



**Research Report 1974**

**Evaluating Mobile Device Ownership and Usage in the  
U.S. Army: Implications for Army Training**

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**July 2014**

**United States Army Research Institute  
for the Behavioral and Social Sciences**

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# EVALUATING MOBILE DEVICE OWNERSHIP AND USAGE IN THE U.S. ARMY: IMPLICATIONS FOR ARMY TRAINING

## EXECUTIVE SUMMARY

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### Research Requirement:

For the Army, leveraging mobile devices for training purposes requires Soldiers from all backgrounds to be able to use mobile devices effectively to support formal and informal training opportunities. However, questions regarding Soldiers' ownership and familiarity with mobile devices remain to be answered. The extent which Soldiers use mobile devices in their daily lives, and are willing to use them, will influence how easily these devices can be used as a training platform (Mercado & Murphy, 2012). The goal of this research was to address these questions by examining mobile device ownership, mobile device usage, and willingness to a smartphone among Soldiers in the U.S. Army and in a comparable civilian sector sample.

### Procedure:

Items were included in an annual Army survey to determine: how many Soldiers own mobile devices, the types of devices they own, the relative frequency with which they use these devices for various activities, and whether Soldiers would use an Army-issued smartphone. We examined our findings with regard to Soldiers' age and rank, with the expectation that younger Soldiers would own more mobile devices, would use them for more activities on a more frequent basis, and would be more open to using an Army-issued smartphone than older Soldiers. To provide a comparison to a civilian sector sample, we asked the same questions to a sample of students at a large southeastern university. Although the samples were heterogeneous in terms of age, we expected to find similar trends, with younger students using mobile devices more frequently and for more activities than older students. Finally, we sought to compare mobile device usage between the military and our civilian sector sample to determine if mobile device usage displayed similar trends.

### Findings:

Results show that most Soldiers own a mobile device of some sort. However, the type of device varies with age. Smartphone ownership generally increases with age, while ownership of other mobile devices, such as tablets and e-Readers was more likely among younger Soldiers. Soldiers reported using their mobile devices more frequently for making phone calls, texting, and sending and receiving email, and less frequently for sending pictures, watching videos, and social networking. The frequency of engaging in these activities also depended on age. Further results revealed that junior enlisted Soldiers report using their current mobile device more frequently for a variety of tasks than officers. However, officers reported a greater willingness to use an Army-issued smartphone.

Our comparison of Soldiers' and university students' mobile device ownership revealed both groups owned a similar number of mobile devices, yet there was a difference in the type of mobile devices owned. Soldiers reported owning tablets at higher rates than their university counterparts, while students reported owning smartphones at a higher rate than Soldiers. Despite

similar levels of mobile device ownership, results revealed students used their mobile device more frequently and were more willing to use an issued smartphone than Soldiers.

#### Utilization and Dissemination of Findings:

These findings suggest that overall most U.S. Army Soldiers own and are familiar with mobile devices and their usage. The extent to which certain devices, such as smartphones and tablets are owned and used is related to the age/rank of the Soldier. Younger Soldiers reported owning more tablets and e-Readers, while smartphones were more prevalent among older Soldiers. In addition, if issued an Army-issued smartphone, most Soldiers would be comfortable incorporating it into their work environments. The Army must consider these findings when leveraging mobile devices to expand learning if it is to be successful.

Portions of this research were presented at the 2012 Conference on Education and Training Modeling and Simulation.

EVALUATING MOBILE DEVICE OWNERSHIP AND USAGE IN THE U.S. ARMY:  
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# EVALUATING MOBILE DEVICE OWNERSHIP AND USAGE IN THE U.S. ARMY: IMPLICATIONS FOR ARMY TRAINING

## **Introduction**

Over the last few years, the use and popularity of mobile devices, such as smartphones, tablets, e-Readers and similar mobile devices have risen greatly (Smith, 2012). This increase can be attributed to the convenient features inherent to many mobile devices, including their ability to run software applications (apps), record and capture still and motion pictures, connect to the Internet, and to easily share and access informational and social media. Because of these affordances, many organizations, including the U.S. Army, are looking at ways to leverage mobile devices for training purposes.

The Army's commitment to leveraging mobile devices for training and education is highlighted in the Army Learning Model (ALM), which describes a vision for future Army Training (U.S. Department of the Army, 2011). This document states the Army must close the gap between how Soldiers use mobile devices in their off duty experiences, and what they experience in training and working in their units. Rather than limiting training to the classroom, the ALM calls for a training system that allows Soldiers to access information at the point of need to support formal and informal learning opportunities. Mobile devices have the ability to support this type of model by providing Soldiers with relevant knowledge and training when they need it.

For the Army, realizing this vision requires Soldiers from all backgrounds to be able to use mobile devices effectively. To date, the limited research on learning with mobile devices (i.e., mobile learning) has focused on how to design training content to support mobile learning and how to incorporate mobile devices into blended learning solutions (Tucker McGilvray, Leibrecht, Strauss, Perrault, & Gesselman, 2009). Such research is enhancing our understanding of how to leverage mobile devices for training. Yet, to date, much less research has focused on Soldiers' familiarity and use of mobile technologies. This is an important question because the extent to which Soldiers are already familiar with mobile devices and use them in their daily lives will influence how easily these technologies can be used as a training platform (Mercado & Murphy, 2012). The goal of this research was to address this question by examining mobile device ownership usage and potential usage among Soldiers in the U.S. Army.

## **Using Mobile Devices in Army Training and Education**

Mobile learning (mLearning) refers to the exploitation of ubiquitous handheld technologies together with wireless and mobile phone networks to facilitate, support, and enhance and extend the reach of teaching and learning (Brown, 2010). Recent research suggests mLearning has the potential to provide distinct advantages over traditional forms of instruction. MLearning technologies can afford students the ability to access, capture, create, and share information anytime, anywhere (van-'t Hooft, 2008). They can afford instructors the ability to deliver unique multimedia materials and interactive tasks that can transform learning experiences inside and outside of the classroom (Armatas, Holt, & Rice, 2005). They can promote authentic

learning experiences and facilitate communication between instructors, students, and peers. Most importantly, mobile devices can provide students and instructors with the opportunity to reshape the classroom from a passive, lecture-based model of instruction, to an interactive model where students are able to access information when needed, contribute to this knowledge, and share information with others for the purposes of learning (Armatas et al., 2005; Rankin, 2009).

**How could mobile devices be used in Army Training and Education?** In a review of mobile learning approaches for U.S. Army training, Tucker (2010) provides examples of how mobile technologies could benefit Army training. Many of these examples are in line with the ALM vision of using mobile technologies to facilitate learning. One example is using web 2.0 applications to promote student-centered learning and social networking. Another example is using wikis, co-creating knowledge, sharing feedback among peers, and using stand alone mobile apps to provide training and performance support at the schoolhouse or in field training exercises. A further example is using stand-alone mobile applications to provide training or performance support in institutional and unit training. For example, Tucker described how students in the Infantry Officer Basic Leader Course (IBOLC) could use mobile devices to document their decision-making process when they develop platoon operation orders. She noted if students had smartphones, the training could be structured so that students could blog about their ideas and progress on their orders (e.g., create short video clips that discuss their design plans, revisions, and rationale) and receive feedback from their peers. Tucker noted when training moved from the classroom to the field, exercise relevant information could be pushed to the trainee's mobile device (i.e., intelligence information, etc.) to simulate certain aspects of mission command. Tucker also discussed how stand-alone mobile applications could be used in Army training by allowing trainees to view content and respond to questions on the device.

**Assumptions about Mobile Device Use and Ownership.** Many of the presumed benefits of using mobile devices to support training and education are based on the premise that Soldiers, particularly young Soldiers, own mobile devices and use their features regularly. Proponents of using mobile devices for training purport young Soldiers use mobile devices daily and are familiar with their functionalities and capabilities. They purport that because they are "digital natives," they should respond positively to training on mobile devices and may even voluntarily complete training outside of the classroom because they always have their devices handy. Current trends in mobile device usage in nonmilitary samples may support this assumption. For example, the Pew Research Center reported that 66% of young adults aged 18-29 owned smartphones, and tablet ownership among young adults was on the rise (Smith, 2012).

However, technology usage patterns in the military do not always reflect patterns from the civilian population (see Orvis, Moore, Belanich, Murphy, & Horn, 2010). For example, the military increased the amount of videogame-based training based on the assumption that the majority of Soldiers played video games regularly (Bourge & McGonigle, 2006). The catalyst for these beliefs were survey results from non-military samples that found 69% of American heads of households played videogames (Entertainment Software Association, 2010) and 65% of college students are regular or occasional gamers. However, research by Orvis et al. (2010), using an Army sample, found that fewer than 43% of U.S. Soldiers played videogames at least weekly. The maximum percentage reported for a single rank was 59%, with most ranks reporting only 20% - 30% of weekly game play. In addition, Orvis, Horn, and Belanich (2009)

found that only approximately 40% of U.S. Military Academy cadets reported moderate to heavy videogame play.

To date, there has been limited research on the ownership, usage, and potential usage of mobile devices for training, particularly within an Army sample. If the U.S. Army plans to use mobile devices as a training medium then it is important to understand the extent to which Soldiers are familiar with, and willing to use mobile devices for training purposes. Given these needs, the current research sought to determine the extent to which active duty Soldiers own and use mobile devices in their daily lives. To this end, we included items in an annual Army survey to determine how many Soldiers own mobile devices, the type of devices they own, and the relative frequency with which they use these devices for various activities, and whether Soldiers saw utility in a smartphone provided by the Army. We examined our findings with regard to Soldiers' age, with the expectation that younger Soldiers would own more mobile devices, would use them for more tasks on a more frequent basis, and would be more open to using an Army-issued smartphone than older Soldiers. To provide a comparison to the civilian sector, we asked the same questions to a sample of students at a large southeastern university. We expected to find similar trends, with younger students using mobile devices more frequently and for more tasks than older students. Finally, we sought to compare mobile device usage between the military and our civilian sector sample to determine if mobile device usage displayed similar trends. The rest of this paper discusses the methodology used to gather these data. Then we discuss the practical implications of our findings for future training initiatives in the Army.

