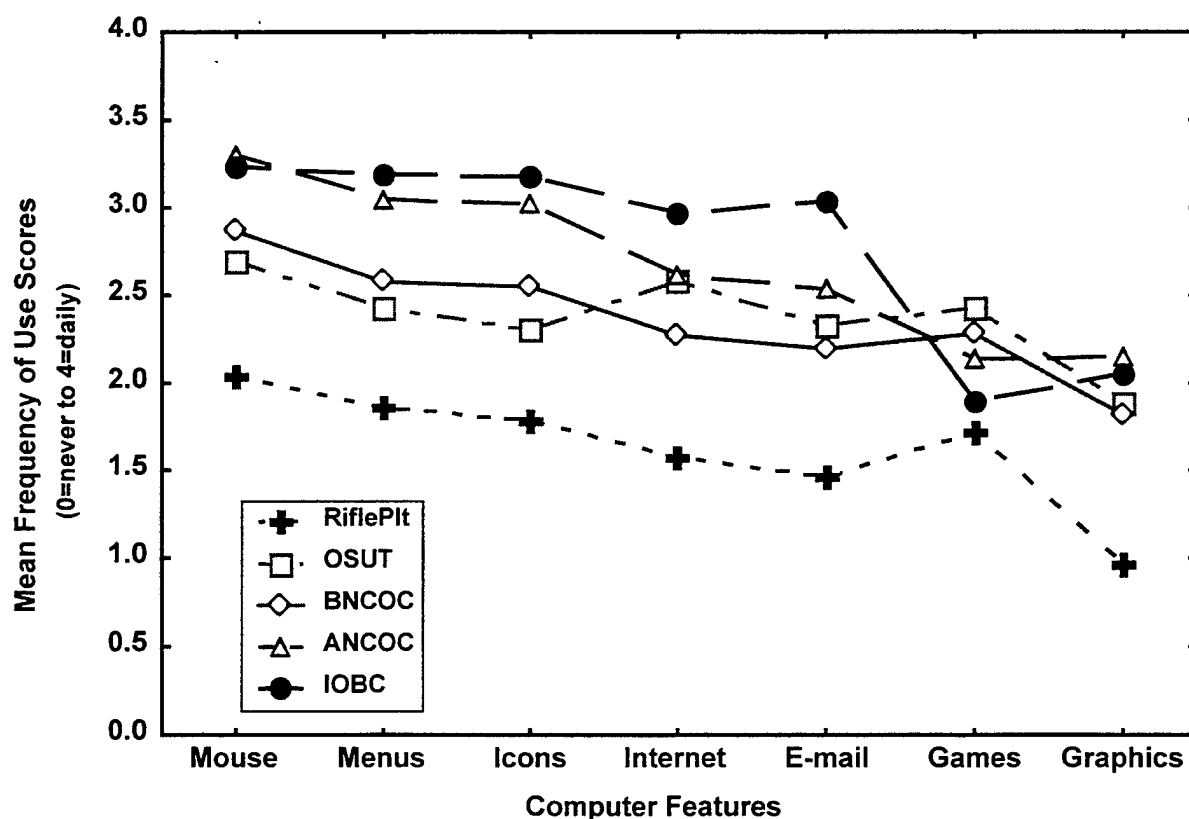


Figure 7. Interaction between soldier group and use of computer features.

The frequency distributions for each feature are presented in Appendix A to illustrate the distinct differences in usage patterns. Except for the platoons, the use of a mouse, icons, and

menus (Figure A-2) was such that the frequency of use increased from “never” to “daily” with “daily” often being the most frequent category. For the Internet and e-mail (Figure A-3), this distribution shape was only characteristic of IOBC. For the other soldier populations, the distribution was U-shaped, indicating two types of users - infrequent and frequent. For graphics (Figure A-4), the distributions were typically flat across the five usage categories. Lastly, the distributions were most varied for games (Figure A-4). The IOBC distribution was flat; the rifle platoon was U-shaped; OSUT, BNCOC, and ANCOC also reflected a U-shape, but with a tendency for soldiers to be frequent users.

Self-ratings of skill. Soldiers ratings of their computer skill are displayed in Figure 8 (see also Table A-10). Approximately 45% of the rifle platoon, OSUT, and BNCOC soldiers rated themselves as computer novices. The corresponding percentages in ANCOC and IOBC were 33% and 11%. Given the computer backgrounds of the different populations, it is not surprising that IOBC soldiers had the highest self-ratings; i.e., good with several programs or having the additional ability to program. The percentages of soldiers who rated themselves in these more experienced categories were as follows: IOBC – 72%, ANCOC – 53%, BNCOC – 43%, OSUT and rifle platoons – 36%. Figure 8 shows the split between novices and more experienced users in the platoons, OSUT, and BNCOC. The mean ratings for the groups (Table A-11) were statistically different, $F(4, 754) = 18.95, p < .0000$. Post hoc comparisons showed that IOBC had higher self-ratings than each of the other groups, and that ANCOC self-ratings were higher than ratings by OSUT and the rifle platoons.

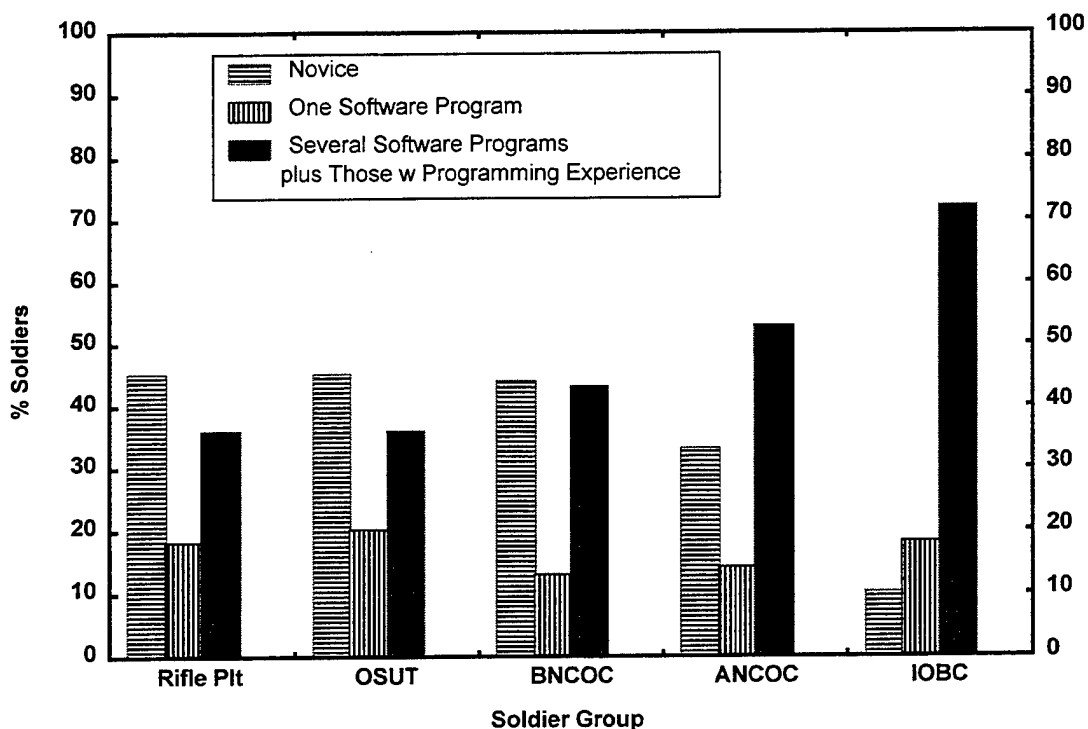


Figure 8. Self-ratings of computer skill.

Software programs and programming languages. The software reported by soldiers was divided into the five categories: office type, word processing, spreadsheet, graphics, operating systems, and "other." Across all groups, the most common software category was word processing, marked by 27% of all soldiers. The other five categories were each cited by 18% to 23% of the soldiers (see Table A-20). The most commonly reported software programs (see Table A-21) were Microsoft Word (23%), Microsoft Excel (19%), and Microsoft PowerPoint (14%). Microsoft Office was the most commonly reported office type software, and Microsoft Windows was the most commonly reported operating system. These patterns were typical of each group of soldiers. Other software programs reported by soldiers included: Lotus Suite, MS Works, Claris Works; WordPerfect, Lotus 123, Harvard Graphics, computer assisted drafting (CAD) programs, photograph software, Form Flow, Calendar Creator, financial software such as MS Money and Quicken, MS Access, various Internet and e-Mail software; and Windows, Unix, Macintosh and MS DOS operating systems.

With regard to programming languages, 8% of all soldiers cited programming languages. The most common programming languages cited by soldiers were Basic and C++. Some of the other languages reported were FORTRAN, PASCAL, COBOL, JAVA, HTML, and Visual Basic. A more complete breakout of these responses is in Tables A-20 and A-21.

Icon Test Scores

Two icon scores were computed due to the change in the survey. The 12-icon score was available on all groups. The 18-icon score was not available for the platoons and one IOBC class.

A scoring code was developed for each icon (see Appendix C). An inter-rater reliability check on a sample of 30 surveys showed an agreement of 98% on all the icons where soldiers responded (454 icons). Icons with no response were eliminated from this statistic, as raters could not disagree. For 7 of the 18 icons, there was no disagreement; on 6 of the icons there was a single disagreement. For the remaining three icons, there were either two or three instances of disagreement. The scoring code was revised to remove the ambiguities that led to these inconsistencies.

