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May 2010

Using Hand-Held Computers When Conducting National Security Background Interviews: Utility Test Results

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BACKGROUND

The Defense Personnel Security Research Center (PERSEREC) and the Department of State (DOS) collaborated to test whether background investigators are able and willing to conduct interviews with a tablet computer. Tablet PCs resemble ordinary notebook computers but can be configured to resemble a paper notepad and the user can write directly on the display. For interviews, case files could be automatically downloaded, checked for any issues or inconsistencies between sources of information, and reviewed to ensure that all necessary questions were asked and answered. In addition, help and reference documents could be available to assist new investigators and cover infrequently encountered concerns. This project moved beyond prior PERSEREC research by conducting realistic mock interviews using both paper and a tablet computer. This work also supports the Joint Suitability and Security Reform Team (JSSRT).

HIGHLIGHTS

Discussions were held with seven DOS investigators to understand the current DOS vetting process and needs. Following this, realistic simulated cases and prototype tablet software were created through consultation with two investigators. Finally, independent 3-4 hour test sessions were held with eight participating investigators to: (1) teach them how to use the tablet computer, (2) perform a simulated interview on paper in the normal fashion, (3) perform a simulated interview using the tablet computer, and (4) complete questionnaires and provide feedback on the system. The findings were very favorable for tablet computers. The tablets required minimal training, seven of the eight participants preferred the tablet to the paper method, and many of these investigators were eager to use tablets as soon as possible. The suggested next steps include (1) reevaluating what is possible and appropriate for field interviews with computerized workflow, and (2) developing tablet and case management software.

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14. ABSTRACT: The Defense Personnel Security Research Center (PERSEREC) and the Department of State (DOS) collaborated to test whether background investigators are able and willing to conduct interviews with a tablet computer. Discussions were held with seven DOS investigators to understand the current DOS vetting process and needs. Following this, realistic simulated cases and prototype tablet software were created through consultation with two investigators. Finally, independent 3-4 hour test sessions were held with eight participating investigators to: (1) teach them how to use the tablet computer, (2) perform a simulated interview on paper in the normal fashion, (3) perform a simulated interview using the tablet computer, and (4) complete questionnaires and provide feedback on the system. The findings were very favorable for tablet computers. The tablets required minimal training, seven of the eight participants preferred the tablet to the paper method, and many investigators were eager to use tablets as soon as possible. The suggested next steps include (1) reevaluating what is possible and appropriate for field interviews with computerized workflow, and (2) developing tablet and case management software.

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PREFACE

Tablet computers resemble a paper notepad and can be held and used like a notepad. They are relevant to personnel security because they bring all of the power of computers into interview settings. This is the first research to directly test if and how personnel security background interviews might be conducted with this technology. The findings are exciting because they provide evidence that the computers are a realistic option that opens the door for transforming expectations about what is possible during field investigations.

This research is of interest to all who conduct or rely on personnel security investigations, for tablet computers could lead to more comprehensive and consistent interviews, as well as more comprehensive Reports of Investigation. It is of particular interest to the Joint Security and Suitability Reform Team (JSSRT), Department of State, Office of Personnel Management, and others who conduct background investigations, because it helps lay a foundation for the next-generation systems that integrate interviews into the automated workflow of the future.

James A. Riedel
Director

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The authors greatly appreciate the help received from the Department of State over the course of this research. James Onusko and Albertina Littleton of the Office of Personnel Security and Suitability (DS/SI/PSS) provided collaborative oversight for the project, reference documentation for PERSEREC to use in the study, and allocated funding that enabled field investigators to participate in the project. Special Investigators Ken Davidson, the western regional Background Investigation Coordinator (BIC), and Mark Vallerga were very supportive of this project and extremely generous with their time, traveling to PERSEREC twice and answering numerous questions by telephone and email. The enthusiasm and professionalism of the numerous Department of State field investigators who were contacted by phone and participated in the test interviews in Monterey, CA, and Denver, CO, also contributed greatly to the successful completion of this project.

EXECUTIVE SUMMARY

The interviews currently conducted for security clearance background investigations primarily rely on paper for documenting interview results and fail to capitalize on the benefits of higher technology. Specifically, tablet computers have the potential for broadly improving and even transforming the way personnel security interviews are conducted without compromising eye contact or other communication dynamics of face-to-face interviewing. Tablet computers resemble ordinary notebook computers but can be set up as a flat display for handwriting by means of a stylus (digital pen). When used in this fashion, the tablet is a computerized version of a paper notepad.

These computers are of interest to all government entities that conduct or are customers of personnel security investigations, for they could deepen what is considered practical and appropriate coverage for interviews. The present research was performed in conjunction with the Department of State (DOS), and is one of many potential improvements to the current process supported by the Joint Security and Suitability Reform Team (JSSRT). In the JSSRT Integrated Work Plan (IWP), this project was described as conducting a feasibility study for using hand-held tablet PCs to improve the content coverage, individualized risk management, customization, quality control, and processing speed of Subject interviews.