## **METHOD**

### **Participants and Procedure**

Data for this research were drawn from two comparable questionnaires: the 2011 Spring Sample Survey of Military Personnel (SSMP) and the 2011 Mobile Device Usage Questionnaire. The SSMP is a biannual survey administered by the U.S. Army Research Institute's (ARI) Attitude and Opinion Research Unit to collect information from active component Soldiers and their dependent family members on a wide range of issues important to the Army. The SSMP is sent to a representative sample of all permanent party, Active Army personnel excluding all PV1s.

The 2011 SSMP was conducted as an online survey from 24 May through 01 August 2011 among officers (second lieutenant - colonel and warrant officer 1 - chief warrant officer 5) and senior-level enlisted Soldiers (staff sergeant - command sergeant major). Because of low response rates to the online version of the 2011 SSMP among junior-level enlisted Soldiers (private E2 - sergeant), a traditional paper and pencil 2011 SSMP was used at 33 continental United States installations, including Hawaii and Alaska. The units of Soldiers who reported that they had recently returned from a war theater and Soldiers who reported preparing to be deployed soon to a war theater were not included in the paper and pencil survey. Completed responses from both the online and paper and pencil surveys were received from 15,857 Active Army Soldiers (7,300 officers and 8,557 enlisted Soldiers). Of these respondents, 86.4% were men.

The 2011 Mobile Device Usage Questionnaire was developed for the purposes of this research effort to collect similar information regarding mobile device usage from a civilian sector sample. This questionnaire was conducted as an online questionnaire from 24 October through 09 December 2011, among students from a large southeastern university who volunteered for class credit. Completed responses were received from 564 undergraduate and graduate students. Of these respondents, 98.6% were undergraduates and 70.9% were women. Table 1 shows the age demographics of our Soldier and civilian samples.

Table 1.  
*SSMP and 2011 Mobile Device Usage Questionnaire Age Demographics*

<i>2011 SSMP</i>	
<i>Age</i>	<i>Percent</i>
Under 20	3.1
20-24	16.4
25-29	17.8
30-34	15.9
35-39	16.6
40-44	15.4
45-49	10.1
50 and older	4.8
<i>2011 Mobile Device Usage Questionnaire</i>	
<i>Age</i>	<i>Percent</i>
18-20	68.8
21-23	17.7
24-26	6.2
27-29	2.1
30 and older	5.1

## Measures

The 2011 SSMP included 84 questions assessing a wide range of topics (e.g., career development, deployments, motivation for joining the Army, satisfaction with Army life, demographics, human relations experiences, family matters, and personal background). To investigate mobile device usage, five questions were included that focused on Soldier ownership, usage, and willingness to use mobile devices. These included two demographic questions and three questions that addressed the types of mobile devices Soldiers owned and how frequently they used these devices for certain activities (see Table 2).

The 2011 Mobile Device Usage Questionnaire, which was administered to university students, included seven questions. Three questions addressed demographics (e.g., sex, age, and level of education) to establish the comparability with the Soldier sample. Four questions addressed student usage and willingness to use mobile devices (see Table 3). These questions were similar in wording and response format to those used in the SSMP.

Table 1.  
**SSMP Mobile Device Usage Questions**

<b>39. Do you currently own any of the following mobile devices? MARK ALL THAT APPLY?</b>				
iPhone	iPad (or other tablet PC)			
iPhone Touch	Android smartphone			
Blackberry	E-Reader (e.g., Kindle, Nook)			
None of the above				
<b>40. How frequently do you use your mobile device(s) for the following activity?</b>				
	Many Times a day	Almost every day	Once a week or so	Never
Text messaging				
Internet browsing				
Sending and receiving emails				
Navigation				
Making phone calls				
Watching videos or movies				
Social networking (e.g., Facebook Twitter)				
Sharing pictures or videos (e.g., You Tube, Flickr)				
<b>41. Which of the following would you likely do, if it were provided by the Army on a smartphone?</b>				
Official phone and email	Text messaging			
Access to online training	Battle tracking			
Personal Organizing (e.g., scheduling, tasks)	Access to Technical and Field Manuals			
Social networking (e.g., Facebook, Twitter)	Other uses			
<b>69. What is your rank?</b>				
Officer		Enlisted		
2LT	WO1	PV1	SSG	
1LT	CW2	PV2	SFC	
CPT	CW3	PFC	MSG / 1SG	
MAJ	CW4	CPL / SPC	SGM / CSM	
LTC	CW5	SGT		
COL+				
<b>75. What was your age on your last birthday?</b>				
Under 20		35-39 years old		
20-24 years old		40-44 years old		
25-29 years old		45-49 years old		
30-34 years old		50 or over		

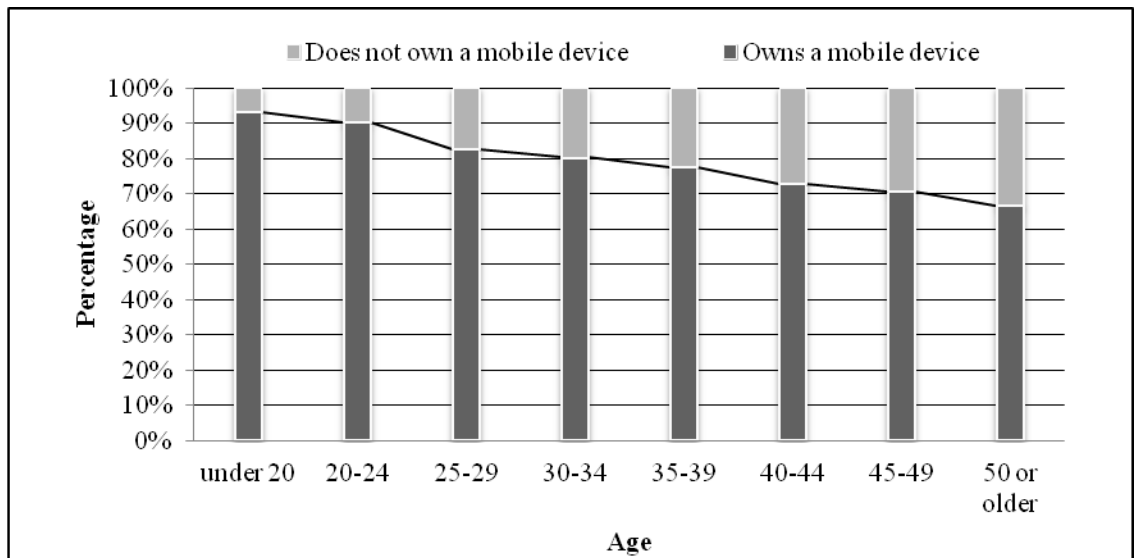
Table 2.  
**2011 Mobile Device Usage Questionnaire**

<b>1. Please select your sex?</b>				
Male		Female		
<b>2. Please select your age range?</b>				
18-20 years old		27-29 years old		
21-23 years old		30 years old or older		
24-26 years old				
<b>3. Please select your level of education?</b>				
Freshman		Senior		
Sophomore		Graduate student		
Junior				
<b>4. Do you currently own any of the following mobile devices? MARK ALL THAT APPLY?</b>				
iPhone		iPad (or other tablet PC)		
iPhone Touch		Android smartphone		
Blackberry		E-Reader (e.g., Kindle, Nook)		
None of the above				
<b>5. How frequently do you use your mobile device(s) for the following activity?</b>				
	Many Times a day	Almost every day	Once a week or so	Never
Text messaging				
Internet browsing				
Sending and receiving emails				
Navigation				
Making phone calls				
Watching videos or movies				
Social networking (e.g., Facebook Twitter)				
Sharing pictures or videos (e.g., You Tube, Flickr)				
<b>6. Which of the following would you likely do, if it were provided by your University on a smartphone?</b>				
Official phone and email		Text messaging		
Access to online courses		Access to student handbook and other school manuals		
Personal Organizing (e.g., scheduling, tasks)		Other uses		
Social networking (e.g., Facebook, Twitter)				
<b>7. Which of the following would you likely do, if it were provided by your University on a Tablet PC?</b>				
Official phone and email		Text messaging		
Access to online courses		Access to student handbook and other school manuals		
Personal Organizing (e.g., scheduling, tasks)		Other uses		
Social networking (e.g., Facebook, Twitter)				

## RESULTS

### Military Sample Results

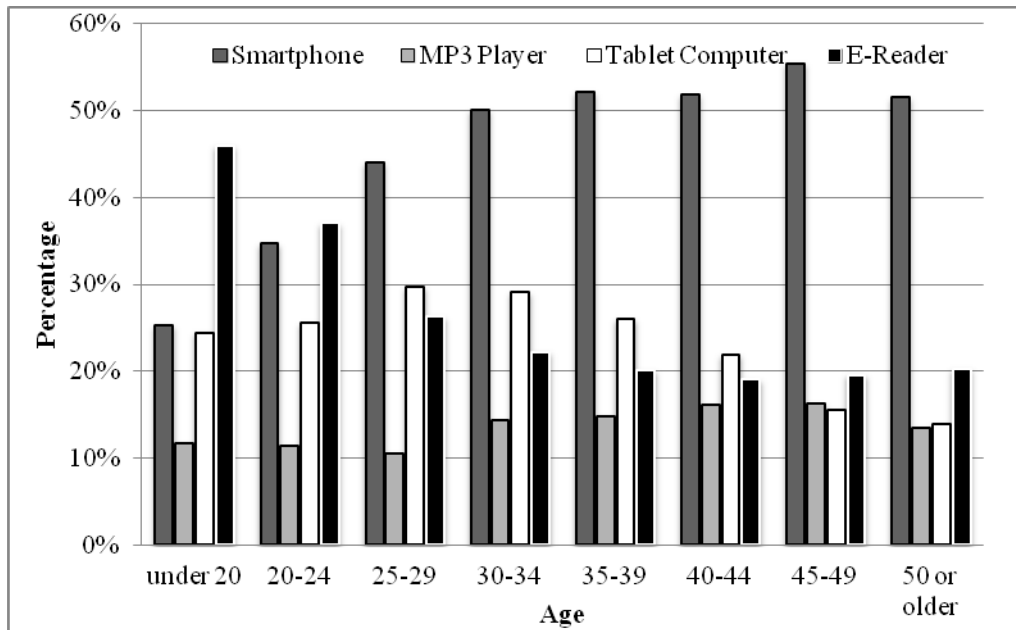
**Overall mobile device ownership.** Overall, 79% ( $n = 12,584$ ) of all Soldiers who responded to the SSMP reported owning at least one mobile device while 29% reported owning two mobile devices. Almost 94% of Soldiers under 20 years old reported owning a mobile device, more than any other age group. Pearson's correlation analysis was used to evaluate the strength of the relation between mobile device ownership and age. In general, mobile device ownership decreased with age ( $r = -.17, p < .01$ ; See Figure 1).