The icon scores paralleled the expertise reflected in other survey measures, in that IOBC scores were highest, rifle platoon and OSUT scores the lowest, and BNCOC and ANCOC scores were between these groups (see Figure 9). Significant differences occurred among the groups on both icon scores, $F(4,752) = 56.99, p < .0000$ on the 12-icon score; $F(3, 591) = 28.68, p < .0000$ for the 18-icon score. Descriptive statistics are in Table A-12. Post hoc comparisons on the 12-icon score indicated significant differences between each group, except for the rifle platoons and OSUT. On the 18-icon scores, significant differences occurred between every group. The overall correlation between the score on the 12 icons and the additional 6 icons was .76. The part-whole correlations for the 12-icon and 6-icon scores with the overall 18-icon score were .97 and .89 respectively.

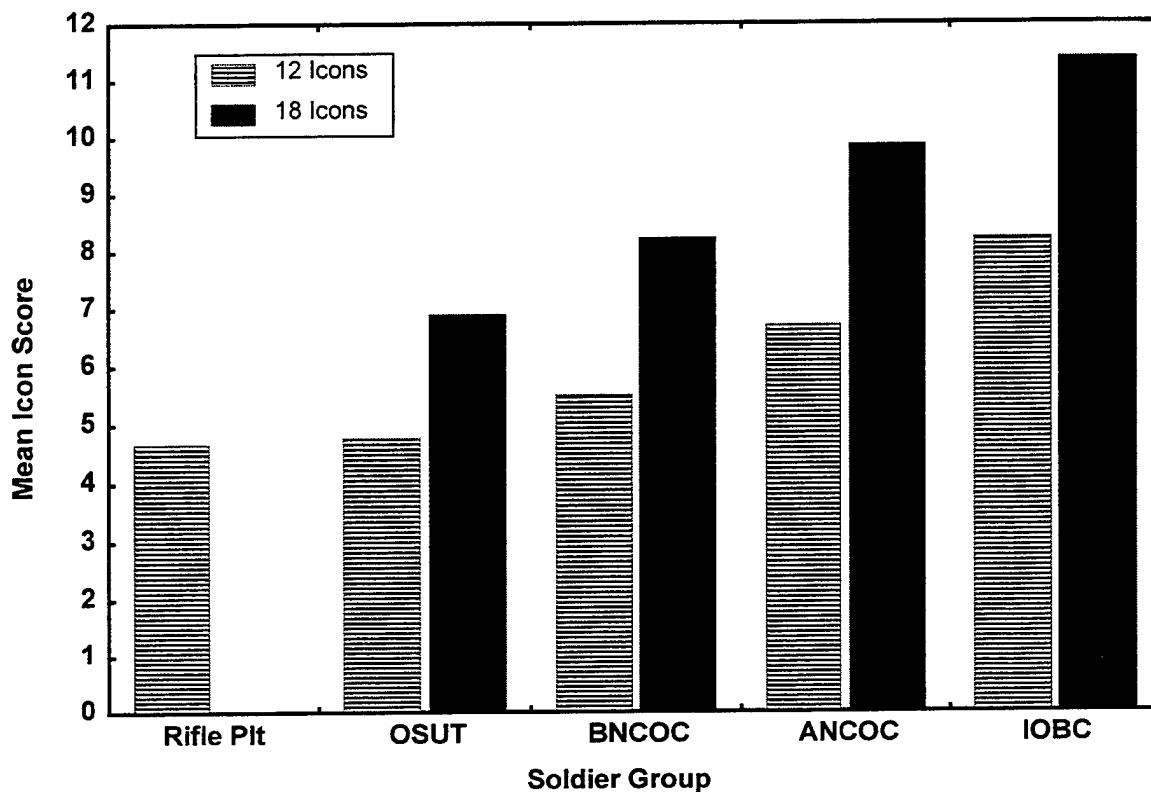


Figure 9. Icon scores by soldier group. (Rifle platoons did not take 18-icon test.)

The individual icons differed in difficulty for all soldiers, ranging from a high of 82% correct for the recycle icon to a low of 5% correct for the arrow icon. The solid line in Figure 10 depicts these percentages. The percentages for each soldier group are in Table A-13.

Several other findings are illustrated in Figure 10. The easiest icons (> 75% correct; recycle, cut, spell check, and open file) are labeled. The hardest items (< 25% correct, new file, paste, fill, group, and arrow) are also labeled. The remaining nine icons (between 75% and 25% correct) were considered of intermediate difficulty. These icons were print, help, zoom, cursor, save, center, close, copy and undo. Three of the five difficult icons were those related to graphics software (fill, group, arrow).

An additional question of interest was whether any survey measures that assessed computer background distinguished those soldiers who identified the icons from those who missed them. For example, if self-ratings of computer skill and ability to identify the individual icons were related, one would expect more of the experienced soldiers to identify the icons and fewer of the novices to do so. However, for the very difficult or very easy icons, there would likely be less discrimination and this pattern might not hold, as either "all" soldiers would miss the difficult icons or "all" soldiers would identify the easy icons. Figure 10 contrasts novices ($n = 250$) and soldiers experienced with at least several software programs as well as those who

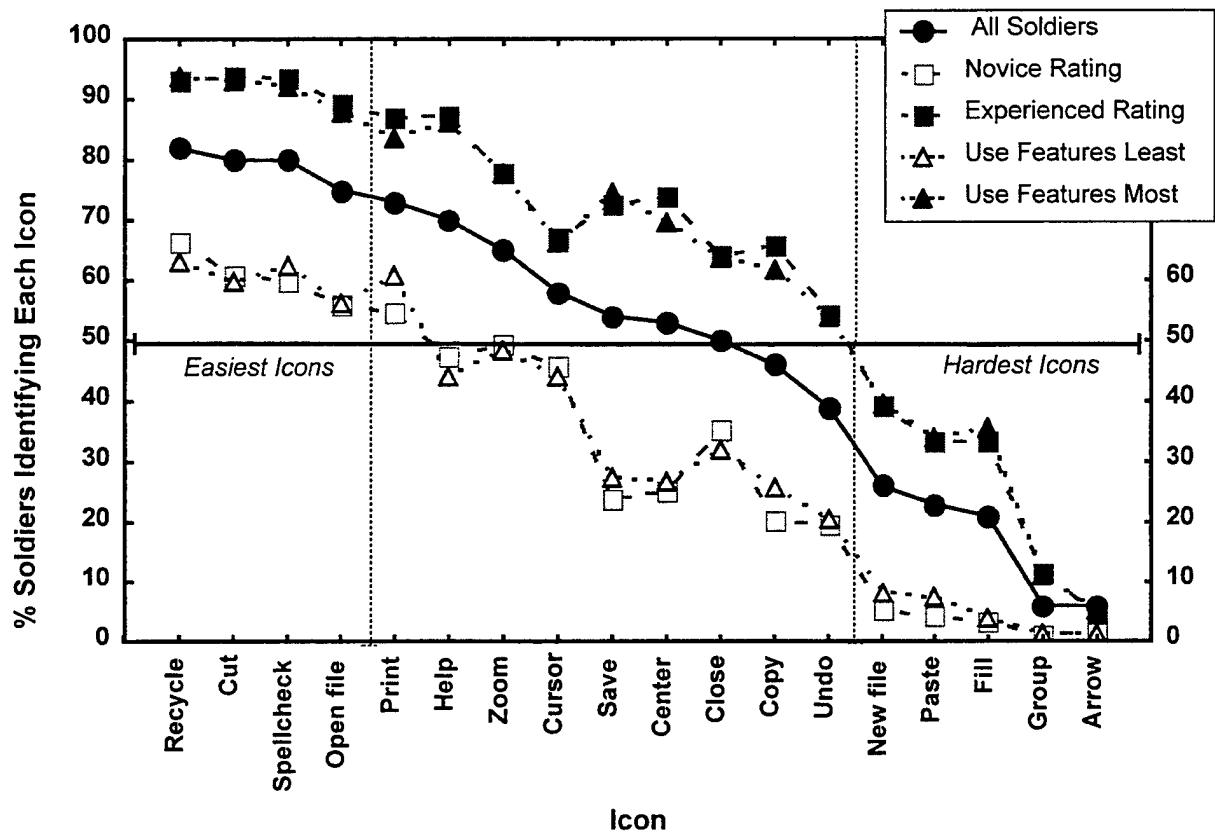


Figure 10. Icon difficulties for all soldiers, by high and low self-ratings, and by high and low use of computer features.

said they could program ($n = 382$). The soldiers who stated they were experienced with only one program are omitted from this figure.

The results depicted in Figure 10 show a relationship between self-ratings and icon difficulty, with the more experienced soldiers consistently scoring higher than novices except for the two most difficult icons (group and arrow). In addition, the graph indicates that over half of the experienced soldiers identified 13 of the 18 icons correctly. On the other hand, over half the novices identified only 5 of the 18 icons correctly (see also Table A-14).

A similar analysis was conducted examining the relationship between the frequency with which soldiers used the seven computer features covered in the survey and the individual icon scores. The feature usage frequencies were summed to generate a single index of use and the distribution divided into thirds. The top third ($n = 248$, 34% of 727) of soldiers in terms of use was compared to the bottom third ($n = 248$, 34% of 727). The top third had usage scores of 24 and above, reflecting a weekly to daily use of all features. The bottom third had scores of 14 and below, reflecting use of all features on a much less frequent basis, less than monthly or never. The pattern of results was identical to that obtained with the self-ratings. These findings are

depicted in Figure 10 (see also Table A-15). In summary, soldier perceptions of their computer skill and the frequency with which they used common/typical computer features related to the individual icon scores, except when the icons were extremely difficult.