The most notable benefits of tablet computers foreseen for improving the quality, consistency, completeness of investigations, and the streamlining of workflow include:

(1) Automated detection and summarization of potential issue content, including conditional branching to display issue questions appropriate for each case

(2) Automated, real time, consistency checking between information contained in case files and answers provided during interviews

(3) Error checking to ensure that the investigator asked all necessary questions

(4) Integrated reference and best practices documents

(5) Automated case file downloading and uploading

(6) Integrated reporting tools to minimize writing and rekeying

(7) Enhanced security for personally identifiable information relative to paper through encryption, access cards, and other electronic measures

(8) Enhanced accuracy of collected data by recording original entries and reducing the need to transcribe paper notes

For the present research, the Defense Personnel Security Research Center (PERSEREC) and DOS collaborated to assess how well tablet computers might work during personnel security interviews. The research questions included (1) whether tablets offer adequate functionality for background interviews, (2) whether they

significantly interfere with interpersonal interaction, and (3) the willingness of investigators to use them. To these ends, discussions of investigation procedures were held with DOS staff and active field investigators to understand the needs and requirements. Second, prototype interview software was created on a tablet computer so that Subject interviews could be closely simulated. Realistic but fictitious cases were programmed into the computer and then used by investigators to conduct mock interviews. Eight participating investigators conducted interviews using both the conventional paper method and the tablet computer. The interview methods were compared and the investigators provided feedback about the prototype tablet system.

The tablet computer system was very well received by the investigators, as reflected by observed behavior, answers provided on questionnaires, and comments expressed at the end of the test sessions. Some of the highlights of participant feedback include:

- Seven of eight "Agreed" or "Strongly Agreed" to the statement "I think that I would like to use this system frequently."
- Seven of eight "Agreed" or "Strongly Agreed" to the statement "I would imagine that most people would learn to use this system very quickly."
- Six of eight felt the tablet has no impact or a positive impact on their ability to conduct interviews.
- Six of eight strongly preferred the tablet to paper, one slightly preferred the tablet, and one had no preference between the computer and paper.
- Many of the investigators asked when the computer would be available for use or volunteered to participate in future research.

The major findings and conclusions are presented below:

- Tablet computers can be used during interview situations by a wide range of investigators. Anyone who might refuse to use a tablet (expected to be a small percentage) is more likely to be unwilling than unable to do so.
- The system was very well received for a prototype and virtually all who chose to participate felt they would prefer a production tablet system over paper.
- The prototype system required minimal training beyond basic computer literacy (i.e., 30 minutes to 1 hour).
- The system had no noticeable adverse impact on interpersonal interaction (three felt the tablet was better than paper, three felt both were similar, and two felt the tablet was worse). All indicated that the problems would diminish or that the tablet would be superior to paper with greater user experience.

- Many investigators indicated that resource integration was the greatest benefit of the tablet computer. One described the tablet as “a mobile headquarters” with diverse functions (i.e., case file, reference documents, interview tool, etc.).
- An unexpected finding was that issue coverage varied widely between investigators with the current paper process. Specifically, some investigators asked just a few questions about a given concern while others spent much more time or chose to emphasize other issues. The tablet should help reduce differences in issue coverage (e.g., which questions are necessary when a Subject reports foreign associates or financial problems) between investigators and facilitate the use of current documents and standards.

Overall, the findings were very favorable for tablet computers and the investigators’ attitudes ranged from interested to enthusiastic about proceeding with their use. The next steps toward deployment involve two paths: (1) determining the costs, organizational impact, and database integration requirements, and (2) conducting detailed usability research to refine the interview forms, the report generation system, and the case handling tools. These topics have already been discussed with representatives from DOS and there is a similar need to address them with JSSRT stakeholders.

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BACKGROUND

Face-to-face personal interviews are a critical source of information in security clearance background investigations. The currently predominant method relies on paper to document interview results and fails to capitalize on the benefits that technological tools can provide. Specifically, tablet computers have the potential for broadly improving and even transforming the way personnel security interviews are conducted without compromising eye contact or other communication dynamics of face-to-face interviewing. For example, in the current Department of State (DOS) background investigation process, Subjects enter personal information via a computer (i.e., the SF-86 using e-QIP), and then computer software is used to assign and manage cases. The field investigator then prints out the documents and conducts the actual interviews using a pen and paper. Finally, the investigator returns to a computer to enter the findings and generate a report. If tablet computers were used for conducting interviews, case documents could stay in their original electronic form and the tablet could bring all the additional features of computers into interviews. This would streamline workflow and expand the capabilities of investigators.

Tablet computers are largely identical to ordinary notebook computers. They use standard Windows software, they accept standard PC accessories, and often strongly resemble notebook computers. However, all tablets can be set up as a flat display for handwriting by means of a stylus (digital pen). When used in this fashion the tablet is a computerized version of a paper notepad. These computers can therefore be used in situations where a conventional computer is awkward or where a keyboard cannot be used. Finally, a tablet computer can perform general computing tasks, obviating the need for a conventional computer. The overall cost is therefore expected to be incrementally higher than a conventional computer.