*Figure 1.* Percentage of Soldiers who reported owning mobile devices by age group.

We also asked Soldiers to indicate which types of mobile devices they owned. Overall, 46.9% of responding Soldiers reported owning at least one smartphone, 25% reporting owning at least one tablet, 25% reported owning at least one e-Reader, and 14% reporting owning at least one MP3 player. When looking at mobile device ownership by age, younger Soldiers largely reported owning e-Readers and tablets whereas older Soldiers largely reported owning smartphones. Overall, Pearson's correlation analysis revealed that smartphone ownership increased with age ( $r = .13, p < .01$ ). Tablet and e-Reader ownership, on the other hand, decreased with age ( $r = -.08, p < .01$ , and  $r = -.14, p < .01$ , respectively, see Figure 2).

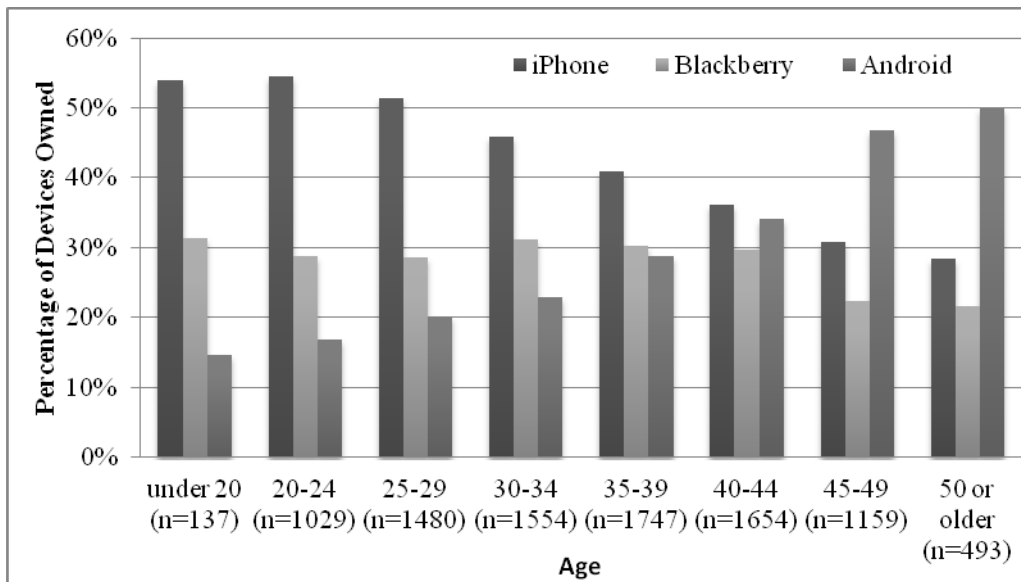




**Figure 2.** Percentage of Soldier owned mobile devices owned by age group.

Note: Soldiers were able to report owning more than one type of mobile device, meaning the total number of devices owned within an age group can exceed 100% within the bar chart. For example, a Soldier under 20 could have reported owning a smartphone and tablet.

Next, to provide a closer look into smartphone ownership we examined the types of smartphones Soldiers owned. We used the total number of smartphones owned within each age group to calculate the percentages. This allowed us to determine which smartphones were most popular among age groups. As shown in Figure 3, Soldiers in the younger age groups owned more iPhones than Android or Blackberrys. These trends changed as age increased. Upper-middle-aged Soldiers owned a mix of devices. Pearson’s correlation showed iPhone ownership decreased with age ( $r = -.16, p < .01$ ), while Android ownership increased with age ( $r = .28, p < .01$ ; see Figure 3).



**Figure 3.** Popularity of smartphones among smartphone owners by age group.

Note: The percentages are based on the total number of smartphones owned within each age group as opposed to the overall sample for this analysis.

**Mobile device usage.** Next, we examined how often Soldiers used their mobile devices for common activities such as making phone calls, text messaging, sending and receiving email, Internet browsing, social networking, watching videos or movies, and sharing pictures or videos. For this set of analyses we created an aggregate variable comprised of the first three response options from Item 40 (see Table 2). The newly created variable accounted for at least weekly usage. Results showed 96% of Soldiers who owned a mobile device used it at least weekly to make phone calls, 95% reported using their mobile device weekly to send or receive text messaging, 91% reported using their mobile device weekly for Internet browsing and 87% reported using their mobile device weekly to send and receive emails. Less common, but still frequently reported activities included: navigation, social networking, watching videos or movies, and sharing pictures or videos at, 76%, 70%, 64% and 60%, respectively (see Table 4). We ran Spearman’s Rho correlation analysis between age, rank and activity to examine collinearity between the variables before constructing the logistical regression models. Results showed that age and rank were positively correlated for both enlisted Soldiers ( $r = .816, p < .001$ ) and officers ( $r = .818, p < .001$ ), see Appendix B Table B1.

Table 3.

*Percentage of Soldiers Who Engage in Activity At Least Weekly by Age and by Rank*

<i>Variable</i>	<i>Making Phone Calls</i>	<i>Text Messaging</i>	<i>Internet Browsing</i>	<i>Sending and Receiving Emails</i>	<i>Navigation</i>	<i>Social Networking</i>	<i>Watching Videos or Movies</i>	<i>Sharing Pictures or Videos</i>
<b>Age</b>								
Overall ( <i>n</i> = 11890)	96%	94.3%	91.3%	86.6%	75.6%	70%	64.2%	60.3%
Under 20 ( <i>n</i> = 392)	97.2%	97.4%	94.6%	75.5%	76.4%	89.4%	76.2%	80.3%
20-24 ( <i>n</i> = 2030)	97.8%	98.0%	94.7%	83.6%	79.8%	86.3%	78.4%	75.5%
25-29 ( <i>n</i> = 2126)	96.0%	96.3%	92.4%	85.4%	78.0%	78.3%	70.1%	65.4%
30-34 ( <i>n</i> = 1958)	97.0%	96.2%	93.3%	88.0%	79.2%	74.9%	70.3%	62.7%
35-39 ( <i>n</i> = 1998)	95.6%	94.6%	91.6%	87.6%	76.0%	68.6%	63.7%	57.8%
40-44 ( <i>n</i> = 1754)	94.3%	91.4%	89.3%	89.0%	72.9%	56.8%	54.7%	50.3%
45-49 ( <i>n</i> = 1131)	94.6%	88.8%	84.8%	89.5%	66.7%	45.8%	41.2%	41.8%
50 and older ( <i>n</i> = 501)	94.2%	81.4%	82.3%	88.2%	60.8%	39.6%	35.8%	38.8%
<b>Rank</b>								
<b>Enlisted</b>								
Overall ( <i>n</i> = 6329)	96.7%	96.2%	92.0%	84.0%	75%	75.5%	68.5%	66.5%
Private ( <i>n</i> = 627)	96.8%	97.0%	94.1%	78.4%	78.5%	88.9%	78.2%	77.9%
Private first class ( <i>n</i> = 872)	97.5%	97.7%	94.9%	80.3%	78.2%	86.9%	76.7%	78.8%
Corporal/specialist ( <i>n</i> = 1347)	97.7%	97.6%	92.8%	81.8%	75.8%	81.5%	73.0%	73.8%
Sergeant ( <i>n</i> = 676)	95.5%	95.9%	92.3%	82.7%	74.8%	78.8%	72.8%	66.9%
Staff sergeant ( <i>n</i> = 996)	97.1%	96.7%	91.6%	85.5%	76.3%	73.0%	70.1%	64.1%
Sergeant first class ( <i>n</i> = 876)	96.0%	95.2%	91.3%	86.7%	75.2%	66.4%	62.0%	55.7%
Master sergeant/first sergeant ( <i>n</i> = 471)	96.6%	95.1%	90.4%	88.9%	69.4%	60.0%	52.9%	53.6%
Sergeant major/command sergeant major ( <i>n</i> = 470)	95.1%	90.2%	85.6%	93.0%	65.6%	51.9%	46.1%	46.2%
<b>Officers</b>								
Overall ( <i>n</i> = 4498)	95.1%	91.6%	90.1%	89.6%	76.3%	63.7%	58.2%	52.7%
Second lieutenant ( <i>n</i> = 545)	98.5%	98.5%	95.6%	93.0%	86.5%	84.2%	71.2%	66.4%
First lieutenant ( <i>n</i> = 666)	96.1%	96.7%	92.5%	86.7%	78.9%	75.0%	66.5%	57.9%
Captain ( <i>n</i> = 1266)	95.5%	95.0%	92.1%	88.4%	79.6%	72.1%	63.5%	57.2%
Major ( <i>n</i> = 720)	93.8%	90.6%	90.3%	89.0%	78.0%	61.3%	61.1%	53.5%
Lieutenant colonel ( <i>n</i> = 656)	92.4%	85.7%	85.1%	90.9%	70.7%	47.5%	48.4%	43.8%
Colonel and higher ranks ( <i>n</i> = 645)	94.9%	81.1%	84.3%	91.2%	62.6%	37.8%	35.3%	35.4%

Next, to determine if age predicted mobile device usage a series of standard logistic regression models were performed using the Statistical Package for Social Sciences (SPSS). Because age was a categorical variable with more than two levels it could not be entered directly into the logistic regression model. Therefore, (k-1) dummy coded variables were created. This resulted in seven dichotomous variables for age. The reference group for each model was the age group with the highest reported usage of that particular activity. For example, the reference group for the outcome variable “Making Phone Calls” was the 20-24 age group because it had the highest reported usage of phone calls. The outcome for each model was whether individuals used their mobile device to participate in the given activity (e.g., text messaging, Internet browsing, sending and receiving email) at least weekly. Because this was a dichotomous variable, we chose to use the logistic regression approach.