Relationships Among Indices of Computer Skill

Given the findings on the relationship between self-ratings and use of features with the individual icons, it was expected that the overall icon scores would relate to the background factors on the survey, both within each soldier group and for all soldiers. These correlations, all significant, are presented in Table 2.

Table 2
Correlations With 12-Icon and 18-Icon Tests

Variable	Soldier Group					
	Rifle Plt (n = 60)	OSUT (n=149)	BNCOC (n = 178)	ANCOC (n = 181)	IOBC (n = 190, 12 icon) (n = 88, 18 icon)	All Soldiers (n = 757, 12 icon) (n = 595, 18 icon)
Use of Computer Features (Sum)	.61**** ^a -----	.49**** .54****	.54**** .58****	.60**** .63****	.47**** .65****	.55**** .60****
Self-Rating	.56**** -----	.45**** .46****	.53**** .55****	.56**** .58****	.40**** .49****	.55**** .55****
Own a Computer	.27* -----	.25**** .32****	.37**** .41****	.42**** .44****	.35**** .44****	.42**** .45****
Currently Use Computer	.42*** -----	.31**** .37****	.38**** .42****	.33**** .36****	.36**** .38****	.38**** .40****
# Formal Education Settings Where Used a Computer	.36** -----	.40**** .42****	.25*** .28****	.33**** .36****	.31**** .39****	.29**** .23****

Note. Within each cell, the 12-icon correlation is given first. The 18-icon correlation is presented below it. The rifle platoons did not have the 18-icon test.

^a n = 28.

* p < .05, ** p < .01, *** p < .001, **** p < .0001

In general, the relationships that occurred for the entire sample were typical of each soldier group. The frequency with which soldiers used computer features and their self-ratings of skill correlated most highly with the icon scores. Computer ownership, whether soldiers currently used a computer, and the use of computers in formal schooling had lower relationships with the icon scores.

For all soldiers, we also examined the relationship between the frequency with which each computer feature was used and computer ownership, current use of computers, self-ratings,

and number of formal educational settings where a computer was used. These correlations are in Table 3. All were significant, but clearly the strongest correlates of feature usage were ownership and computer use, followed by self-ratings.

Table 3
Correlations With Usage Frequency of Computer Features

Variable	Computer Feature						
	Mouse	Menus	Icons	Internet	E-Mail	Games	Graphics
Own a Computer	.68	.67	.66	.57	.61	.43	.52
Currently Use a Computer	.65	.60	.60	.47	.46	.40	.40
Self-Rating	.46	.54	.53	.42	.46	.25	.50
# Education Settings Where Used a Computer	.17	.21	.23	.25	.26	.13	.17

Note. $N = 708$. All correlations significant at $p < .001$

The relationship between computer ownership and feature usage rates is clarified in Figure 11 and in Table A-16. Figure 11 depicts the two extremes of feature usage, the “never” and “daily” categories, as a function of computer ownership. For the soldiers who owned a computer ($n = 462$), the data points represent the percentage who used each feature on a daily basis versus the percentage who had never used a particular feature. The corresponding percentages are given for those soldiers who did not own a computer ($n = 220$). The top two lines clearly show the impact of computer ownership on the likelihood of using the computer features covered in the survey. At least 65% of those who owned a computer used a mouse, icons, and menus on a daily basis; 57% to 60% said they used the Internet and e-mail daily. Of those who did not own a computer, at least 29% to 38% indicated they had never used a mouse, icons or menus; while 40% to 53% indicated they had never used the Internet or e-mail.

With graphics and games, those who owned a computer, fewer soldiers (26% to 28%) indicated daily use. Of those who did not own a computer, 35% indicated never using computer games; 48% indicated never using graphics.

The correlations among the background variables themselves are in Table A-17. Consistent with the data in Table 3, use of all computer features correlated significantly with owning and using computers. Self-ratings correlated significantly, but less strongly, with these variables. Lastly, the number of educational settings where soldiers used computers did not correlate highly with the other background variables.

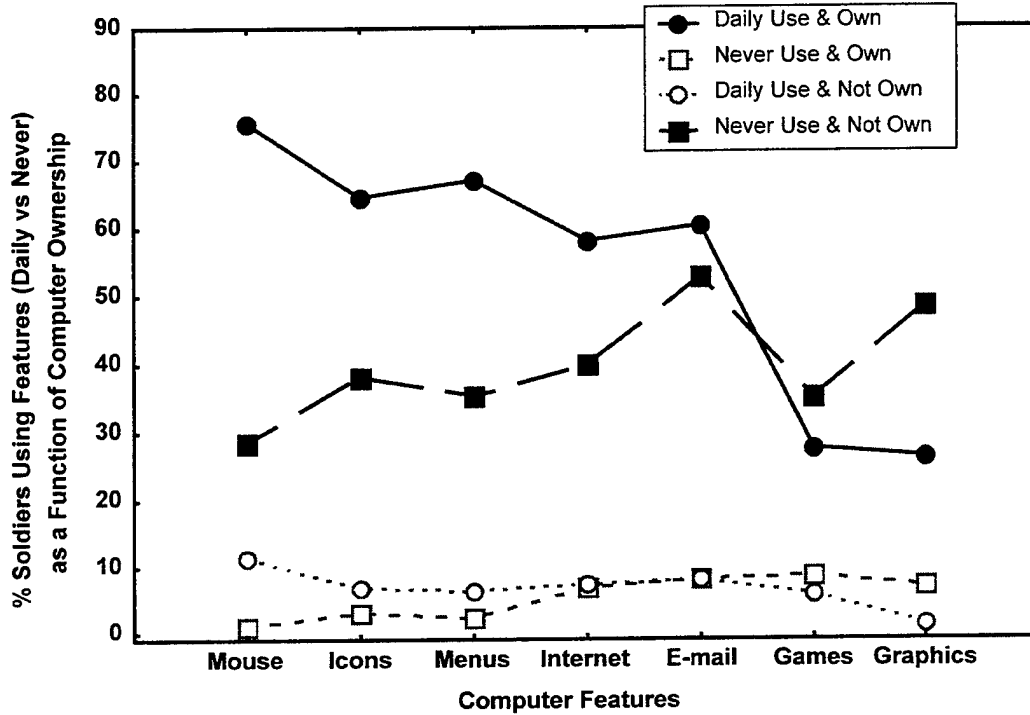


Figure 11. Relationship between computer ownership and frequency of use of computer features.

Conclusions

In general, the results show a consistent picture among computer background and use, soldiers' perceptions of their skill, and an abbreviated, objective index of skill or knowledge. This picture is also consistent with the relatively rapid increase in the availability of personal computers in American society. The youngest soldiers (OSUT) had the greatest exposure to computers in high school. On the other hand, the oldest soldiers, those in ANCOC, did not have computers in high school. But a high percentage of ANCOC soldiers owned a computer and many indicated they used computers in their duty positions. In addition, most IOBC students had used computers in high school, and they also owned a computer, perhaps reflecting the demands made by today's colleges and universities on computer skills (most IOBC students had used a computer in college). All soldiers indicated that the most common location for using a computer was at "home." Thus computer experience was gained in different ways, reflecting the circumstances where computers were available to the different groups surveyed. And these circumstances reflected differences in the soldiers' age, their job, their schooling experiences, and whether they owned a computer.

Of interest is whether these results on Infantrymen parallel the population at large. The U.S. Census Bureau (1999) conducted surveys on computer use in October of 1984, 1989, 1993,

and 1997. The survey reports cited percentages of students using computers in school and having a computer at home. To compare these data with the Infantry groups in our research, we estimated the year that the OSUT, BNCOC, ANCO, and IOBC soldiers were in the 12th grade, based on the average age of each group. This type of comparison has limitations. For example, some of the census data are based on 7th through 12th grade use of computers, and the different Infantry groups are not random samples from the U.S. population (e.g., IOBC students are college graduates). Nonetheless, the data in Table 4 show that the Infantry percentages are similar to the census figures, although the Infantry percentages are consistently higher. Stiles (1999) reported that among Navy personnel attending the Radioman A School, which focuses on using computers, anecdotal data indicated that 57% to 70% of these personnel had no prior computer experience. These results are somewhat lower than our OSUT results.

Table 4
Use of Computers in High School: Comparison with U.S. Census Bureau Figures

Year	Infantry Percentages: Use Computer in High school	Census Percentages		
		Use Computer in High School	Use Internet in High School	Have Computer at Home
1982	20% (ANCO)			
1984		26%		12%
1989	52% (BNCOC)	47%		30%
1993	72% (IOBC)	61%		38%
1996	83% (OSUT)			
1997		75%	25%	55%

In our survey, the overall trend in the frequency with which selected computer capabilities or features were used was as follows (from most to least frequent): a mouse, menu-driven software, software with icons, the Internet, e-mail, computer games, and graphics software. The groups surveyed differed somewhat in the frequency with which they used these capabilities. Soldiers indicated they used Windows features such as icons and drop-down menus on a very frequent basis, particularly those who owned a computer. Soldiers with access to computers were likely to use e-mail or the Internet. Those without a computer were at a disadvantage in this regard. OSUT soldiers used computer games most frequently. Overall, the rifle platoons indicated the least use of the features covered in the survey. Lastly, because the LW system and other digital systems will rely heavily on leader application of computer graphic techniques to military maps, of particular interest was the finding that graphics software was used the least often.

The IOBC soldiers had the most computer expertise and were the most homogeneous on all indicators of computer skill. In the other groups, the picture was more diverse; about half the soldiers had limited skills. These groups ranked in order from high to low as follows: ANCO, BNCOC, and then OSUT and the rifle platoons. Of particular interest was that 40% of the rifle platoons, OSUT, and BNCOC groups rated themselves as computer novices.