These computers should be of interest to all government entities that conduct or are customers of personnel security investigations, because they could expand what is considered practical and appropriate coverage for interviews. The present research was performed in conjunction with the DOS, and is one of many potential improvements to the current process supported by the Joint Security and Suitability Reform Team (JSSRT). The JSSRT seeks an effective federal governance structure, revised federal investigative standards, and an integrated enterprise information technology strategy. The team's vision for a new end-to-end process includes validation of need, eApplication, automated record checks, eAdjudication, enhanced Subject interviews, expandable focused investigations, and continuous evaluation. Tablet computers represent an additional tool for investigations. In the JSSRT Integrated Work Plan (IWP), the present project was described as conducting a feasibility study for using hand-held tablet PCs to improve the content coverage, individualized risk management/customization, quality control, and processing speed of Subject interviews.

BACKGROUND

While the specific features of tablets depend on how the computers are programmed and how they are integrated with case management software, there are numerous potential benefits. Investigators could have greater knowledge and resources during interviews, be able to work more efficiently, and generate reports that provide adjudicators with precise detail about the issues covered and the questions asked. Having the computer store which questions were asked and how they were answered (often sidestepping manual transcription) should enhance the accuracy of the information collected. This additional detail would be useful for adjudication, and also automatically result in an audit trail.

The most notable benefits to the quality, consistency, completeness of investigations, and to streamline workflow include:

(1) Automated detection and summarization of potential issue content, including conditional branching to display the issue questions appropriate for each case

(2) Automated, real time, consistency checking between information contained in case files and answers provided during interviews

(3) Error checking to ensure that the investigator asked all necessary questions

(4) Integrated reference and best practices documents

(5) Automated case file downloading and uploading

(6) Integrated reporting tools to minimize writing and rekeying

(7) Enhanced security for personally identifiable information relative to paper through encryption, access cards, and other electronic measures

(8) Enhanced accuracy of collected data by recording original entries and reducing the need to transcribe paper notes

The Defense Personnel Security Research Center (PERSEREC) previously conducted a preliminary examination of tablet computers (Leggitt & Lang, 2007) to assess whether current products are capable of supporting background interviews, to review applicable research, and to obtain initial feedback from stakeholders. The findings were positive and it was recommended that research continue to address the most commonly expressed concerns and the looming unknowns. The most immediate unanswered questions included whether investigators are actually able to use tablets during interview situations and whether these devices might interfere with natural social face-to-face interview interactions, such as eye contact. If tablets hamper interviewing, then they are not appropriate and should not be used.

GOALS

The primary goal of the project was to obtain concrete evidence about how tablet computers perform in personnel security interviews. Subject interviews were the focus of research because they are the most complex type of interview and present the greatest challenge for a tablet computer. The associated questions included (1) whether tablets offer adequate functionality for background interviews, (2) whether they significantly interfere with interpersonal interaction, and (3) the willingness of investigators to use them. Testing took place in a laboratory setting because the materials for actual cases were not available on the tablet and the policy requirements for tablets have not been established.

DESIGN AND METHODOLOGY

PERSEREC and the DOS collaborated on assessing how well tablet computers work during personnel security interviews. DOS made investigators available, while PERSEREC designed and conducted the research. The first task of the project was to discuss investigation procedures with DOS security staff and active field investigators to better understand their needs and requirements. Second, prototype interview software was created on a tablet computer so that Subject interviews could be closely simulated. Realistic but fictitious cases were programmed into the computer that was then used by investigators to conduct mock interviews. Each participating investigator conducted interviews using both the conventional paper method and the tablet computer. The interview methods were compared and the investigators provided feedback about the prototype tablet system.

The project was divided into three phases. The steps involved for each phase are outlined below.

(1) Planning Phase

- (a) Review of current DOS workflow and the software now used for background investigations
- (b) Discussion of investigation needs and procedures with seven active DOS investigators

(2) Test Preparation Phase

- (a) Generation of prototype interview materials for the tablet computer
- (b) Refinement of the materials and test process through meetings with two active DOS investigators

(3) Test Phase

- (a) Administration of simulated interviews to eight active DOS investigators comparing the paper method to the tablet computer method

Per guidance from DOS headquarters, the western regional Background Investigation Coordinator (BIC/field manager) was consulted for project planning and for recruiting participants. The BIC assisted in this capacity throughout the project.

PLANNING PHASE

Initially, telephone conversations were held with DOS staff to understand their investigations software, high-level procedures, and automation plans. DOS provided the most current investigation documents for review. Structured discussions were then held with seven investigators to understand DOS workflow, investigator needs,

and the potential impact of tablet computers. Six of these discussions were conducted by telephone and one took place through a face-to-face meeting. The primary purpose of these discussions was to obtain detailed information to guide the later phases of research. It was also found that five of the investigators were receptive to the idea of using a tablet computer during interviews, but they wanted to see and use one before reaching any firm conclusions.

Two participants were investigators from the joint DOS/Office of Personnel Management (OPM) program that trains unemployed spouses of DOS staff to conduct overseas background interviews. Both investigators expressed highly favorable views toward the concept of using tablet computers. They perceived great value in having reference documents and integrated guidance on the tablet, due to being the only investigator in an overseas location and having limited experience.