Appendix A Table A1 shows the results of the seven standard multiple logistic regression models, including the regression coefficients, Wald statistic, chi-square statistics, and  $exp(B)$  for each model. As a primer, the Wald statistic is a test of significance for individual predictors. If the coefficient is significantly different from zero we can assume the predictor is making a significant contribution to the model; that is, we can assume the variable is a significant predictor of the dependent variable. The  $exp(B)$  value, or odds ratio, reflects the change in odds resulting from a unit change in the predictor. A value greater than 1 indicates a positive relationship between the predictor and outcome variable. Conversely, a value less than 1 indicates a negative relationship between the two. Odds ratios can be used to calculate percent increase and decrease, with the relative value of the ratio indicating the magnitude of the increase or decrease. In our case we used odds ratios to determine if other age groups were less likely to engage in the mobile usage activity compared to the reference group, with smaller ratios being associated with a lesser likelihood of engaging in the task (Tabachnick & Fidell, 2001).<sup>1</sup>

The first overall model, which tested whether younger Soldiers were more likely to use their mobile device for text messaging compared to older Soldiers was significant ( $\chi^2 = 283.509$ ,  $p < .000$  with  $df = 7$ ). An examination of the odds ratios indicates that compared to the 20-24 year old age group, older Soldiers were less likely to use their mobile device for text messaging. The second overall model, which tested whether younger Soldiers were more likely to use their mobile device for accessing the Internet was also significant ( $\chi^2 = 152.234$ ,  $p < .000$  with  $df = 7$ ). Compared to the 20-24 year old age group, Soldiers in older age groups were less likely to use their mobile device to access the Internet. The third model, which tested whether younger Soldiers were more likely to use their mobile device for navigation than older Soldiers was also significant ( $\chi^2 = 145.709$ ,  $p < .000$  with  $df = 7$ ). A similar pattern emerged for the outcomes of social networking ( $\chi^2 = 1096.642$ ,  $p < .000$  with  $df = 7$ ), sharing pictures or videos ( $\chi^2 = 636.428$ ,  $p < .000$  with  $df = 7$ ) and watching videos or movies ( $\chi^2 = 759.413$ ,  $p < .000$  with  $df = 7$ ), with older Soldiers being less likely to engage in these activities than younger Soldiers. Specifically, Soldiers in the 40-44 age group were 75% less likely to share pictures or videos, 67% less likely to watch videos or movies, and 84% less likely to use social networking than the reference

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<sup>1</sup> To calculate percent decrease (i.e. less likelihood) we subtracted the odds ratio from one then multiply that number by 100. For example, soldiers in the 40-44 year old age group were 78% less likely to use a mobile device for text messaging ((1 - .219) \* 100 = 78%) compared to the 20-24 year old age group. This procedure allowed us to determine if the other age groups were less likely to engage in the usage activity compared to the reference group (Tabachnick & Fidell, 2001).

group. The final model, which tested Soldiers likelihood to check and send email on their mobile device was also significant ( $\chi^2 = 74.907$ ,  $p < .000$  with  $df = 7$ ). However, unlike previous models, results indicated that younger Soldiers were less likely to use their mobile device for this activity, compared to the 45-49 year old age group.

We did not test a model for the outcome “making phone calls” because 96% of respondents indicated using their smartphones at least weekly for making phone calls. Further, the range between age groups was minimal. Any differences that may have resulted from such an analysis may have been statistically significant, but may not have had practical meaning.

Together, these results show that younger Soldiers (24 and younger) are more likely to use their mobile device for social networking, entertainment, and communication, whereas older Soldiers (35 and above) are more likely to use their mobile device for sending emails.

**Willingness to use an Army-issued smartphone.** Next, we examined the willingness of Soldiers to use an Army-issued smartphone for a variety of activities (see Table 5). The activities included: official phone and email, access to online training, personal organization (e.g., scheduling, tasks), social networking, text messaging, battle tracking, access to technical and field manual, and other uses. Overall, 80% of Soldiers responded they would use the smartphone for official phone and email. Additionally, more than half of Soldiers claimed they would use an Army-issued smartphone for personal organizing, text messaging, accessing technical field manuals and accessing online training, at 74%, 70%, 67%, and 67%, respectively. Less common activities were battle tracking and social networking at 41% and 32%, respectively.

Table 4.

***Percentage of Activities Soldiers Reportedly Would Use An Army-Issued Smartphone For By Age***

<i>Variable</i>	<i>Official phone and email</i>	<i>Access to online training</i>	<i>Personal organizing</i>	<i>Social networking</i>	<i>Text messaging</i>	<i>Battle tracking</i>	<i>Access to technical/field manuals</i>
under 20	64%	56.3%	55.9%	36.9%	62.9%	34.8%	55.2%
20-24	74.7%	57.9%	65.6%	35.2%	69%	43.3%	66.1%
25-29	85.9%	57%	73.7%	34.3%	71.9%	43.9%	69.4%
30-34	91.3%	58.7%	76.9%	34.6%	73.2%	44.9%	71.9%
35-39	93%	54.7%	78.6%	30.6%	70.7%	41.2%	70.2%
40-44	93.8%	52.9%	76.9%	28.3%	69.3%	37.5%	64.4%
45-49	94.7%	52.7%	75.1%	28%	69.3%	37.1%	63.8%
50 or older	95.6%	49.3%	70.6%	23.2%	61.5%	28.4%	55.4%
Total	80.1%	66.9%	73.6%	31.9%	70%	40.8%	66.9%

Next, we constructed a series of standard multiple logistic regressions to determine if age predicted willingness to use an Army-issued smartphone for the activities reported in Table 5. Again, outcome, which was dichotomous (yes/no) served as the dependent variable and age

served as the predictor. The reference group for each model was the age group that had the highest reported usage for that particular activity. The central results of the eight multiple logistic regression models are presented in Appendix A Table A2. Similar to previous results, age was a significant predictor of willingness to use a smartphone for all activities. Results of the first model, which tested whether older Soldiers would use an Army-issued smartphone for official phone and email more often than younger Soldiers was significant ( $\chi^2 = 854.280, p < .000$  with  $df = 7$ ). Odds ratio indicated that compared to the 50 or older age group, all other age groups were less likely to use an Army-issued smartphone for official phone and email. The second model, which tested whether middle-aged Soldiers (35-39 years of age) would use an Army-issued device for personal organization more often than other Soldiers was significant ( $\chi^2 = 215.957, p < .000$  with  $df = 7$ ). Odds ratio indicated that compared to Soldiers 35-39 years old, all other age groups were less likely to use an Army-issued smartphone for personal organization. The third model, which tested whether middle-aged Soldiers (30-34 years of age) would use an Army-issued device for text messaging was also significant ( $\chi^2 = 854.280, p < .000$  with  $df = 7$ ). Odds ratios indicated that compared to the 30-34 years old, all other age groups were less likely to use an Army-issued smartphone for text messaging.

A similar pattern emerged for the outcomes of access technical field manuals ( $\chi^2 = 134.130, p < .000$  with  $df = 7$ ), battle tracking ( $\chi^2 = 111.245, p < .000$  with  $df = 7$ ), and access to online training ( $\chi^2 = 42.82, p < .000$  with  $df = 7$ ). Specifically, 30-34 years old were more likely to engage in these activities than other Soldiers were. Our final model, which tested whether younger Soldiers would use an Army-issued device for social networking more often than older Soldiers was significant ( $\chi^2 = 88.792, p < .000$  with  $df = 7$ ).

Together, these results show that middle-aged Soldiers (30-39 years of age) are more likely to use an Army-issued smartphone for personal organizing, text messaging, access to technical field manuals, battle tracking, and access to online training. In addition, older Soldiers (50 years of age or old) are more likely to use an Army-issued smartphone for official phone and email, whereas younger Soldiers (under 20 years of age), are more likely to use an Army-issued smartphone for social networking.

### **Comparison of Officers and Enlisted Soldiers**

Next, we sought to provide a comparison of outcomes between officers, non-commissioned officers (NCOs), and junior enlisted Soldiers. Because of the considerable difference in the sample size between the two groups, we performed a series of Two-Proportion Z-tests, which compares the proportions for two independent samples (Siegel & Castellan, 1988). For example, when comparing “weekly” mobile device usage for making phone calls a Two-Proportion Z-test compared the proportion of officers who reported using their mobile device “weekly” to make phone calls (.951) with the proportion of NCOs who reported using their mobile device “weekly” to make phone calls (.967). We calculated each group’s proportions by dividing the number of Soldiers who reported using their mobile device for that particular activity by the total number of Soldiers who responded to the question.

**Mobile device usage comparison.** The first group of comparisons examined “weekly” mobile device usage for common activities such as making phone calls, text messaging, sending and receiving email, Internet browsing, social networking, watching videos or movies, and

sharing pictures or videos. The proportions used to compare “weekly” usage between officers, non-commissioned officers, and junior enlisted Soldiers are presented in Table 6.

Table 5.

***Proportions Comparing “Weekly” Mobile Device Usage between Officers, Non-Commissioned Officers (NCOs), and Junior Enlisted Soldiers***

<i>Variable</i>	<i>Officers</i>	<i>NCO</i>	<i>Junior Enlisted</i>
Making Phone Calls	0.951 ( <i>n</i> = 4490)	0.962 ( <i>n</i> = 3485)	0.974 ( <i>n</i> = 2832)
Text Messaging	0.912 ( <i>n</i> = 4498)	0.951 ( <i>n</i> = 3489)	0.975 ( <i>n</i> = 2840)
Internet Browsing	0.901 ( <i>n</i> = 4483)	0.907 ( <i>n</i> = 3472)	0.928 ( <i>n</i> = 2829)
Sending and Receiving Emails	0.896 ( <i>n</i> = 4497)	0.867 ( <i>n</i> = 3480)	0.806 ( <i>n</i> = 2819)
Navigation	0.763 ( <i>n</i> = 4465)	0.734 ( <i>n</i> = 3453)	0.771 ( <i>n</i> = 2813)
Social Networking	0.637 ( <i>n</i> = 4482)	0.679 ( <i>n</i> = 3473)	0.848 ( <i>n</i> = 2832)
Watching Videos or Movies	0.582 ( <i>n</i> = 4475)	0.63 ( <i>n</i> = 3461)	0.753 ( <i>n</i> = 2828)
Sharing Pictures or Videos	0.527 ( <i>n</i> = 4488)	0.586 ( <i>n</i> = 3476)	0.762 ( <i>n</i> = 2835)

Note: *n*'s are not equal because of missing data.