We used the self-ratings and the icon scores to estimate the percentage of soldiers likely to need training in basic computer skills before learning a specific software package. First, we determined the percentage of soldiers who scored 50% or less on the icon items. Second, we determined which of these soldiers also rated themselves as novices or good with only one program (see Tables A-18 and A-19). This later percentage was always less than that based on the icon-cut-off only. The point estimate of the percentage of soldiers needing training in basic computer skills was then defined as the mean of these two values. The spread around this estimate was based on the two values themselves: the upper limit was the percentage of soldiers scoring 50% or less on the icon test, while the lower limit was the percentage scoring 50% or less on the icon test who also rated themselves as novices or good with only one program. Using these values we obtained the following estimates of the percentages of soldiers needing training in basic computer skills:

Rifle platoons	69% +/- 11%
OSUT	65% +/- 9%
BNCOG	49% +/- 8%
ANCOG	37% +/- 4%
IOBC	17% +/- 2%

The estimate was highest for the rifle platoons and least for IOBC. The accuracy of these estimates was the least precise (greatest spread) for the platoons and the most precise (least spread) for IOBC.

Access to computers was strongly related to the use of computer capabilities. Such use is also central to maintaining computer skills. This relationship raises several interesting questions with regard to training and maintaining skill on Army digital systems. Do we expect soldiers to buy their own computers to acquire basic skills? Computer skills are subject to decay unless special attention is given to techniques for enhancing retention during training (Throne & Lickteig, 1997). Is it reasonable to assume that training will incorporate retention-enhancing techniques? Is it reasonable to assume that soldiers will have easy and unfettered access to system software or the system's training devices at all times, even during post support cycles? Answers to these questions greatly impact the training and sustainment requirements for digital systems.

The findings are a snapshot of the computer background of Infantrymen in FY99. But they can apply to soldiers in other branches of the Army with similar educational and military experience. The surveys will be continued for two more years to determine shifts in the groups surveyed in FY99, and will also be extended to non-Infantry populations. The extent to which a training package for the Land Warrior or similar software should include special training on basic computer skills will depend on the stability of these initial findings. However, if training were to begin today, the findings indicate that special training is required for many Infantrymen who will use the Land Warrior systems.

References

- Mackay, J. M., & Elam, J. J. (1992). A comparative study of how experts and novices use a decision aid to solve problems in complex knowledge domains. *Information Systems Research*, 3(2), 150-172.
- Stiles, C. (1999, June). *The impact of recruit socioeconomic background and computer literacy on U.S. Navy initial training*. Unpublished master's thesis, Naval Postgraduate School, Monterey, California. (DTIC No. AD-A365 614)
- Throne, M. H., & Lickteig, C. W. (1997, August). *Training computer skills for the future battlefield: A review and annotated bibliography* (Research Product 97-15). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- U.S. Census Bureau. (1999). *Computer use and ownership* [On-line]. www.census.gov/population/www/socdemo/computer.html.
- Van Vliet, P. J. A., Kletke, M. G., & Chakraborty, G. (1994). The measurement of computer literacy: A comparison of self-appraisal and objective tests. *International Journal of Human-Computer Studies*, 40, 835-857.
- Vaubel, K. P., & Gettys, C. F. (1990). Inferring user expertise for adaptive interfaces. *Human Computer Interaction*, 5, 95-117.

Appendix A

Data Tables

Table A-1

Descriptive Statistics on Age

Soldier Group	<i>N</i>	<i>M</i>	Mdn	<i>SD</i>	Min & Max Values	Lower & Upper Quartiles (25th-75th)
Rifle Plt (1 Plt)	28	23.50	22	5.20	18-41	20-25
OSUT	150	20.99	20	3.22	17-34	19-22
BNCOC	175	27.78	27	3.27	22-38	25-30
ANCOC	180	34.96	34	3.63	29-51	33-37
IOBC	188	24.06	23	2.50	21-33	22-25

Note. $F(4,716) = 440.51, p < .0000$. Mean age of all groups differed from each other except IOBC and the rifle platoons.

Table A-2

Descriptive Statistics on Months Served in the Army

Soldier Group	<i>N</i>	<i>M</i>	Mdn	<i>SD</i>	Min & Max Values	Lower & Upper Quartiles (25th-75th)
Rifle Plt	60	47.35	25.00	49.75	1-204	17-54
OSUT						
BNCOC	175	94.35	88.00	33.53	41-228	70-111
ANCOC	178	178.78	179.00	27.45	112-246	159-196
IOBC						

Note. Months served not asked of OSUT soldiers. No data for IOBC because of unreliable responses.

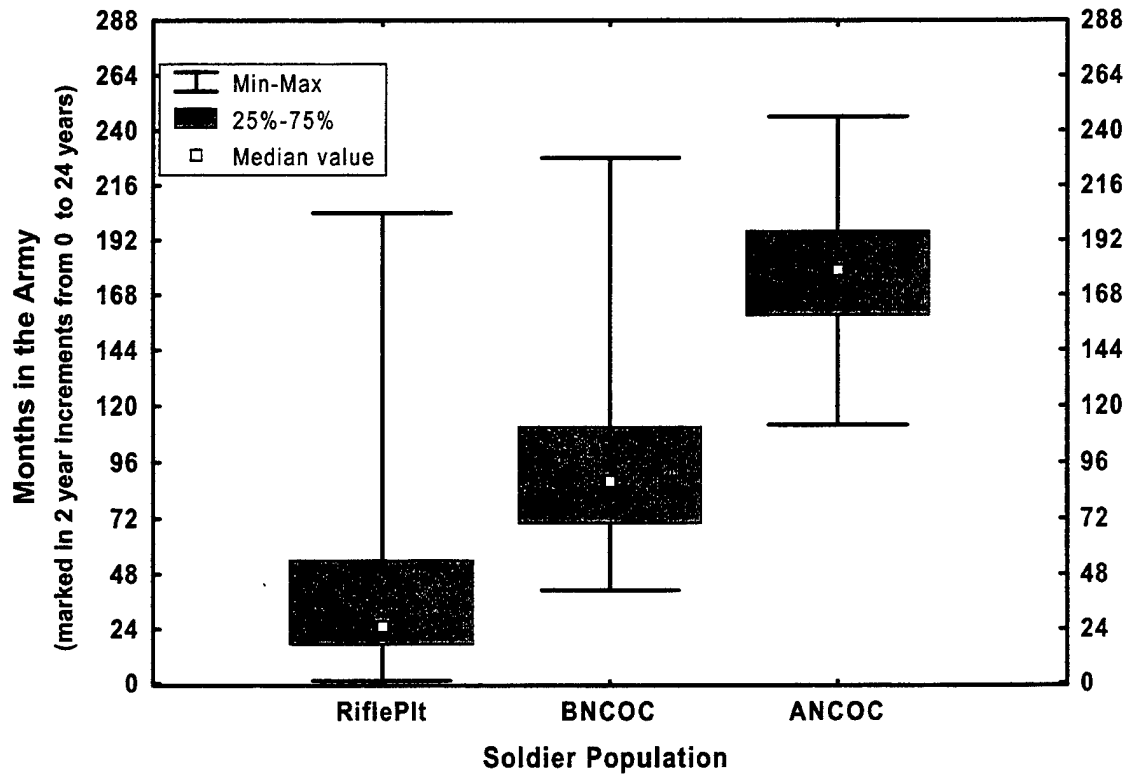


Figure A-1. Box plots of number of months served in the Army for the rifle platoons, BNCOC, and ANCOG.

Table A-3
Percentage of Soldiers Using a Computer in Different Phases of Their Formal Education

Soldier Group	% Soldiers Using a Computer					
	Grade School	Junior High	High School	Technical School	College	Not Use
Rifle Plt	15%	35%	70%	0%	28%	14%
OSUT	34%	62%	83%	7%	28%	5%
BNCOC	7%	19%	52%	7%	40%	27%
ANCOG	2%	3%	20%	3%	36%	46%
IOBC	33%	49%	72%	4%	84%	2%

Table A-4

Number of Educational Settings Where Soldiers Used a Computer

Soldier Group	# Educational Settings (% soldiers)				
	0	1	2	3	4-5
	% Soldiers				
Rifle Plt	13%	45%	25%	13%	3%
OSUT	5%	29%	26%	27%	13%
BNCOC	29%	39%	19%	8%	5%
ANCOC	46%	45%	7%	1%	1%
IOBC	2%	29%	23%	18%	28%

Table A-5

Percentage of Soldiers Indicating Computer Ownership and Current Use of a Computer

Soldier Group	% Own a Computer	% Use Computer Now	Where Currently Use Computer		
			Home	Work/Unit	Trng Facility
Rifle Plt	35%	65%	55%	18%	8%
OSUT	49%	75%	63%	15%	39%
BNCOC	60%	87%	66%	52%	24%
ANCOC	78%	91%	73%	71%	23%
IOBC	81%	90%	85%	6%	21%

Table A-6

Percentage of Soldiers Indicating Different Levels of Typing Skill

Soldier Group	Self Ratings of Typing Skill			
	Hunt & Peck Slowly	Hunt & Peck Quickly	Type Slowly	Type Quickly
Rifle Plt	10%	50%	30%	10%
OSUT	10%	42%	29%	19%
BNCOC	14%	45%	25%	16%
ANCOC	15%	48%	25%	12%
IOBC	2%	35%	26%	37%

Table A-7
Frequency With Which Computer Features are Used: Percentage Soldiers by Scale Category