Two participants dismissed the concept of using a tablet computer before seeing it, and therefore were not considered for the test phase. Throughout the course of PERSEREC tablet computer research some have rejected the idea of having a computer in an interview setting. The concerns have included potential interference with eye contact, potential intimidation of interviewees, the impracticality of using a computer for brief reference interviews, the cost the computers, and the risks of damage, theft, or loss of the device. In fact, most or all of the participants expressed at least some of these thoughts. As the findings presented below demonstrate, these concerns typically dissipated quickly with experience. However, management should expect and plan for some resistance to tablets.

TEST PREPARATION PHASE

The information obtained during the planning phase was compiled to guide the creation of test materials. The materials included simulated investigation files and prototype tablet computer software to present the content. When the draft content was complete, two full-day meetings were held with the BIC and an associate investigator (step 2b above) to discuss the project, review and revise the materials, and ensure that the procedure was similar to existing DOS interviews. Following this feedback the materials were finalized for testing.

Equipment and Materials

The study used a Hewlett Packard 2710p tablet computer running Windows XP for Tablet PC, and the prototype interview forms were created with Knight Software Survey System Version 2.1. A Canon VIXIA HF10 camcorder was used to record the interviews. These were selected as the most appropriate off-the-shelf products for research, but the software would require customization or enhancements for deployment. These products should be periodically reevaluated because technology frequently changes. Additional details are presented in Appendix A.

Interview Forms

The prototype computer forms were designed with two goals in mind: (1) to present information in the most useful way for background interviews and (2) to remain similar to the existing paper process. While it would be possible to add features or modify the format versus paper, such modifications have never been tried in real interviews. Given that a central goal of this project was to assess the degree to which tablet computers can be used, it was deemed desirable that the computer software resemble the paper method. Deviating from the existing process would potentially confound the assessment of investigators' first exposure to a tablet computer. Optimization techniques can be explored as appropriate in the future.

The tablet computer forms presented all questions in a common format. The design resulted from a methodical review of the interview process and preliminary testing with two DOS investigators. As illustrated by Figure 1 through Figure 3 (below), each question is typically followed by "Confirm" and "Update" option buttons. When the interview begins (Figure 1) both options are blank and the note fields are closed (hidden). If the investigator merely needs to confirm what was previously submitted, he or she taps the display to select the option and then proceeds to the next question. The note field remains hidden. In contrast, if the investigator needs to update or take additional notes, the software opens a small text box (Figure 2) and the answer is written directly on the display (Figure 3). The text boxes include a scroll bar and allow virtually unlimited space for comments. This balances the need for quickly getting through lengthy interviews while still allowing extensive notes when necessary.