A quick glance shows similar usage patterns among groups for the first three activities. However, for sending and receiving emails, there are modest differences between officers and junior enlisted Soldiers. Table 7 reports the results of the z tests comparing weekly mobile device usage between officer, non-commissioned officer, and junior enlisted Soldiers. Although there is a significant difference in most activities because of our large sample size, the largest differences between the junior enlisted Soldiers and NCO's samples were for watching videos and moves and sharing pictures and videos, NCOs and officers being less likely to engage in these activities compared to junior enlisted Soldiers. The largest difference between officers and junior enlisted were for social networking, watching videos or movies, and sharing pictures and videos, with officers being less likely to engage in these activities compared to junior enlisted Soldiers.

Table 6.

**Proportion Z-tests Comparing “Weekly” Mobile Device Usage between Officers, Non-Commissioned Officers (NCOs), and Junior Enlisted Soldiers**

<i>Variable</i>	<i>Officers</i>	<i>NCOs</i>	
	<i>vs. Junior Enlisted</i>	<i>Officers vs. NCOs</i>	<i>Junior Enlisted</i>
Making Phone Calls	-4.89**	-2.37*	-2.67 *
Text Messaging	-10.77**	-6.73**	-4.95**
Internet Browsing	-3.96*	-0.9	-3.00*
Sending and Receiving Emails	10.84**	4.00**	6.56**
Navigation	-0.79	2.96**	-3.37**
Social Networking	-19.55**	-3.91**	-3.38**
Watching Videos or Movies	-14.91**	-4.33**	-10.45**
Sharing Pictures or Videos	-20.16**	-4.34**	-14.74**

\* $p < .05$  \*\*  $p < .01$ .

**Willingness to use Army-issued smartphone comparison.** The next comparison examined the willingness of officers, NCOs, and junior enlisted Soldiers to use an Army-issued smartphone for a variety of activities, including: official phone and email, access to online training, personal organization (e.g., scheduling, tasks), social networking, text messaging, battle tracking, access to technical and field manual, and other uses. An examination of Table 8 shows significant variability among the groups for the different activities. For example, Officers and NCOs reported being more likely to use an Army issued phone for sending and receiving email as compared to junior enlisted Soldiers. Similarly, officers reported being more likely to use an Army issued device for personal organizing compared to junior enlisted Soldiers. Interestingly, few Soldiers reported they would use an Army issued device for social networking. Table 9 contains the results of the z-tests. Again, because of the large sample size, many of the z-tests are significant. Meaningful interpretations can be made by examining the proportions listed in Table 8.



Table 7.

***Proportions Comparing Willingness to use an Army-issued Smartphone between Officers, Non-Commissioned Officers (NCOs), and Junior Enlisted Soldiers***

<i>Variable</i>	<i>Officers (n = 5732)</i>	<i>NCOs (n = 4730)</i>	<i>Junior Enlisted (n = 3690)</i>
Official phone and email	0.952	0.914	0.704
Access to online training	0.492	0.609	0.599
Personal organizing	0.815	0.738	0.602
Social networking	0.335	0.292	0.333
Text messaging	0.743	0.677	0.654
Battle tracking	0.423	0.435	0.386
Access to technical/field manuals	0.637	0.723	0.629

Table 8.

***Two Proportion Z-test Comparing Willingness to use an Army-issued Smartphone Between Officers, Non-Commissioned Officers (NCOs), and Junior Enlisted Soldiers***

<i>Variable</i>	<i>Officers vs. Junior Enlisted</i>	<i>Officers vs. NCOs</i>	<i>NCOs vs. Junior Enlisted</i>
Official phone and email	33.36**	7.84**	24.99**
Access to online training	-10.16**	-11.96**	0.93
Personal organizing	22.77**	9.47**	13.25**
Social networking	0.20	4.71**	-4.04**
Text messaging	9.28**	7.43**	2.22*
Battle tracking	3.57**	-1.23	4.53**
Access to technical/field manuals	0.79	-9.35**	9.19**

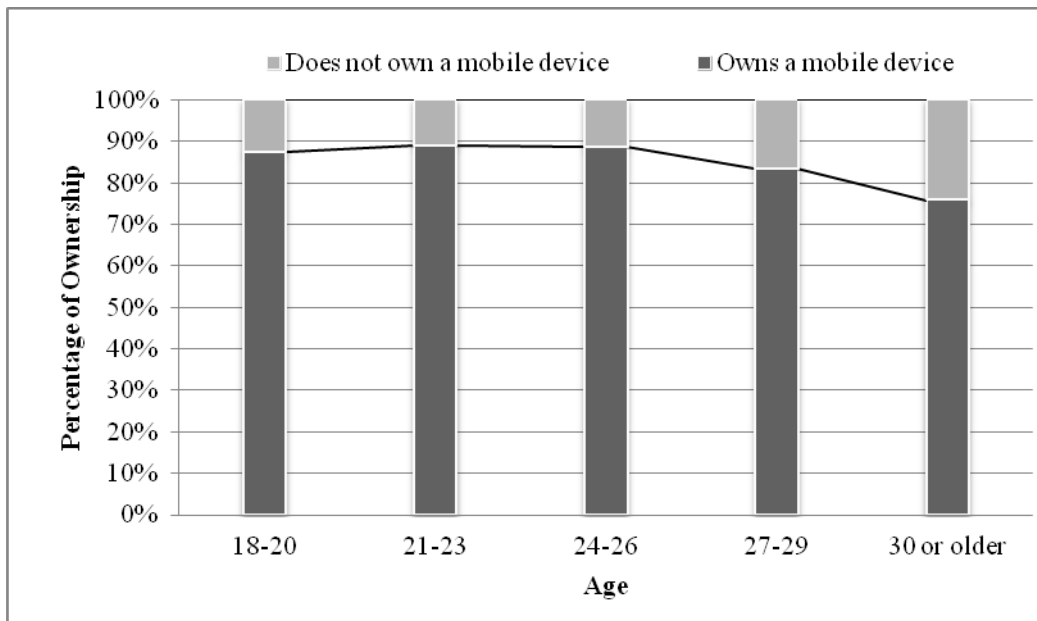
**University Sample Results**

The purpose of the second questionnaire was to examine mobile device ownership and usage trends in a university sample. For many university students, using a mobile device such as a smartphone or tablet computer is an everyday occurrence. As a result, various universities have started to provide their students with a mobile device to enhance their learning experience (Armatas et al., 2005). Seeing that the military and higher education have started to incorporate mobile devices into their training and education respectively, we wanted to compare the two samples. Although the samples varied much less in terms of age, we expected to find similar trends, with younger students using mobile devices more frequently and for more tasks than older students did. Finally, we sought to compare overall mobile device ownership and usage between the military and university student samples.

We used descriptive statistics to investigate the relationships between age and mobile device ownership, usage, and willingness to use an issued smartphone in university students. Preliminary logistic regression and correlation analyses were computed to investigate the relationships between age and mobile device ownership, usage, and willingness to use.

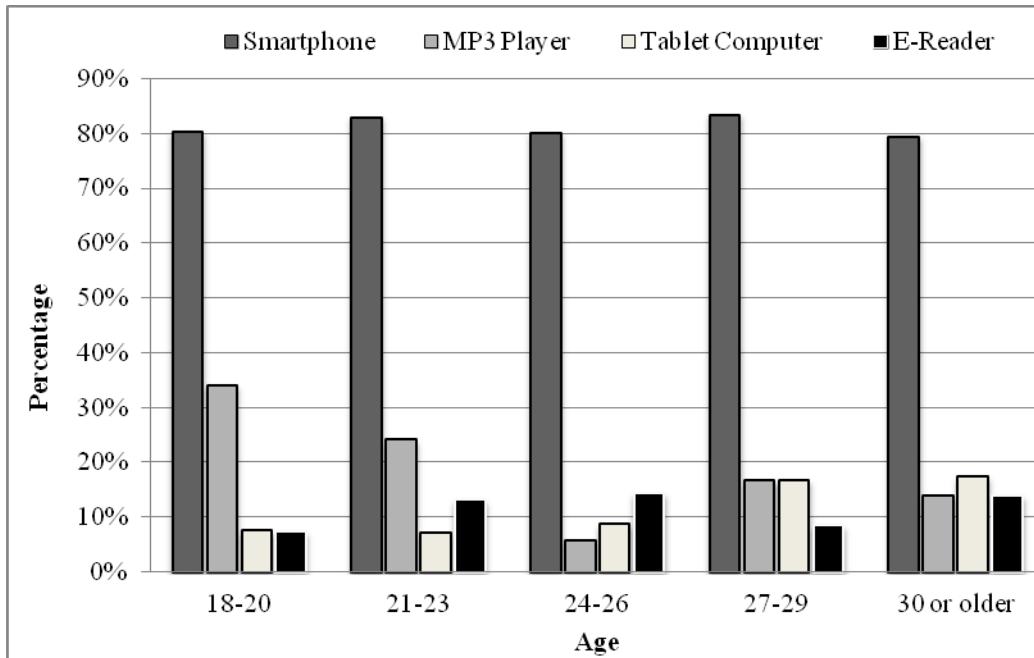
However, the results revealed only a significant negative correlation between age and MP3 player ownership. All other analyses failed to reach significance. As a result, we mainly report descriptive data for this sample.

**Overall mobile device ownership.** We examined four categories of mobile devices: smartphones (iPhone, Android Smartphone, Blackberry), MP3 players, tablet computers, and e-Readers. Overall, 87% ( $n = 491$ ) of all students who responded to the questionnaire reported owning at least one mobile device while 33% reported owning two mobile devices. Eighty-nine percent of 21-23 year olds reported owning a mobile device, more than any other age group. The percentage of university students who reported owning a mobile device by age is shown in Figure 4.