Soldier Group	Frequency (% Soldiers)				
	Daily	Weekly	Monthly	< Monthly	Never
Mouse					
Rifle Plt	29%	14%	11%	25%	21%
OSUT	44%	21%	9%	15%	12%
BNCOC	51%	20%	9%	6%	14%
ANCOC	64%	19%	7%	6%	4%
IOBC	63%	18%	5%	7%	7%
Games					
Rifle Plt	11%	32%	0%	32%	25%
OSUT	23%	34%	14%	20%	9%
BNCOC	30%	23%	12%	19%	17%
ANCOC	20%	30%	12%	21%	17%
IOBC	15%	24%	17%	23%	22%
Icons					
Rifle Plt	21%	14%	11%	29%	25%
OSUT	30%	26%	9%	16%	21%
BNCOC	41%	20%	10%	10%	19%
ANCOC	55%	20%	8%	10%	8%
IOBC	59%	22%	6%	6%	8%
Menus					
Rifle Plt	25%	14%	7%	29%	25%
OSUT	33%	25%	11%	15%	16%
BNCOC	41%	23%	6%	11%	18%
ANCOC	54%	21%	9%	8%	9%
IOBC	61%	18%	7%	7%	7%
Graphics					
Rifle Plt	4%	11%	7%	36%	43%
OSUT	15%	22%	18%	26%	19%
BNCOC	16%	22%	17%	21%	25%
ANCOC	23%	22%	17%	24%	14%
IOBC	21%	19%	21%	22%	17%
E-Mail					
Rifle Plt	18%	14%	4%	25%	39%
OSUT	34%	21%	7%	18%	20%
BNCOC	39%	16%	5%	6%	34%
ANCOC	46%	18%	3%	10%	23%
IOBC	56%	20%	5%	9%	10%
Internet					
Rifle Plt	18%	18%	4%	25%	36%
OSUT	36%	26%	10%	14%	14%
BNCOC	37%	18%	6%	13%	26%
ANCOC	47%	18%	4%	13%	18%
IOBC	49%	26%	6%	9%	9%

Table A-8

Means (standard deviations) on the Computer Features Frequency of Use Scales

Feature	Soldier Group					
	Rifle Plt (n = 28)	OSUT (n = 138)	BNCOC (n = 170)	ANCOC (n = 174)	IOBC (n = 187)	All Groups (n = 697)
Mouse	2.04 (1.57)	2.69 (1.46)	2.86 (1.46)	3.30 (1.13)	3.24 (1.24)	3.01 (1.36)
Menus	1.86 (1.58)	2.43 (1.50)	2.58 (1.55)	3.05 (1.32)	3.19 (1.24)	2.80 (1.45)
Icon	1.79 (1.52)	2.30 (1.54)	2.55 (1.55)	3.02 (1.33)	3.18 (1.26)	2.76 (1.47)
Internet	1.57 (1.57)	2.59 (1.45)	2.27 (1.67)	2.62 (1.59)	2.97 (1.32)	2.58 (1.54)
E-mail	1.46 (1.57)	2.33 (1.57)	2.19 (1.76)	2.53 (1.68)	3.04 (1.38)	2.50 (1.64)
Games	1.71 (1.44)	2.43 (1.28)	2.28 (1.48)	2.14 (1.40)	1.90 (1.39)	2.15 (1.41)
Graphics	0.96 (1.14)	1.88 (1.37)	1.82 (1.42)	2.14 (1.39)	2.05 (1.39)	1.94 (1.40)
All Features	1.63 (1.32)	2.38 (1.36)	2.36 (1.35)	2.69 (1.15)	2.80 (1.11)	

Note. Scale was 0 = never use, 1 = less than monthly, 2 = monthly; 3 = weekly, 4 = daily.

Table A-9

Descriptive Statistics on the Sum of Feature Use Ratings

Soldier Group	Sum of Feature Use Ratings				
	<i>M</i>	<i>Mdn</i>	<i>SD</i>	Min & Max Values	Lower & Upper Quartiles (25th-75th)
Rifle Plt	11.39	8.5	9.24	0-27	3.50-19.75
OSUT	15.71	18	9.50	0-28	7.00-25.00
BNCOC	16.14	18.5	9.47	0-28	8.00-24.00
ANCOC	18.61	21	8.07	0-28	12.50-25.00
IOBC	19.33	21.5	7.77	0-28	15.75-25.00

Note. The 7 features were rated on a 0 to 4 point scale, ranging from “never” used to “daily” use. Maximum score was 28 representing daily use of all 7 features; minimum score was 0 indicating a soldier never used any of the 7 features.

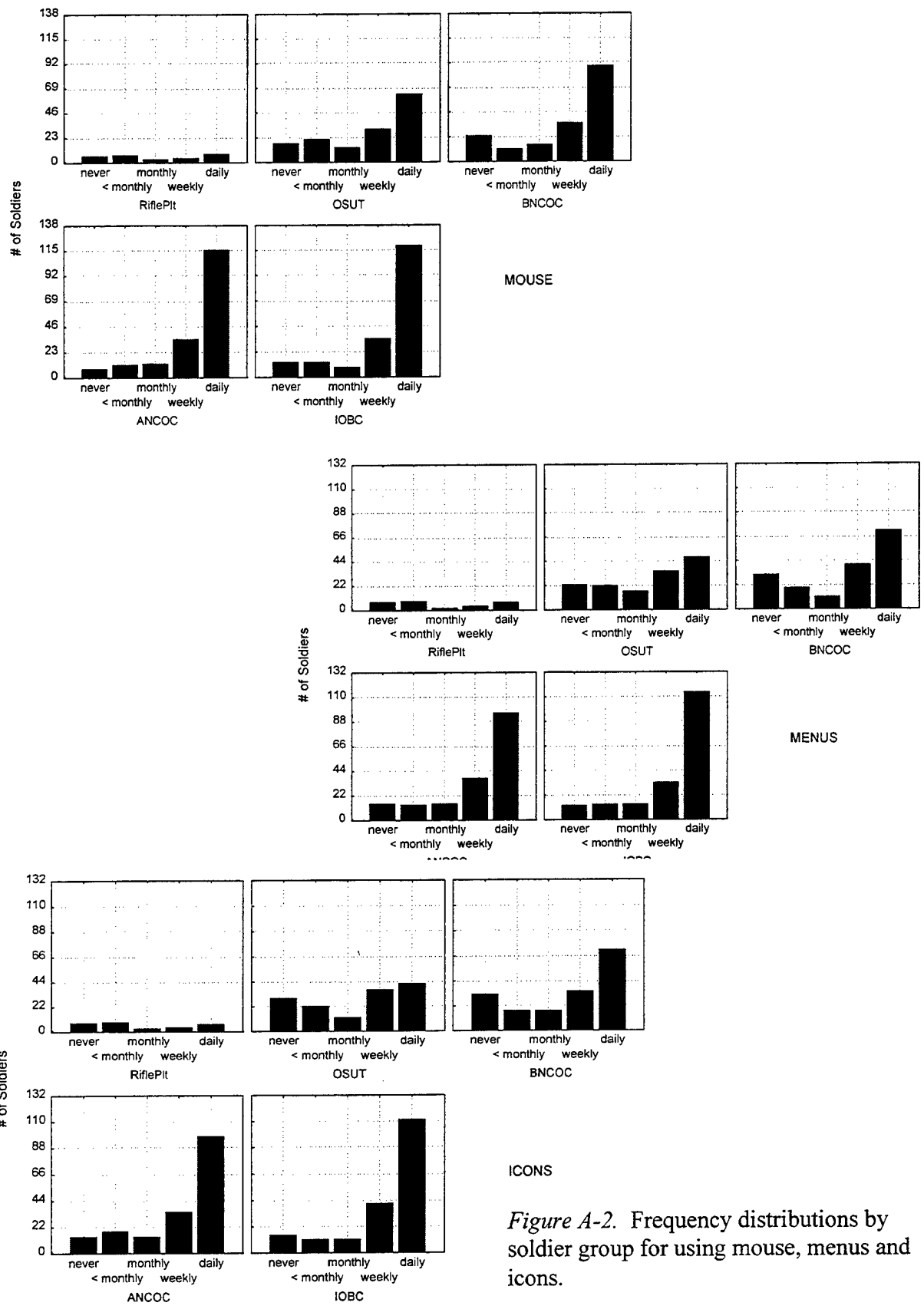


Figure A-2. Frequency distributions by soldier group for using mouse, menus and icons.