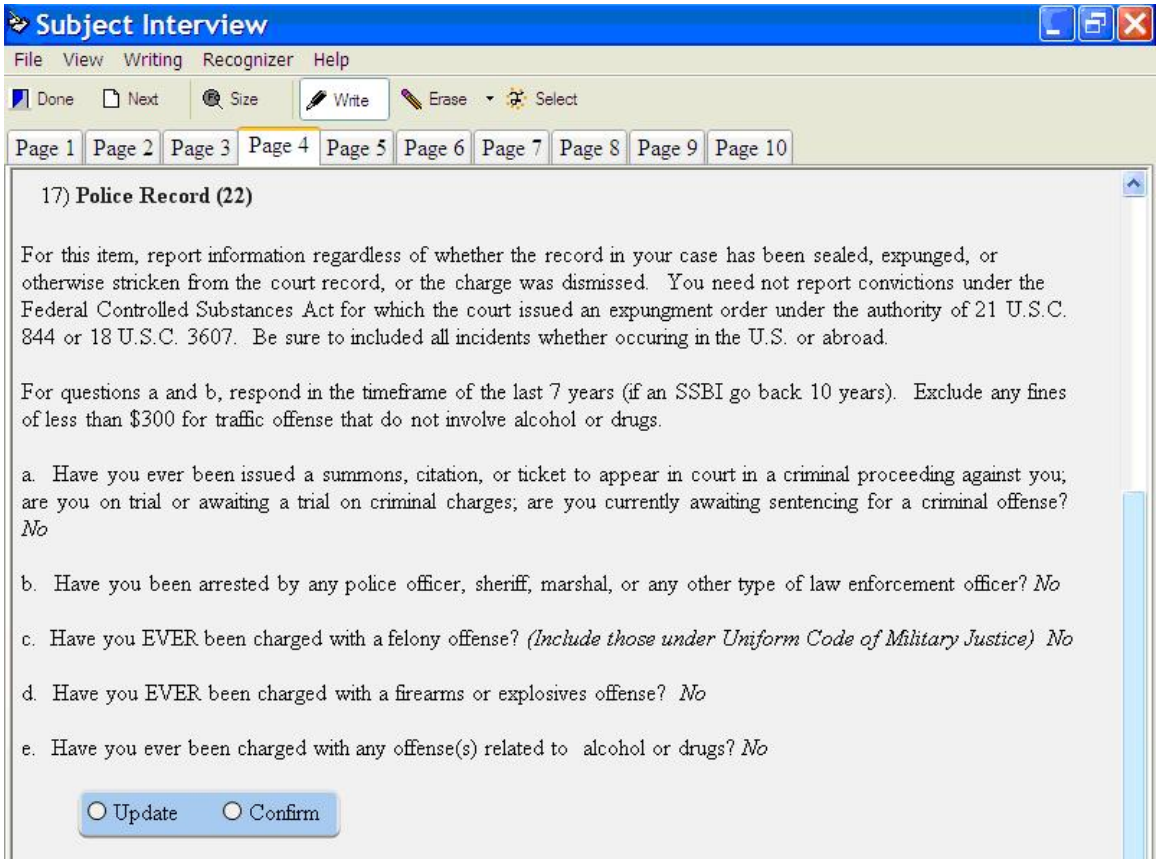

Figure 1 Image of SF-86 (2008) Question Number 22 About Police Record on a Tablet Computer Running Knight Software Survey System

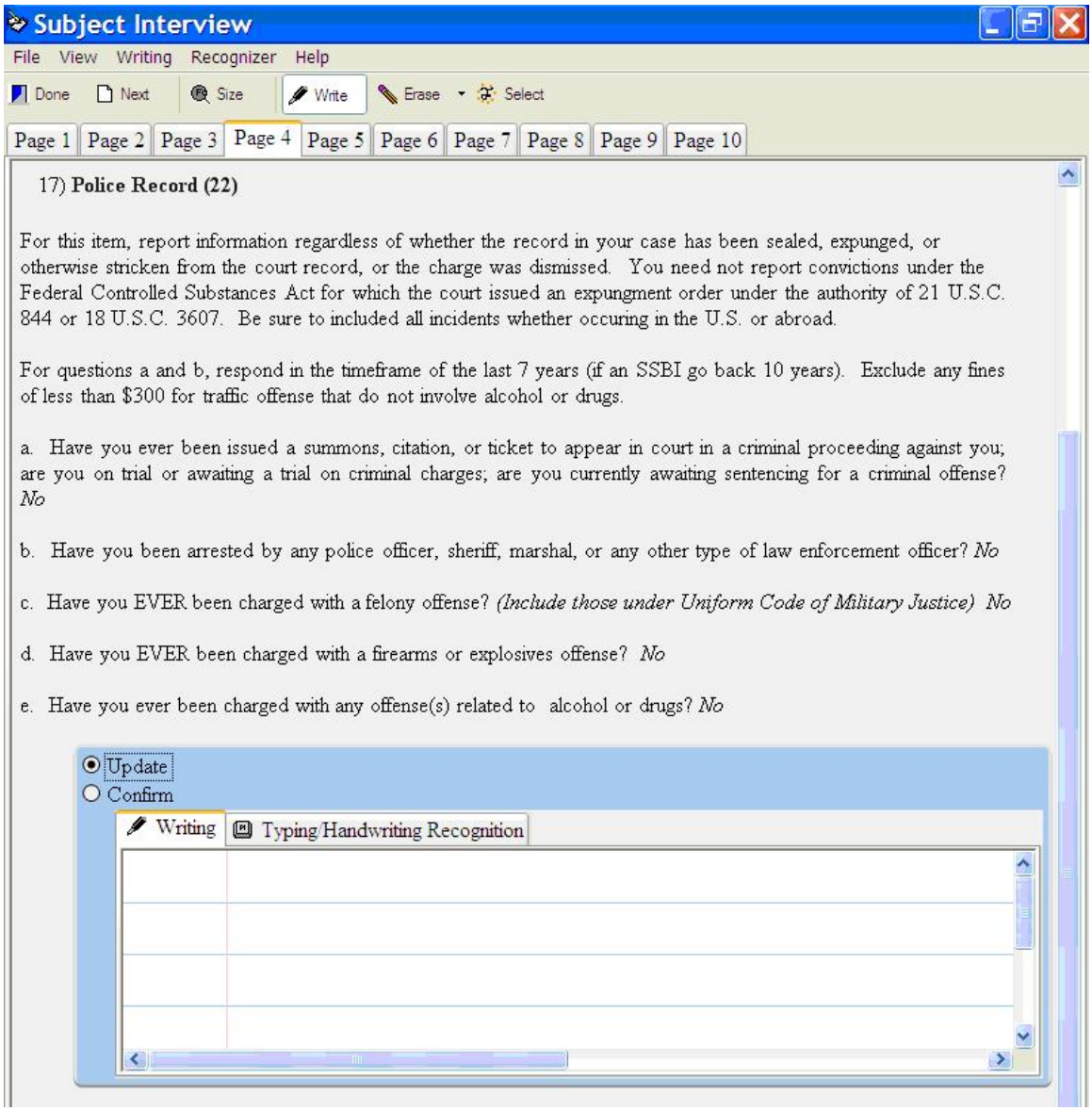

Figure 2 Image of SF-86 Police Record Question Number 22 with the Update Option Selected