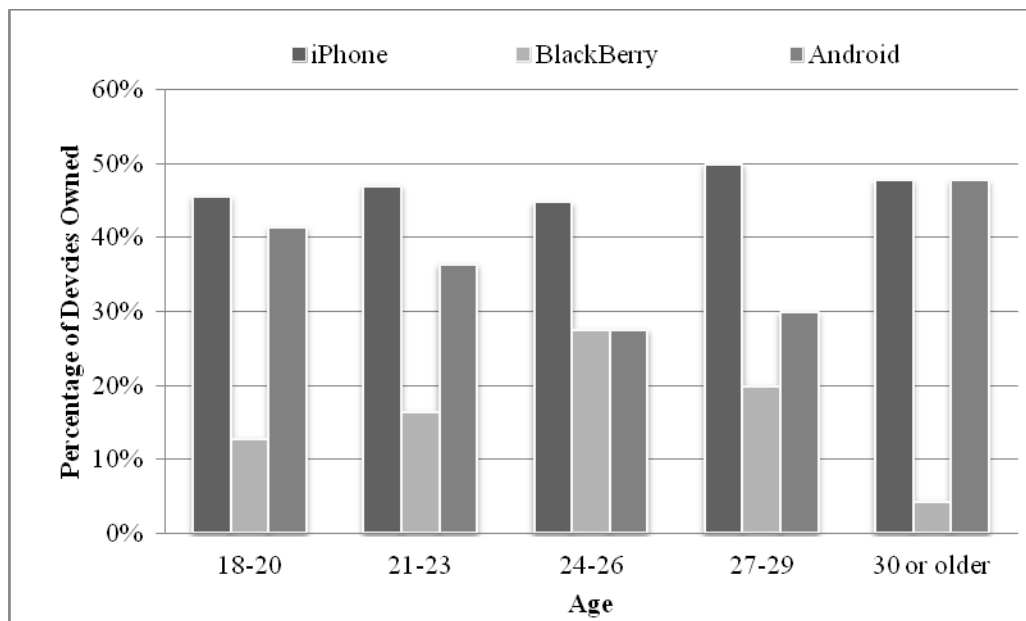
**Figure 4.** Percentage of students who reported owning mobile devices by age group.

Next, we asked students to indicate which type of mobile devices they owned. Overall, 76.9% of responding students reported owning at least one smartphone, 8.2% reporting owning at least one tablet, 9% reported owning at least one e-Reader, and 29.3% reporting own at least one MP3 player. Generally, smartphone ownership was high across all age groups. MP3 players were moderately popular among younger students compared to tablet computers and E-Readers. The percentage of mobile devices owned by university students within each age group is shown in Figure 5.



**Figure 5.** Percentage of student owned mobile devices by age group

Next, we examined the type of smartphones students reported owning. Forty-six percent of smartphones owned by university students were iPhones, 40% were Androids, and 14% were BlackBerrys. Android ownership was highest among the 30 or older age group at 48%, while BlackBerry ownership was highest in the 24-26 year old age group at 28% (see Figure 6).



**Figure 6.** Percentage of each type of smartphone owned by age group.

**Mobile device usage.** When examining the extent to which students perform certain tasks at least weekly, 99% of students who own a mobile device reported using it for text

messaging, 98% reported using their mobile device for making phone calls, 91% reported using their mobile device for Internet browsing, 93% reported using their mobile device to send and receive emails, and 87% reported using their mobile device for social networking. Less common but still frequently used were navigation, watching videos or movies, and sharing pictures or videos at, 79%, 77%, and 76% respectively (see Table 10).

Table 9.  
*Percentage of Students Who Engage in Mobile Device Activities at Least Weekly by Age*

<i>Variable</i>	<i>Making Phone Calls</i>	<i>Text Messaging</i>	<i>Internet Browsing</i>	<i>Sending and Receiving Emails</i>	<i>Navigation</i>	<i>Social Networking</i>	<i>Watching Videos or Movies</i>	<i>Sharing Pictures or Videos</i>
18-20	98%	98%	93%	94%	78%	89%	77%	77%
21-23	100%	100%	89%	89%	82%	83%	78%	74%
24-26	97%	100%	100%	100%	88%	100%	82%	73%
27-29	100%	100%	92%	92%	75%	75%	75%	83%
30 or older	100%	100%	76%	76%	69%	72%	59%	72%
Total	98%	99%	91%	93%	79%	87%	77%	76%

**Willingness to use a university-issued smartphone.** We also asked about the willingness to use a university-issued smartphone for several activities including official school email, access to online courses, personal organization (e.g., scheduling, tasks), social networking, text messaging, access to student handbook and other school materials, and other uses. Ninety-four percent of students responded that if provided a university-issued smartphone, they would use it for official school email. Additionally, more than half of the students reported they would use their smartphone for text messaging, accessing online courses, personal organization (e.g., scheduling, tasks), social networking, and accessing student handbook and other school materials at, 91%, 85%, 82%, 82%, and 55%, respectively. Table 11 shows the percentage of activities for which university students reportedly would use a university-issued smartphone, by age.

Table 10.  
*Percentage of Activities Students Reportedly Would Use a University-Issued Smartphone For By Age*

<i>Variable</i>	<i>School Email</i>	<i>Access to Online Courses</i>	<i>Personal Organizing</i>	<i>Social Networking</i>	<i>Text Messaging</i>	<i>Access to student handbook and other school manuals</i>
18-20	95%	84%	81%	87%	93%	51%
21-23	96%	87%	88%	79%	90%	66%
24-26	100%	88%	82%	59%	71%	71%
27-29	83%	92%	83%	50%	92%	58%
30 or older	79%	76%	76%	62%	90%	55%
Total	94%	85%	82%	82%	91%	55%

## Comparison of Soldiers and Students

We also sought to compare mobile device ownership, usage, and potential usage between the military and university sample to determine the degree to which data from the university sample could be generalized to the Soldier sample. To ensure comparability across the two samples, we only compared responses from Soldiers and students less than 30 years of age. Again, because of a considerable difference in the sample size between the two samples, we performed a series of Two-Proportion Z-test to examine differences in ownership and usage.

**Mobile device ownership comparison.** Our first set of comparisons examined differences in mobile device, smartphone, and tablet ownership between the Soldier and civilian sectors. Results show the proportion of Soldiers and students under the age of 30 who own a mobile device are equal; however smartphone and tablet ownership differ for each group. Compared to Soldiers, students had a higher proportion of smartphone owners. The opposite trend occurred for tablet ownership. In other words, although both groups own the same proportion of mobile devices, there was a difference in the types of mobile devices owned. The results of the three Two-Proportion Z-tests are presented in Table 12.

Table 11.

### *Two Proportion Z-test Comparing Mobile Device Ownership between Soldiers and University Students*

<i>Variable</i>	<i>Mobile Device</i>	<i>Smartphone</i>	<i>Tablet</i>
Soldiers 30< ( <i>n</i> = 6021)	0.86	0.38	0.28
Students 30< ( <i>n</i> = 535)	0.86	0.77	0.08
<i>z</i> =	0.00	-17.56**	10.06**

\**p* <.05 \*\* *p* <.01.

**Mobile device usage comparison.** Next, we compared “weekly” current mobile device usage for common activities such as making phone calls, text messaging, sending and receiving email, Internet browsing, social networking, watching videos or movies, and sharing pictures or videos. We constructed eight Two-Proportion Z-tests and results showed that the largest differences between the two groups were for social networking, entertainment, and sending and receiving emails. The results of the eight Two-Proportion Z-tests are presented in Table 13.

Table 12.

**Two Proportion Z-test Comparing “Weekly” Mobile Device Usage between Soldiers and University Students**

<i>Variable</i>	<i>Making Phone Calls</i>	<i>Text Messaging</i>	<i>Internet Browsing</i>	<i>Sending and Receiving Emails</i>	<i>Navigation</i>	<i>Social Networking</i>	<i>Watching Videos or Movies</i>	<i>Sharing Pictures or Videos</i>
Soldiers 30< (n = 5204)	0.97	0.97	0.94	0.84	0.79	0.83	0.74	0.71
Students 30< (n= 460)	0.99	0.999	0.98	0.93	0.87	0.94	0.85	0.82
<i>z =</i>	-2.48*	-3.64**	-3.55**	-5.14**	-4.09**	-6.15**	-5.22**	-5.03**

\* $p < .05$  \*\*  $p < .01$ .

**Willingness to use an issued smartphone comparison.** Next, we compared the willingness to use an issued smartphone for a variety of activities. We compared the three activities that were included in both questionnaires, which included personal organizing, social networking, and text messaging. We constructed three Two-Proportion Z-tests and results showed that compared to Soldiers, students would use a smartphone more for every activity, with social networking showing the largest significant difference. The results of the three Two-Proportion Z-tests are presented in Table 14.

Table 13.

**Two Proportion Z-test Comparing Willingness to use an Issued Smartphone between Soldiers and University Students**

<i>Variable</i>	<i>Personal Organizing</i>	<i>Social Networking</i>	<i>Text Messaging</i>
Soldiers 30< (N = 5860)	0.67	0.35	0.70
Students 30< (N = 535)	0.82	0.82	0.90
<i>z =</i>	-6.48**	-19.561**	-9.35**

\* $p < .05$  \*\*  $p < .01$ .

Note: *n*'s are not equal because of missing data.

## DISCUSSION

As the Army looks to leverage mobile devices to expand learning there is a growing need for empirical data on the actual frequency of mobile device ownership, usage, and potential usage among U.S. Army Soldiers. Proponents of using mobile computing devices to support training argue that most Soldiers, particularly young Soldiers, own and are familiar with mobile devices. Yet, to date, there is no research that examines this notion. The purpose of the current research was to determine the extent to which active duty U.S. Army Soldiers own and use mobile devices in their daily lives and their willingness to use a potential Army-issued smartphone. In this section, we discuss our findings and review how they compare to others studies conducted with civilian sector samples. Lastly, we discuss the practical implications of our findings for future mobile device training initiatives in the U.S. Army.

### Current Findings in Comparison to Past Civilian Sector Findings

**Smartphone ownership.** Past civilian sector trends in mobile device research suggest that most young people own mobile devices and are familiar with their functionalities and capabilities (Adkins, 2008). In May 2011, the Pew Research Center surveyed 2,277 American adults and found that 83% owned a cell phone while 35% owned a smartphone. In 2012, the Pew Research Center ( $n = 3014$ ) found that both cell phone and smartphone ownership increased from 2011, with 85% of American adults reporting owning a cell phone and 45% owning a smartphone (Duggan & Rainie, 2012). When examining smartphone ownership among younger adults, the 2012 survey found that 66% of young adults (18-29) owned smartphones and indicated that tablet ownership among young adults was on the rise. The data reported by the Pew Research Center (i.e., Smith, 2011; Duggan & Rainie, 2012) illustrate an increase in cell phone and smartphone ownership, with younger adults owning smartphones at a higher percentage compared to the overall sample. Given these findings, one might assume these trends would carry over to other samples, such as U.S. Army Soldiers and higher education.