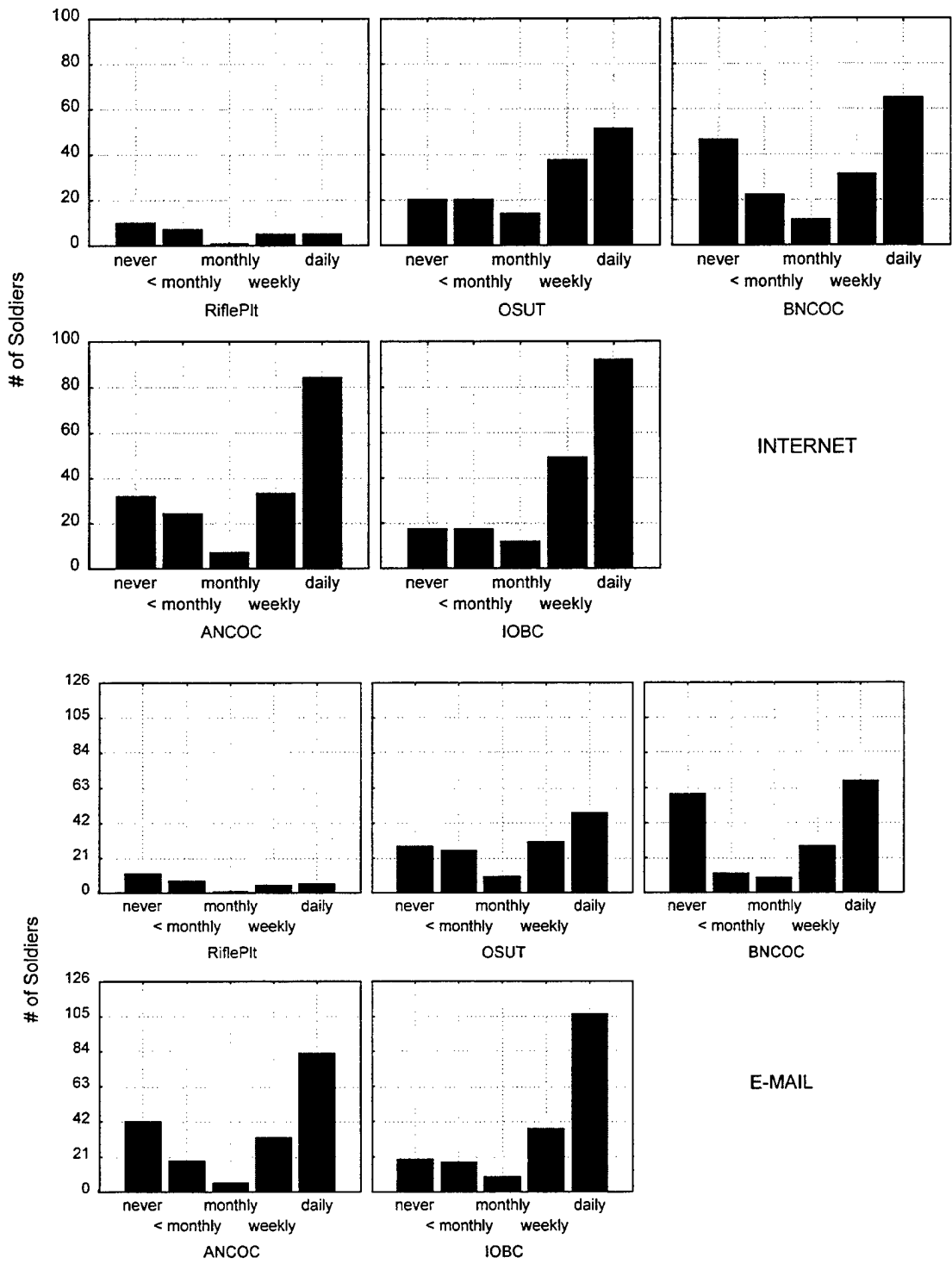


Figure A-3. Frequency distributions by soldier group for using the internal and e-mail.

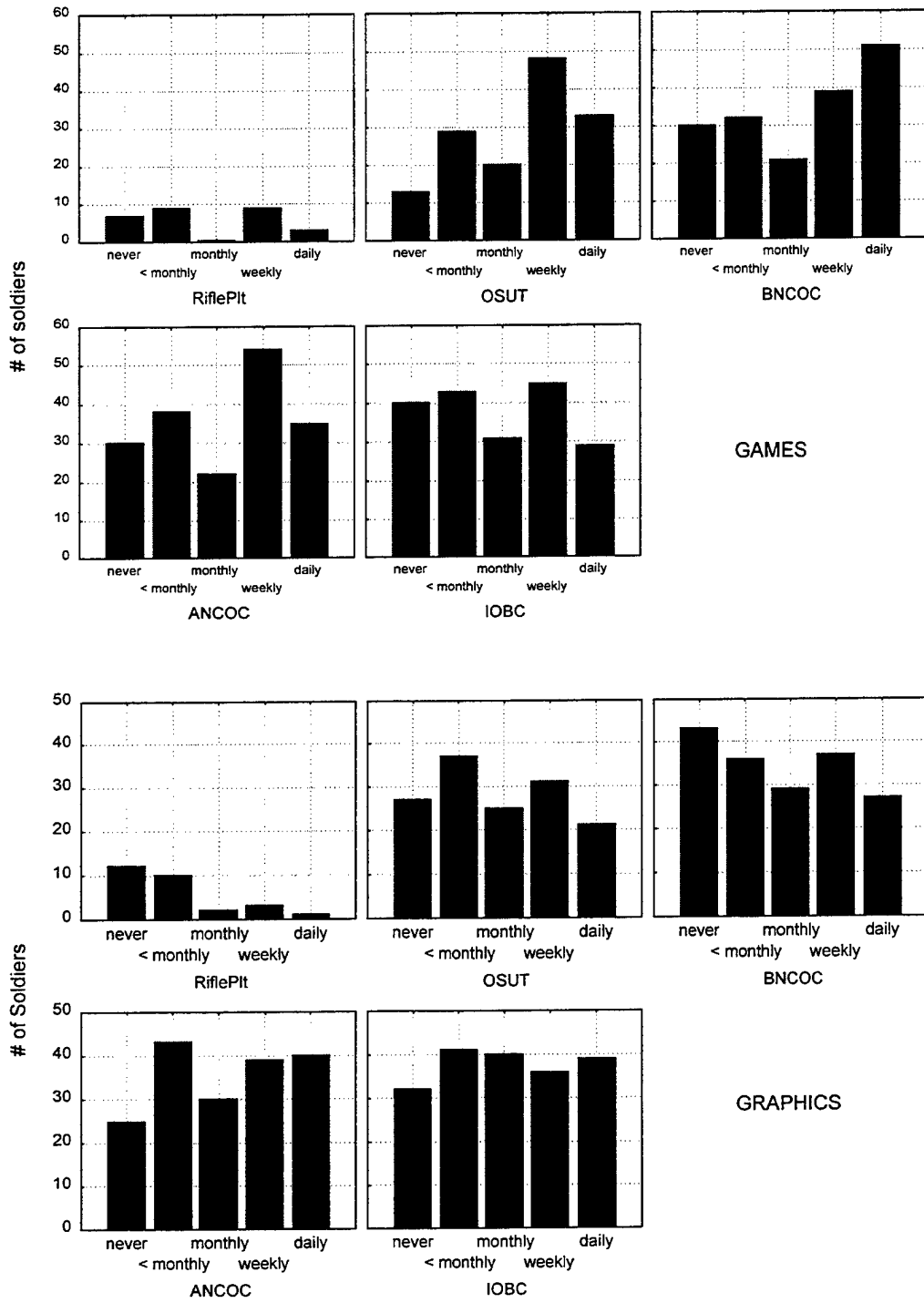


Figure A-4. Frequency distributions by soldier group for using games and graphics.

Table A-10

Percentage of Soldiers Indicating Different Levels of Computer Skill

Soldier Group	Self-Ratings of Computer Skill					
	Novice	Good w 1 softw program	Good w several Soft Progr	1 Progm Lang + Software	Several Progm Lang + Soft	Bill Gates hire me
Rifle Plt	45%	18%	28%	8%	0%	0%
OSUT	45%	20%	27%	7%	1%	1%
BNCOC	44%	14%	34%	6%	1%	2%
ANCOC	33%	14%	44%	7%	2%	0%
IOBC	11%	18%	52%	12%	5%	3%

Note. Sample size for each group is shown in Table A-11.

Table A-11

Descriptive Statistics on Self-Ratings of Computer Skill

Soldier Group	Self-Ratings of Computer Skill					
	<i>N</i>	<i>M</i>	<i>Mdn</i>	<i>SD</i>	Range	Interquartile
Rifle Plt	60	2.00	2	1.04	1-4	1-3
OSUT	150	2.02	2	1.10	1-6	1-3
BNCOC	178	2.12	2	1.18	1-6	1-3
ANCOC	181	2.31	3	1.07	1-5	1-3
IOBC	190	2.91	3	1.09	1-6	2-3

Note. Scores: Novice = 1, One software program = 2; Several software program = 3, Lang + software = 4, Program language + software = 5; Bill Gates hire = 6.

Table A-12
Descriptive Statistics on Icon Test Scores

Soldier Group	12 Icon Version						
	<i>N</i>	<i>M</i>	<i>Mdn</i>	Range	% ≤50% correct (Score of 6)	Interquartile Range	<i>SD</i>
Rifle Plt	60	4.67	5.00	0-11	80%	3.00-6.00	2.48
OSUT	149	4.74	4.50	0-11	71%	3.00-7.00	2.61
BNCOC	178	5.50	6.00	0-12	61%	4.00-7.50	3.07
ANCOC	180	6.68	7.00	0-12	41%	5.00-9.00	2.79
IOBC	190	8.21	8.5	0-12	20%	7.00-10.00	2.28
	18 Icon Version						
	<i>N</i>	<i>M</i>	<i>Mdn</i>	Range	% ≤50% correct (Score of 9)	Interquartile Range	<i>SD</i>
OSUT	149	6.89	7.0	0-16	74%	4.00-9.50	3.67
BNCOC	178	8.20	9.00	0-18	57%	5.50-11.13	4.53
ANCOC	180	9.85	10.50	0-17	41%	7.00-12.50	3.99
IOBC	88	11.36	12.00	0-17	19%	10.00-13.50	3.31