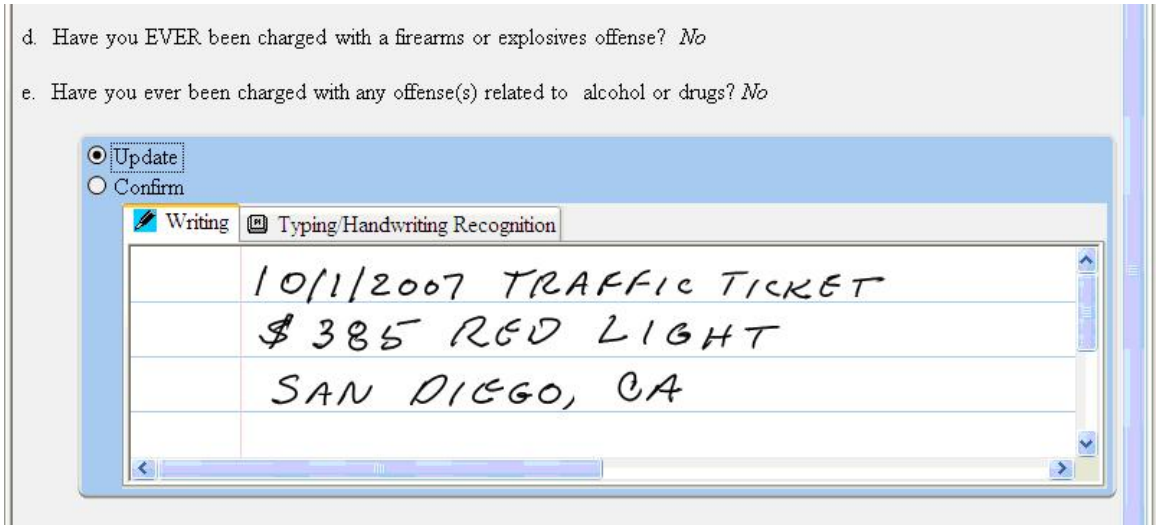

Figure 3 Image of SF-86 Police Record Question Number 22. Note Field with Handwritten Information About a Traffic Ticket

In addition to the question-by-question note fields, a simple blank note page was added to the end of each questionnaire for note taking during unforeseen circumstances, either for the investigator's own needs or when an unexpected topic is mentioned. This feature and additional screen images are presented in Appendix B.

Content of Simulated Case Files

Case information and documents were created for three fictitious applicants to positions requiring Single Scope Background Investigations (SSBIs). For each case, the simulated materials included Standard Form 86 (SF-86), credit report, and National Agency Check (NAC) information. All names, telephone numbers, addresses, and other personally identifiable information were made up so the Privacy Act of 1974 (U.S.C. 552a) did not apply. The first case contained only minor potentially derogatory information about foreign pleasure travel and two late credit payments. This case served to demonstrate the tablet computer and provide a way for the investigators to learn how to use the system. Two test cases (Benjamin Owens and Calvin Bradford) contained substantial but distinct information about potential Foreign Influence, Foreign Preference, and Foreign Travel concerns.

- (Fictitious) Benjamin Owens: An independent consultant who works with a German national on NATO contracts. He has also traveled to Iraq, Afghanistan, and Germany for work-related purposes.
- (Fictitious) Calvin Bradford: Born in Australia, he became a naturalized U.S. citizen as a teenager. He married and divorced a German national when stationed in Germany, and is now married to a Japanese national. He also reported one pleasure trip to the Bahamas.

TEST PHASE

Participants

Eight[1] active DOS contract background investigators in the western region were recruited (due to proximity to PERSEREC) to participate in individual test sessions. The investigators typically had extensive experience in law enforcement and/or background investigations, and some held current credentials with multiple agencies or organizations. The only requirements were that the investigators be willing to try the computer and provide honest feedback. Each test session required 3 to 4 hours.

Procedure

The test procedure involved the steps below:

(1) Orientation and tablet training session with a simulated subject interview (30 min to 1 hr)

(2) Investigator conducted a test interview (Benjamin or Calvin) using either the conventional paper method or with the tablet computer (about 1 hr). One of the researchers portrayed the Subject.

(3) Investigator conducted another test interview (Benjamin if previously Calvin, Calvin if previously Benjamin) using the opposite method[2] (about 1 hr)

(4) Investigator completed a brief usability questionnaire after the tablet interview (following either #2 or #3 but not both; about 1 min)

(5) Demonstration of additional features of the tablet computer – beyond the prototype software and time available (about 15 min)

(6) Discussion and final questionnaire (about 30 min)

Before each test session began a camcorder on a tripod was placed in the corner of the room (in position to see both people and the papers or computer display), and a conference-style microphone was taped to the middle of the table. Upon arrival, each participant was greeted and presented with a standard research participation

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[1] This number corresponds with the recommended sample size of the Discount Usability methodology (Nielsen, 2009). This approach emphasizes small, frequent iterative tests rather than large static tests. More than 20 years of research has indicated that most usability problems can be detected with five participants. As the present research involved rough prototype software and considered untested questions, a small sample was appropriate. A large usability test should be used when software is in a fixed state and a detailed benchmark of its performance is required.
[2] Counterbalancing was used to reduce the impact of fatigue, practice, and other changes that might result from the sequence of tasks but that have no relevance to the project. This means that half of the participants interviewed "Benjamin Owens" first while the other half first interviewed "Calvin Bradford." Similarly, half the participants conducted the interviews on paper first and then on the tablet computer, while the other half used the computer first and finished with paper.

form. He (all male) was seated near the end of a conference table to read and sign the form.