When compared to the data reported by the Pew Research Center (Duggan & Rainie, 2012; Smith, 2011), our data show smartphone ownership was higher in both our university and U.S. Army Soldier samples. Forty seven percent of U.S. Army Soldiers sampled in our survey reported owning at least one smartphone. This percentage marks a 12% increase over the results reported by Smith (2011) and a 2% increase over the results reported by Duggan and Rainie (2012). However, when comparing smartphone ownership among age groups, our results show important differences between the samples. Only 38% of Soldiers 18-29 years old owned a smartphone, whereas 66% of 18-29 year olds in Duggan and Rainie's (2012) Pew Center Research report owned smartphones, and 77% of students from our university sample owned smartphones. These findings suggest that smartphone ownership rates among young U.S. Soldiers is not commensurate with rates reported in the civilian sector. In addition, data from our U.S. Army Soldier sample show that smartphone ownership generally increased with age, while ownership of other mobile devices, such as tablet computer and e-readers, was more likely among younger Soldiers. Conversely, data from our university sample show smartphone ownership remained steady across age while ownership of other mobile devices generally increased with age.

Although our data do not allow us to make conclusive inferences as to why younger Soldiers do not own smartphones at rates of their counterparts in the civilian sector or older Soldiers, speculation is possible. One reason may be related to the cost associated with smartphones. Many junior enlisted Soldiers, particularly initial entry Soldiers ages 20 and below, might not be able to afford the costs associated with owning a smartphone (i.e., monthly service contract). Alternatively, devices such as tablet computers, mp3 players, and e-Readers provide similar options for entertainment and maintaining communication, without requiring a monthly service contract. E-Readers, in particular, were popular with younger Soldiers because, along with no monthly service requirements, they are typically less expensive than tablet computers, although cheaper tablet computers are starting to hit the market (Van Heerden & Van Belle, 2013).

**Mobile device usage.** As discussed earlier, the national Pew Research Center data (Smith, 2011; Duggan & Rainie, 2012) illustrates an increase in cell phone ownership, particularly smartphone ownership, in the general population. As expected, the increase in cell phone and smartphone ownership lead to an increase in cell phone usage. According to the Pew Research Center (Smith, 2011; Duggan & Rainie, 2012), from 2011 to 2012 cell phone usage increased for many common activities such as taking pictures, accessing the Internet, and sending and receiving text messages and email. The 2012 Pew Research Center survey (Duggan & Rainie, 2012), revealed that 80% of all cell phone owners used their cell phone to send and receive text messages, 82% used their cell phone to take pictures, 56% used their cell phone to access the Internet, and 50% used their cell phones for email.

We cannot directly compare both our U.S. Army Soldier and University samples with that of the Pew Research Center data, in terms of mobile device usage, because of methodological differences. Our data reported weekly mobile device usage, while the Pew Research Center (Duggan & Rainie, 2012) reported overall cell phone usage. That is, the Pew Research Center asked participants if they had *ever* used their *cell phone* for certain activities, while we asked our participants to indicate their *weekly* usage of their *mobile device* for certain activities. However, our data showed that both our university and Soldier samples used their mobile devices to engage in activities similar to those reported by the Pew Research Center (Duggan & Rainie, 2012) at a high rate. Over 93% of students from our university sample reported using their mobile device to send and receive text messages, access the Internet, and email. Similarly, over 87% of our U.S. Army Soldier sample reported using their mobile device for the same activities.

### **Soldier Versus Student Findings**

Our comparison of U.S. Army Soldiers' and university students' mobile device ownership revealed that while a majority of individuals from both groups owned mobile devices, there were differences in the types of mobile devices owned between the two. Soldiers (25%) reported owning tablets at a higher rate than their university (8%) counterparts, while students (77%) reported owning smartphones at higher rate than the Soldiers participating in our survey (47%). This finding follows the same trend found earlier between our U.S. Army Soldier sample and Pew Research Center report (Duggan and Rainie, 2012). Younger Soldiers (under 30) did not own smartphones at the same rate as their counterparts in the civilian sector. As mentioned



earlier, Soldiers may be more inclined to purchase tablets instead of smartphones because tablets can provide the same entertainment features as a smartphone, without requiring a monthly service contract.

When examining mobile device usage, both our U.S. Army Soldiers and university samples reported using their mobile device regularly for communication and Internet browsing purposes. Over 85% of students and Soldiers reported using their mobile device for text messaging, making phone calls, email, and Internet browsing. With that said, the percentage of mobile device usage by Soldiers for many activities, including social networking, watching videos or movies, and sharing pictures or videos decreased with age.

When examining willingness to use a smartphone, our data suggest that if given a university-issued smartphone, students would use them more for communication purposes than any other activity. Age was not a factor in a student's willingness to use a smartphone. U.S. Army Soldier data suggest that more than half of the Soldiers were willing to use an Army-issued smartphone for official phone and email, access to online training, personal organizing, text messaging, and access to online/technical field manuals. However, Soldiers were less inclined to use an Army-issued smartphone for social networking and battle tracking. Older Soldiers were more likely to use an Army-issued smartphone for official phone and email and personal organizing, while younger Soldiers were more likely to use an Army-issued smartphone to access online training and social networking. The data presented here do not enable us to make any conclusive inferences about why younger Soldiers are more likely to use an Army-issued smartphone for online training and social networking. One reason could be, compared to older Soldiers, younger Soldiers are typically lower in rank, which may require them to complete more training activities. In addition, the social networking boom has been ubiquitous for the majority of young Soldiers' lives. This exposure may have led to a more open attitude towards social networking, allowing younger Soldiers to be more comfortable partaking in social networking activities on an Army-issued smartphone.

### **Officer Versus Enlisted Soldier Findings**

Interestingly, comparison of officers and junior enlisted Soldiers revealed that enlisted Soldiers reported using their current mobile devices more frequently compared to officers for a variety of tasks including, text messaging, social networking, watching videos or movies, and sharing pictures or videos. However, a different trend emerged when examining the willingness to use an Army-issued smartphone of both groups. Officers reported a greater willingness to use an Army-issued smartphone compared to junior enlisted Soldiers for a variety of activities including, official phone and email, text messaging, and personal organizing.

Activities related to communication and personal organization accounted for the greatest difference in willingness to use an Army-issued smartphone between officers and junior enlisted Soldiers. The reason why officers would be more willing to use an Army-issued smartphone for these activities compared to junior enlisted Soldiers might be attributed to differences in job responsibilities. Officers are responsible for leading Soldiers and managing increasingly diverse resources, which often requires communication and organization skills. In addition, senior Soldiers (officers and NCOs) are more likely to use mobile devices for work related email or

phone, yet this is not common practice for younger Soldiers (enlisted). Simply put, due to the nature of their job responsibilities, officers may find a greater need for an Army-issued smartphones compared to junior enlisted Soldiers.

### **Implications for Army Training**

As the Army transitions into leveraging mobile devices to expand learning, the core question is how to maximize the use of these mobile devices to provide a training system that allows Soldiers to access training content and performance support information at the point of need. As Tucker (2010) points out there are many examples of how mobile technologies could benefit Army training that are in line with the ALM's vision of using mobile technologies to facilitate learning. However, for this to occur, Soldiers must be familiar with the types of mobile devices the Army plans on using and be willing to use them for Army training.

As our data show, we can assume that if the Army leverages mobile devices as tools for training, that Soldiers will embrace them and use them. However, contrary to popular assumptions about the "digital generation," many younger Soldiers do not report owning a smartphone or tablet. As a result, any plan to incorporate mobile devices as tools for training should include careful analysis for how the Army will distribute mobile devices and how Soldiers will use them. In addition, our results suggest that regardless of how these devices will be distributed and used, the Army is going to have to anticipate the need for some training on the basics of mobile device usage for a moderate amount of the Soldier population.

Our data would suggest that using the cost effective Bring Your Own Device (BYOD) approach, as a means of leveraging mobile devices would be challenging for multiple reasons. First, findings of our research revealed that smartphone and tablet ownership was low, only 47% of the U.S. Army Soldier sample owned smartphones and only 25% owned tablets. Second, the diverse mobile device ownership among Soldiers means that the Army will have to develop at least three different versions (iPhone, Android, BlackBerry) of each application (app). One challenge with developing mobile apps is that software developer has to modify their app for different types of operating systems. For example, a native app originally built for an iPhone with an iOS™ operating system would have to be modified for Android or BlackBerry operating system. Even within the same operating system, developers have to modify training apps because of the differences in technical specifications among mobile devices. For instance, two mobile devices that run the Android OS might differ in screen size, screen resolution, and processing power. Consequently, for an app to have the same look and feel across both devices a developer has to use unique user interface elements and graphics to ensure the material is scalable for each device. This might become costly and time consuming when creating training apps for a variety of different operating systems and device types.

The findings discussed above suggest the government-issued mobile device approach may be the better option. Although this approach is more expensive, there are fewer challenges. One minor challenge with the government-issued mobile device approach is related to general training for using the device. Because of the low ownership of smartphones and tablets among Soldiers, the Army is going to have to expect many Soldiers will need training on the basic skills of mobile devices. Training would assist Soldiers who are unfamiliar with the Army-issued mobile device, raising their mobile device knowledge. Research also suggests training should

also be included for instructors to learn how to use and operate the device, and how to incorporate mobile devices into their curriculum (Killilea, Marraffino, & Singer, 2013).

Another challenge is related to the willingness of Soldiers to use an Army-issued mobile device. Our data showed a large number of Soldiers reported using a mobile device regularly in their daily lives, yet a substantially lower number of Soldiers reported that they would use an Army-issued smartphone. In addition, when compared to an exemplar group of university students, Soldiers were less likely to use an issued smartphone. This generally reluctance to use an Army-issued smartphone could be the result of privacy concerns, their preference to use their own devices, or their familiarity with existing government issued mobile devices, such as Blackberrys and other computer devices, that have many features disabled for security reasons.