Table A-13
Percentage of Soldiers Correctly Naming Each Icon

Soldier Group	Icon Name					
	Spell Chk	Cursor	Zoom	Open File	Save	Print
Rifle Plt	65%	58%	58%	67%	30%	61%
OSUT	69%	46%	51%	61%	33%	69%
BNCOC	75%	58%	60%	70%	40%	61%
ANCOC	85%	61%	65%	81%	58%	72%
IOBC	92%	65%	69%	88%	84%	92%
	Cut	Copy	Paste	Undo	New File	Arrow
Rifle Plt	67%	37%	10%	5%	8%	0%
OSUT	65%	30%	8%	17%	9%	1%
BNCOC	78%	30%	11%	36%	17%	3%
ANCOC	85%	48%	22%	56%	22%	3%
IOBC	94%	74%	45%	54%	51%	5%
	Recycle	Help	Center	Fill	Close	Group
OSUT	76%	56%	37%	17%	26%	1%
BNCOC	79%	66%	46%	16%	52%	6%
ANCOC	85%	78%	58%	17%	63%	9%
IOBC (1class)	87%	87%	78%	29%	58%	8%

Table A-14
Relationship Between Self-ratings and Icon Difficulty

Icon	% Correct Overall	Novices		More Experienced	
		More Correct than Incorrect Answers?	Ratio of Correct to Incorrect	More Correct than Incorrect Answers?	Ratio of Correct to Incorrect
Easiest Icons					
Recycle	82%	Yes	1.96	Yes	14.11
Cut	80%	Yes	1.55	Yes	15.61
Spell check	80%	Yes	1.48	Yes	14.28
Open file	75%	Yes	1.26	Yes	8.32
Icons of Intermediate Difficulty					
Print	73%	Yes	1.20	Yes	6.64
Help	70%	No	0.90	Yes	6.78
Zoom	65%	No	0.98	Yes	3.52
Cursor	58%	No	0.84	Yes	2.05
Save	54%	No	0.32	Yes	2.65
Center	53%	No	0.34	Yes	2.82
Close	50%	No	0.54	Yes	1.78
Copy	46%	No	0.25	Yes	1.92
Undo	39%	No	0.24	Yes	1.18
Hardest Icons					
New file	26%	No	0.09	No	0.64
Paste	23%	No	0.04	No	0.50
Fill	21%	No	0.03	No	0.50
Group	6%	No	0.01	No	0.13
Arrow	6%	No	0.01	No	0.04

Note. The groups were combined for this analysis. The “more experienced” category included soldiers who said they were experienced with at least several software programs as well as those who said they could program (the top 4 categories of the self-rating scale). Ratios greater than 1.00 reflect more correct than incorrect responses. Ratios less than 1.00 reflect more incorrect than correct responses.

Table A-15

Relationship Between Feature Usage Frequency and Icon Difficulty

Icon	% Correct Overall	Least Frequent Users of Features (Bottom 1/3rd)		Most Frequent Users of Features (Top 1/3rd)	
		More Correct than Incorrect Answers?	Ratio of Correct to Incorrect	More Correct than Incorrect Answers?	Ratio of Correct to Incorrect
Easiest Icons					
Recycle	82%	Yes	1.71	Yes	15.31
Cut	80%	Yes	1.49	Yes	13.58
Spell check	80%	Yes	1.67	Yes	12.05
Open file	75%	Yes	1.29	Yes	7.26
Icons of Intermediate Difficulty					
Print	73%	Yes	1.56	Yes	5.20
Help	70%	No	0.79	Yes	6.26
Zoom	65%	No	0.94	Yes	3.54
Cursor	58%	No	0.79	Yes	1.96
Save	54%	No	0.38	Yes	2.95
Center	53%	No	0.36	Yes	2.28
Close	50%	No	0.47	Yes	1.75
Copy	46%	No	0.35	Yes	1.65
Undo	39%	No	0.25	Yes	1.17
Hardest Icons					
New file	26%	No	0.09	No	0.65
Paste	23%	No	0.08	No	0.52
Fill	21%	No	0.04	No	0.55
Group	6%	No	0.01	No	0.13
Arrow	6%	No	0.01	No	0.06

Note. The groups were combined for this analysis. Ratios greater than 1.00 reflect more correct than incorrect responses. Ratios less than 1.00 reflect more incorrect than correct responses.

Table A-16

Percentage of Soldiers Using Computer Features as a Function of Computer Ownership

Own a Computer	Frequency of Use				
	Never	< Monthly	Monthly	Weekly	Daily
	Mouse				
Yes	1%	3%	3%	18%	76%
No	29%	22%	17%	21%	11%
	Icons				
Yes	3%	5%	5%	23%	65%
No	38%	24%	14%	17%	7%
	Menus				
Yes	2%	4%	6%	21%	67%
No	35%	25%	13%	20%	6%
	Internet				
Yes	7%	8%	4%	23%	58%
No	40%	23%	12%	18%	7%
	E-Mail				
Yes	8%	8%	3%	21%	60%
No	53%	19%	9%	12%	8%
	Games				
Yes	9%	17%	13%	34%	28%
No	35%	31%	14%	14%	6%
	Graphics				
Yes	7%	21%	20%	26%	26%
No	48%	28%	14%	9%	1%

Note. Within rounding error, rows sum to 100%. For all groups combined, the *N* for computer ownership = 462. *N* for no ownership = 220.

Table A-17
Correlations Among Background Variables

Background Variable	Soldier Group	Self-Rating	Own a Computer	Use a Computer	# Educational Settings
Use of Computer Features (sum)	All	.54****	.70****	.61****	.26****
	Platoons	.49**	.76****	.72****	.25
	OSUT	.56****	.68****	.58****	.42****
	BNCOC	.61****	.74****	.62****	.35****
	ANCOC	.56****	.67****	.54****	.33****
	IOBC	.35****	.60****	.62****	.19**
Self-Rating	All	----	.41****	.33****	.34****
	Platoons		.37**	.51****	.19
	OSUT		.50****	.31****	.38****
	BNCOC		.44****	.32****	.41****
	ANCOC		.37****	.22**	.39****
	IOBC		.16*	.29****	.25***
Own a Computer	All		----	.49****	.14****
	Platoons			.46****	-.11
	OSUT			.37****	.25**
	BNCOC			.46****	.27****
	ANCOC			.46****	.26***
	IOBC			.58****	.14
Use a Computer	All			----	.14****
	Platoons				.22
	OSUT				.24**
	BNCOC				.27****
	ANCOC				.22**
	IOBC				.12

Note. Samples sizes for each correlation varied with the number of missing data points for each variable. For the total sample the n ranged from 695 to 759; rifle platoon $n = 28$ for computer features and 60 for all other correlations; OSUT $n = 141$ to 150; BNCOC $n = 165$ to 178; ANCOC $n = 172$ to 181; IOBC $n = 181$ to 190.

* $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$

Table A-18

Estimates of Percentage of Soldiers With Limited Basic Computer Skills Based on the 12-Icon Test and Self-Ratings

Variable	Rifle Plts (n = 60)	OSUT (n = 149)	BNCOC (n = 178)	ANCOC (n = 180)	IOBC (n = 190)
Estimate A: % scoring 50% or less on 12 icon test (6 or less)	80%	71%	61%	41%	19%
Estimate B: Intersection of Estimate A with self ratings (novice/good with 1 program)	58%	54%	45%	31%	11%
Estimate C: Mean of A & B	69% +/- 11%	63% +/- 8%	53% +/- 8%	36% +/- 5%	15% +/- 4%

Table A-19

Estimates of Percentage of Soldiers With Limited Basic Computer Skills Based on the 18-Icon Test and Self-Ratings

Variable	OSUT (n = 149)	BNCOC (n = 178)	ANCOC (n = 180)	IOBC (n = 88)
Estimate D: % scoring 50% or less on 18 icon test (9 or less)	74%	57%	41%	19%
Estimate E: Intersection of Estimate D with self-ratings (novice/good with 1 program)	56%	41%	33%	15%
Estimate F: Mean of D & E	65% +/- 9%	49% +/- 8%	37% +/- 4%	17% +/- 2%

Table A-20

Percentage of Soldiers Indicating Experience With Computer Software Programs and Programming Languages

	Percentage of Soldiers				
	OSUT (n = 150)	BNCOC (n = 178)	ANCOC (n = 181)	IOBC (n = 89)	All Groups (n = 598)
Software Programs					
Office Type	10%	16%	28%	22%	18%
Word Processing	17%	26%	29%	44%	27%
Spreadsheets	10%	20%	26%	36%	23%
Graphics	7%	15%	24%	36%	19%
Operating Systems	29%	15%	14%	19%	19%
Other Software	11%	22%	26%	22%	21%
Programming Languages	7%	6%	8%	13%	8%

Note. Not all the soldiers who indicated they were skilled with software packages answered this question. A soldier was counted only once if he indicated skill with more than one software program within a specific category, e.g., knew both Word and Word Perfect word processing programs, or knew several programming languages, Basic, FORTRAN and Pascal. Excluded from these tallies were generic responses such as "spreadsheets," "word processing," and "all graphics" programs. To be included in the count, a specific software program had to be listed by the soldier.