During the introductory and demonstration portions of each session (i.e., #1, #5) a researcher sat adjacent to the participant at the end of the conference table. This was to show various aspects of the tablet computer to the investigator. During the simulated interviews (i.e., #2 and #3) the researcher portraying the Subject sat at or across the end of the table. Sample images from paper and tablet interviews are shown in Figure 4 and Figure 5 below. Each investigator was allowed to sit relative to the clearance applicant as they would normally. The camcorder was used only to record the simulated interviews.

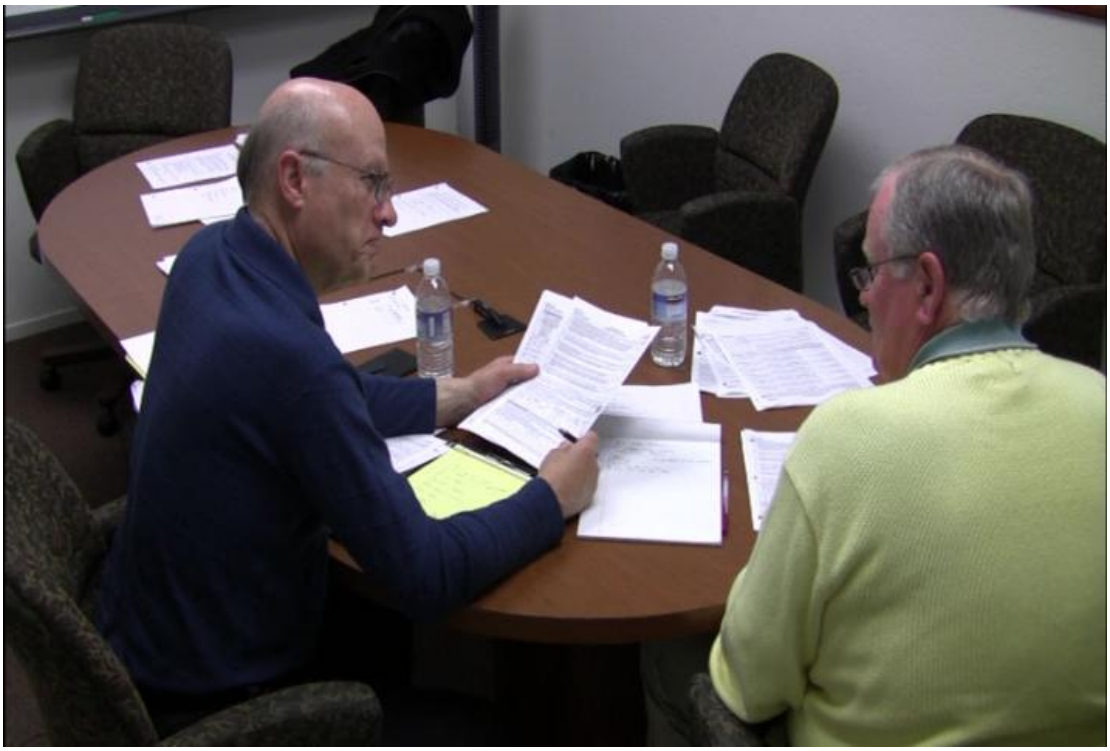

Figure 4 Sample Image from an Interview Conducted Using Paper

Figure 5 Sample Image from an Interview Conducted Using a Tablet Computer

The test interviews were similar to actual background investigation interviews. The first portion reviewed the complete SF-86 and answers provided by the applicant, followed by the credit report, NAC results, and finally DOS "Blue Book" (investigation manual) questions relevant to the case content. For these cases the additional DOS questions for Foreign Influence, Foreign Preference, and Foreign Travel were presented. The Blue Book questions for the remaining Adjudicative Guidelines were not presented.

Data Collected

The data collected included answers to questionnaires, video recordings of the simulated interviews, and observations generated during the sessions. Two questionnaires were administered during each session. The first was the System Usability Scale (SUS; Digital Equipment Corporation, 1986; Appendix C). This survey includes 10 broad questions about general usability with the answers recorded on a five-point rating scale. The participant was asked to check the appropriate boxes. The survey was used to capture investigators' initial impressions of the tablet system, and was handed to the participant immediately after the tablet interview. No discussion occurred in conjunction with this questionnaire.

The second questionnaire (see Appendix C) was created to more specifically understand the investigators' perceptions of the tablet. It included 12 questions, some of which are standard usability items and others that were designed to get at the heart of using tablet computers for personnel security interviews. For example,

one item asked “What impact did the tablet have on your ability to conduct interviews?” Half the items required open-ended answers while the other half used rating scales. This questionnaire was given orally during the discussions held at the end of each session, and follow-up explanations were encouraged for all items. Furthermore, the investigators were encouraged to be honest about problems so that the system could be refined or corrected.