### **Limitations and Future Research**

Several limitations with this research that should be noted. Demographic and sample size differences limited the comparison of our Soldier and civilian sector samples. As a result, we mainly reported non-parametric tests. Ideally, the number of participants from both samples would have been more evenly distributed in terms of overall sample size, gender, and age. In addition, because of the diverse mobile device ownership reported among Soldiers, this research effort would have benefited from additional questions regarding willingness to use other types of Army-issued mobile devices. Lastly, this research could have benefited from improved wording of the survey items. Participants may have had a better understanding of the question “How frequently do you use your mobile device(s) for the following activity?” had we listed what we considered a mobile device. Because of the question’s wording, the participant’s interpretation of the devices classified as a mobile device was subjective. Moreover, the design of the survey did not allow us to determine the types of devices Soldiers and students used for specific activities.

The limitations mentioned above lead to several future research possibilities. Future research would benefit by collecting data from a larger and more diverse civilian sample, as opposed to the limited university sample we targeted. This would allow for inferential data analysis, providing a stronger statistical comparison between Soldiers and a civilian sector sample. Furthermore, research investigating the specific types of mobile devices used for certain activities would provide more detail on mobile device usage among Soldiers. Currently, we know that Soldiers use their mobile devices for a number of activities, but we do not know which mobile device they use for each activity. This research effort would provide the Army with pertinent information on U.S. Army Soldier mobile device usage, specifically the difference in smartphone and tablet usage among Soldiers.

### **Conclusion**

Taken together, our findings suggest that overall, most U.S. Army Soldiers own and are familiar with mobile devices and their usage. The extent to which certain devices, such as smartphones and tablets are owned and used is related to the age/rank of the Soldier. Younger Soldiers reported owning more tablets and e-Readers, while smartphones were more prevalent among older Soldiers. In addition, if issued an Army smartphone, most Soldiers would be

comfortable incorporating it into their work environments. The Army must consider these findings when leveraging mobile devices to expand learning if it is to be successful.

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**APPENDIX A:  
LOGISTIC REGRESSION TABLES**

Table A1.

**Logistic Regression Predicting “Weekly” Usage of Mobile Device**

<i>Predictor</i>	<i>Text Messaging (n = 11890)</i>			<i>Internet Browsing (n = 11844)</i>			<i>Sending and Receiving Emails (n = 11855)</i>			<i>Social Networking (n = 11852)</i>		
	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)
<i>under 20</i>	-0.24	0.45	0.787	-0.02	0.01	0.977	-1.01	43.53**	0.364	<b>2.13</b>	<b>165.75**</b>	<b>8.39</b>
<i>20-24</i>	<b>3.88</b>	<b>605.33**</b>	<b>48.512</b>	<b>2.88</b>	<b>842.92**</b>	<b>17.888</b>	-0.51	19.87**	0.601	-0.28	2.54	0.754
<i>25-29</i>	-0.63	10.34*	0.534	-0.38	80.84*	0.682	-0.37	10.35*	0.691	-0.85	23.76**	0.429
<i>30-34</i>	-0.66	11.19*	0.518	-0.25	3.51	0.778	-0.14	1.37	0.87	-1.04	35.70**	0.355
<i>35-39</i>	-1.01	29.33**	0.364	-0.49	14.93**	0.61	-0.19	2.47	0.83	-1.35	61.07**	0.26
<i>40-44</i>	-1.52	71.84**	0.219	-0.76	36.82**	0.466	-0.05	0.17	0.95	-1.85	115.72**	0.157
<i>45-49</i>	-1.81	97.49**	0.163	-1.16	8.83**	0.312	<b>2.14</b>	<b>486.38**</b>	<b>8.479</b>	-2.29	170.50**	0.101
<i>50 or older</i>	-2.4	151.59**	0.09	-1.35	76.46**	0.26	-0.12	0.52	0.886	-2.55	182.24**	0.078
$\chi^2$	= 283.509, p <.00 with df = 7			= 152.234, p <.00 with df = 7			= 74.907, p <.00 with df = 7			= 1096.642, p <.00 with df = 7		
<i>Predictor</i>	<i>Sharing Pictures or Videos (n = 11864)</i>			<i>Watching Videos or Movies (n = 11830)</i>			<i>Navigation (n = 11789)</i>					
	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)			
<i>under 20</i>	<b>1.4</b>	<b>120**</b>	<b>4.066</b>	-0.12	0.86	0.886	-0.2	2.23	0.821			
<i>20-24</i>	-0.28	3.98*	0.759	<b>1.29</b>	<b>568.27**</b>	<b>3.621</b>	<b>1.37</b>	<b>612.48**</b>	<b>3.948</b>			
<i>25-29</i>	-0.77	31.89**	0.464	-0.44	36.75**	0.647	-0.11	2.04	0.897			
<i>30-34</i>	-0.88	41.79**	0.414	-0.43	33.64**	0.654	-0.04	0.23	0.963			
<i>35-39</i>	-1.09	64.30**	0.336	-0.72	102.47**	0.486	-0.22	8.50**	0.8			
<i>40-44</i>	-1.39	103.43**	0.249	-1.1	231.06**	0.333	-0.38	24.38**	0.682			
<i>45-49</i>	-1.73	150.06**	0.176	-1.64	408.96**	0.194	-0.68	65.05**	0.507			
<i>50 or older</i>	-1.86	139.63**	0.156	-1.87	301.32**	0.154	-0.94	76.04**	0.392			
$\chi^2$	= 636.428, p <.00 with df = 7			= 759.413, p <.00 with df = 7			= 145.709, p <.00 with df = 7					

\* $p < .05$  \*\*  $p < .01$ .

WALD = Wald statistic

Reference variable represented in bold



Table A2.

**Logistic Regression Predicting Soldiers' Willingness to use an Army-issued Smartphone (n = 15562)**

<i>Predictor</i>	<i>Official Phone and Email</i>			<i>Personal Organizing</i>			<i>Text Messaging</i>			<i>Social Networking</i>		
	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)
<i>under 20</i>	-2.57	153.79**	0.077	-1.07	103.95**	0.344	-0.48	20.52**	0.619	<b>0.54</b>	<b>31.49**</b>	<b>.584</b>
<i>20-24</i>	-2.06	118.50**	0.128	-0.66	107.09**	0.518	-0.21	10.79*	0.814	-0.07	0.50	.929
<i>25-29</i>	-1.33	48.37**	0.264	-0.27	17.90**	0.761	-0.07	1.13	0.936	-0.11	1.20	.892
<i>30-34</i>	-0.80	16.42**	0.451	-0.1	2.24	0.904	<b>1.01</b>	<b>493.40**</b>	<b>2.738</b>	-0.10	.87	.907
<i>35-39</i>	-0.56	7.96*	0.571	<b>1.30</b>	<b>737.51**</b>	<b>3.678</b>	-0.13	4.07*	0.881	-0.28	7.29**	.754
<i>40-44</i>	-0.42	4.31*	0.657	-0.1	2.18	0.904	-0.19	9.46*	0.823	-0.39	13.67**	.676
<i>45-49</i>	-0.26	1.41*	0.775	-0.20	6.92*	0.82	-0.19	7.57*	0.823	-0.41	13.62**	.664
<i>50 or older</i>	<b>3.14</b>	<b>293.46**</b>	<b>23.161</b>	-0.43	20.68**	0.654	-0.54	37.43**	0.585	-0.66	26.03**	.518
$\chi^2$	= 854.280, p <.00 with df = 7			= 215.957, p <.00 with df = 7			= 854.280, p <.00 with df = 7			= 88.792, p <.00 with df = 7		

<i>Predictor</i>	<i>Access to Technical Field Manuals</i>			<i>Battle Tracking</i>			<i>Access to Online Training</i>		
	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)	$\beta$	WALD	EXP(B)
<i>under 20</i>	-0.73	50.02**	.483	-0.43	16.46**	.653	-0.10	0.98	.904
<i>20-24</i>	-0.27	19.67**	.762	-0.07	1.343	.936	-0.04	0.38	.965
<i>25-29</i>	-0.12	3.89*	.887	-0.04	0.59	.958	-0.07	1.54	.933
<i>30-34</i>	<b>0.94</b>	<b>441.79**</b>	<b>2.556</b>	<b>-0.20</b>	<b>25.50**</b>	<b>.816</b>	<b>0.35</b>	<b>75.10**</b>	<b>1.424</b>
<i>35-39</i>	-0.08	1.66	.923	-0.15	7.29**	.858	-0.16	8.28**	.849
<i>40-44</i>	-0.35	31.44**	.707	-0.31	27.81**	.735	-0.24	16.67**	.790
<i>45-49</i>	-0.37	29.33**	.689	-0.32	24.02**	.725	-0.24	14.21**	.784
<i>50 or older</i>	-0.72	70.33**	.486	-0.72	63.14**	.487	-0.38	20.91**	.682
$\chi^2$	= 134.130, p <.00 with df = 7			= 111.245, p <.00 with df = 7			= 42.82, p <.00 with df = 7		

\*p &lt; .05 \*\* p &lt;.01.

WALD = Wald statistic

Reference group represented in bold

**APPENDIX B:  
MOBILE DEVICE CORRELATIONS**

Table B1.  
***Correlations Between Age, Rank, and Activity***

<i>Variable</i>	<i>Age</i>	<i>Enlisted Rank</i>	<i>Officer Rank</i>	<i>Making Phone Calls</i>	<i>Text Messaging</i>	<i>Internet Browsing</i>	<i>Sending and Receiving Emails</i>	<i>Navigation</i>	<i>Social Networking</i>	<i>Watching Videos or Movies</i>	<i>Sharing Pictures or Videos</i>
Age	1										
Enlisted	.816**	1	-								
Officer	.818**	-	1								
Making Phone Calls	-.057**	-.030*	-.064**	1							
Text Messaging	-.146**	-.076**	-.204**	.605**	1						
Internet Browsing	-.104**	-.072**	-.119**	.267**	.310**	1					
Sending and Receiving Emails	-.069**	.103**	.013	.270**	.224**	.517**	1				
Navigation	-.094**	-.063**	-.148**	.258**	.277**	.466**	.377**	1			
Social Networking	-.295**	-.243**	-.303**	.180**	.242**	.424**	.315**	.345**	1		
Watching Videos or Movies	-.238**	-.181**	-.212**	.103**	.161**	.365**	.286**	.404**	.420**	1	
Sharing Pictures or Videos	-.226**	-.213**	-.176**	.160**	.211**	.302**	.240**	.316**	.522**	.404**	1

\* $p < .05$  \*\*  $p < .01$ .

Note: Officer and enlisted rank are ascending rank order variables. All activities are dichotomous variables (yes/no).