Table A-21

Percentage of Soldiers Indicating Experience With Specific Software Programs and Languages

	Percentage of Soldiers				
	OSUT (n = 150)	BNCOC (n = 178)	ANCOC (n = 181)	IOBC (n = 89)	All Groups (n = 598)
Office Type					
Office Suites	7%	14%	27%	18%	17%
Small Office	4%	3%	5%	8%	5%
Word Processing					
Word	13%	24%	24%	39%	24%
Word Perfect	4%	2%	6%	10%	5%
Other	1%	0%	2%	1%	1%
Spreadsheets					
Excel	8%	18%	22%	31%	19%
Lotus 123	2%	2%	4%	9%	4%
Other	1%	0%	0%	0%	0%
Graphics					
Power Point	3%	12%	19%	28%	14%
Harvard Graphics	0%	1%	3%	2%	2%
Other	5%	2%	9%	15%	7%
Operating Systems					
Windows	27%	13%	12%	19%	17%
DOS	5%	6%	4%	2%	4%
Other OS	4%	0%	1%	0%	1%
Other Software					
Form Flow	0%	11%	13%	1%	7%
Calendar	0%	3%	4%	3%	3%
Financial	4%	5%	4%	6%	5%
Internet/E-Mail	5%	2%	3%	17%	6%
Data Bases	1%	4%	2%	2%	2%
Other	4%	5%	13%	10%	8%
Programming Languages					
BASIC	7%	3%	4%	4%	4%
FORTTRAN	1%	1%	1%	2%	1%
PASCAL	1%	1%	1%	3%	1%
COBOL	0%	2%	2%	2%	1%
JAVA	0%	0%	1%	3%	1%
HTML	1%	0%	1%	2%	1%
C++	2%	3%	2%	7%	3%
Other	0%	1%	0%	7%	1%

Note. Not all the soldiers who indicated skill with software packages answered this question. Each citation of a specific software package or programming language was tallied in computing the percentages. If a soldier cited Power Point and Harvard Graphics, each was tallied.

Appendix B
Survey Forms

COMPUTER QUESTIONNAIRE

[Demographic Questions]

ANCOC and BNCOC Surveys

Name: _____ Age: _____ Rank: _____

Years and Months in Army: _____ years _____ months

Are you returning to the same position you held when you left your unit? Yes _____ No _____

If Yes, what is that position? _____

If No, what position are you going to? _____

IOBC Survey *(Those taking the first IOBC Survey were not asked about source of commission nor whether they were active or reserve.)*

Name: _____ Age: _____ Rank: _____

Years and Months in Army: _____ years _____ months

What is your source of commission? West Point _____ ROTC _____ OCS _____

Are you Active or Reserve component/National Guard? AC _____ RC _____

OSUT Survey

Name: _____ Age: _____

What is the highest level of education you have had?

High School _____

Technical School _____

Less than 4 yrs of college _____

Completed 4 yrs of college _____

Other _____

Rifle Platoon Survey *(Soldiers in the Baseline platoon were not asked their age.)*

Name: _____ Age: _____ Rank: _____

Years/Months in Army _____ Position _____

-
1. When did you use computers in your education? *(Circle all that apply)*
 Grade School Jr High High School Technical School College Did Not Use
2. Where do you currently use a computer? *(Circle all that apply)*
 Home/barracks/BOQ Unit/Work Site
 Library/Learning Ctr/Training Facility Do Not Use

3. For each of the following questions, circle the response that best describes you.

- a. Do you own a personal computer? Yes No
- b. How often do you:
- Use a mouse? Daily, Weekly, Monthly, Less Often, Never
 - Play computer games? Daily, Weekly, Monthly, Less Often, Never
 - Use icon-based programs/software? Daily, Weekly, Monthly, Less Often, Never
 - Use programs/software with pull-down menus? Daily, Weekly, Monthly, Less Often, Never
 - Use graphics/drawing features in software packages? Daily, Weekly, Monthly, Less Often, Never
 - Use E-mail (at home or at work)? Daily, Weekly, Monthly, Less Often, Never
 - Use the Internet? Daily, Weekly, Monthly, Less Often, Never

Note. For the Baseline platoon, the questions under Item 3b required only a Yes or No response.

4. Which of the following best describes your typing ability? *(check \surd one)*
 Hunt and peck slowly
 Hunt and peck quickly
 Type slowly while not looking at the keyboard
 Type quickly while not looking at the keyboard
5. Which of the following best describes your expertise with computers? *(check \surd one)*
 Novice
 Good with one type of software package (such as word processing or work calendars or slides)
 Good with several software packages
 Can program in one language and use several software packages
 Can program in several languages and use several software packages
 Expert – Bill Gates would hire me

If you are good with one or more software packages, please list them.

If you can program in one or more languages, please name these languages.

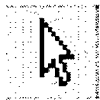
Note. The free-response questions under Item 5 were not given to the rifle platoons nor to one IOBC class.

6. What is the function of the following icons?























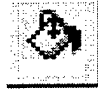






















Note. The last two rows of icons were not given to the two rifle platoons nor to one IOBC class. Therefore, these soldiers had only a 12-item icon test.









We thank you for providing information on your computer background, and appreciate your cooperation and time devoted to this survey.



Full confidentiality will be maintained in the processing of all data.

US Army Research Institute for the Behavioral and Social Sciences, Ft. Benning, GA.

Appendix C
Scoring of Computer Icons

<p>Spellcheck Spelling</p> 	<p>Save to disk Save Save to hard drive To save information</p>  <p>½: Save disk—backup ½: Disk floppy (save) ½: Insert Disk or Save</p> <p>0: Hard drive 0: Normally A Drive 0: Floppy disk to excess 0: Open disk</p> <p>½: Store ½: Disk save ½: Save as</p> <p>0: Disk 0: Insert disk 0: Removable disk</p>
<p>Mouse/Point Point/Select Mouse Arrow or Pointer Points to desired function Return to point/click icon or cursor itself Large Mouse Pointer To choose options on screen Use of mouse (select)</p> <p>0: Click on item 0: Indicator 0: Manipulate shape 0: Pick object or picture 0: To click on different icons 0: Switch to cursor or to arrow 0: To activate icons or put down menus</p> <p>Pointer Cursor</p> <p>0: Mouse icon 0: Locator 0: Mouse 0: Points to Icons</p> 	<p>Print Printing Print Function</p>  <p>½: Print/Fax</p> <p>0: Fax 0: Faxing 0: Printer 0: Printer page 0: Printer select 0: Printer (activate) 0: Copy</p>
<p>Zoom Increase image Zoom in or out Magnify selected section on paper or picture</p> <p>½: To search for something ½: Pointer magnifier ½: Search/Zoom</p> <p>0: Print Preview 0: Enhance 0: Print preview 0: Bigger 0: Scan 0: View</p> <p>Magnify Amplify Enlarge</p> <p>½: Magnifies ½: Search ½: Find</p> <p>0: Next page 0: Preview 0: Closer look 0: Look 0: View Document</p> 	<p>Cut Edit (cut out) Cut/Copy</p>  <p>0: Cut pages 0: Edit a document 0: Cut <u>and</u> paste</p> <p>0: Clip 0: Cut sentences 0: Cut/Paste</p>
<p>Open file Open folder To Open Files</p> <p>0: Open Cycle 0: File Download 0: File 0: Folder 0: Computer Folder</p> <p>Open File Open</p> 	<p>Copy Duplicate</p>  <p>½: Paste or copy ½: Page 2 or copy</p> <p>0: Copied file 0: Print front and back 0: Page layout—All 0: Create Document 0: Show both pages</p> <p>0: 2 sided 0: Paste copy 0: Pages 0: File 0: Copy/Paste</p>

<p>Recycle Bin Trash Bin Empty Trash</p> <p>½: Delete</p> <p>0: Waste Basket 0: Garbage</p>	<p>Recycle Trash</p>  <p>Center Paragraph Align Text Center</p> <p>½: Justify Center</p> <p>0: Center page 0: Change Paragraph 0: Arrange Sentences 0: Letter Form 0: Center document</p> <p>Center Text Center</p>  <p>½: Middle Align</p> <p>0: Format 0: Margin 0: Text 0: Align</p>
<p>Question/Help What is this Information</p> <p>0: Question</p>	<p>Help</p>  <p>Fill with Color Shading</p> <p>½: Paint/Fill Color ½: Coloring ½: Paint Fill</p> <p>0: Paint 0: Color</p> <p>Fill</p>  <p>½: Change Color ½: Fill/Unfill ½: Add Color</p> <p>0: Paintbrush</p>
<p>Paste Paste from clipboard</p>  <p>½: Clipboard for copy/paste</p> <p>0: Proofread 0: Paste to clipboard 0: Attached file 0: Put certain data on clipboard 0: Detach from clipboard or clipboard only</p> <p>0: Clipboard 0: Notepad 0: Chart</p>	<p>Undo Go back or undo Undo/Redo</p>  <p>0: Backup one 0: Redo 0: Flip page 0: Back 0: Rotate 0: Last 0: Undelete</p> <p>0: Make subtitle 0: Flip over 0: Go back 0: Rotate text 0: Move to 0: Restore</p>
<p>New file New document [Word] New slide [PowerPoint] New workbook [Excel]</p>  <p>½: New ½: File</p> <p>½: New Form</p> <p>0: 1 sided 0: Paste 0: Page 0: Document 0: New page</p> <p>0: Page layout(s) 0: Turn page 0: New sheet 0: Next page</p>	<p>Draw arrow</p>  <p>½: Drawer ½: Draw a line ½: Arrow Tool</p> <p>0: Drag 0: Pointer 0: Special function 0: Small mouse pointer</p> <p>½: Draw ½: Draw tool</p> <p>0: Locator 0: Angle text 0: Cursor 0: Arrow</p>

Close Screen Close Program Close Window	Exit Close 	Group	Grouping 
½: Close page ½: Delete/Close File	½: Close Out ½: End Program	½: Group or ungroup 0: Graphics alignment 0: Resize 0: Move Windows	½: Combine 0: Graphic 0: Minimize 0: Size Objects
0: Max/Close 0: Delete/Remove 0: Cancel or leave page 0: Open/Close	0: Go Back Close 0: Cancel Screen 0: Delete 0: Stop/End		