RESULTS

INITIAL QUESTIONNAIRE: SYSTEM USABILITY SCALE (SUS)

The findings for the SUS are summarized in Table 1. The SUS presents half the questions with positive phrasing (e.g., “I thought the system was easy to use”) and the other half negatively (e.g., “I found the system unnecessarily complex”). In Table 1 the negative items were rephrased to make it is easy to see the strengths and weaknesses at a glance. As presented below, “Strongly Agree” always indicates the tablet computer was well received while “Strongly Disagree” always indicates a problem or dislike.

Overall, the initial reactions were consistently supportive of the tablet computer and the investigators were neutral to very positive about the prototype system. Most importantly, seven of eight investigators “Agreed” or “Strongly Agreed” that they would like to use the system frequently, and six of eight “Agreed” that the system was easy to use. Similarly, seven of eight “Agreed” or “Strongly Agreed” that most people would learn to use the system quickly. The only negative rating was by one investigator for needing to learn a lot of things to get going with the system.

Table 1
Investigator Feedback Reported with the System Usability Scale

SUS Question (Even numbered items rephrased so "Agree" ratings are always favorable)	Number of Investigators (out of eight) Providing Each Rating				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I think that I would like to use this system frequently			1	4	3
2. I DID NOT FIND the system unnecessarily complex			2	4	2
3. I thought the system was easy to use			2	6	
4. I DO NOT think that I would need the support of a technical person to be able to use this system			1	4	3
5. I found the various functions in this system were well integrated			1	6	1
6. I DID NOT THINK there was too much inconsistency in this system			3	3	2
7. I would imagine that most people would learn to use this system very quickly			1	6	1
8. I DID NOT FIND the system very cumbersome to use			1	6	1
9. I felt very confident using the system			2	5	1
10. I DID NOT NEED to learn a lot of things before I could get going with this system		1	2	4	1

FINAL QUESTIONNAIRE

The final questionnaire was intended to go into greater depth than the SUS, and to collect more specific information about using tablet computers for interviews. The items answered using rating scales are shown Table 2 below, and the open-ended comments are discussed in the section that follows. The first four questions are about various aspects of using the tablet for interviews while the final two are about overall impressions. Note that the item numbers in Table 2 are provided for easy reference and differ from those on the questionnaire itself (in Appendix B).

RESULTS

Table 2
Results for Rating Scale Questions from the Final Questionnaire

Question	Number of Investigators (out of eight) Providing Each Rating				
	Very Negative	Negative	None	Positive	Very Positive
1. What impact did the tablet have on your ability to conduct interviews?		2	2	2	2
2. What was the impact of the tablet on the mechanics of the interview (i.e., handling papers and notes versus viewing information on the display)?		1	2	4	1
3. What was the impact on the efficiency of collecting information?			3	4	1
4. What was the apparent impact of the tablet on the social dynamics of the interview?		2	3	2	1
	None	Too small to be worthwhile	Nice to have	Important impact	Major impact
5. How much value do you perceive in the additional features [beyond paper] demonstrated today?			3	3	2
	Strongly Paper	Slightly Paper	Equal	Slightly Tablet	Strongly Tablet
6. Considering that you have tried a rough prototype and the final product would be more capable and complete, which method do you think you would prefer for conducting interviews?			1	1	6

The first question (Item #1) asked about the impact of the tablet on the ability to conduct interviews, and received answers ranging from "Negative" to "Very Positive." This wide variation mainly demonstrates the uncertainty felt in learning to use the computer. The four investigators with positive reactions liked the fact that the tablet brought all the case materials together, reduced the need for shuffling paper, and looked more contemporary or professional. The two who felt the tablet had a negative impact were less comfortable with the device and that they had to keep their attention on the computer. During follow-up questioning they indicated that it would become easier to use with familiarity, and that their ratings applied to the test session only. Finally, two investigators felt the tablet had no impact on conducting interviews.

The responses to Items #2 and #3 were similar and in favor of the tablet computer overall. Seven of eight investigators felt the tablet had no impact or a positive impact on the mechanics of conducting interviews on paper versus the computer. Similarly, eight of eight felt the tablet had no impact or a positive impact on collecting information. Both of these show that the tablet can be appropriate for the depth of examination required of background interviews.

Item #4 asked about the impact of the tablet on the social and interpersonal aspects of interviews. Again, largely due to lack of familiarity with the tablet, this question resulted in a wide range of opinions. Three of eight felt the tablet had a positive impact, three felt the tablet had no impact, and two felt the tablet had a negative impact. The investigators who felt the computer had a negative impact explained they were just becoming familiar with the device and felt that it would become easier over time. The negative comments were restricted to discomfort during the test session rather than how it would be to use a tablet on a regular basis.

Items #5 and #6 were used to wrap up the discussions and collect bottom-line views about the tablet computer (acknowledging that a prototype system was shown). Item #5 asked about how much value the investigators perceived in the tablet computer. Two felt it would have a major impact, three felt it would have an important impact, and three felt that it would be nice to have. None of the investigators felt there would be no impact or that the impact would be too small to be worthwhile.

The final question (#6) asked about preferences for conducting interviews on paper or with the computer. Six of eight strongly preferred the tablet, one slightly preferred the tablet, and one had no preference (he reserved judgment pending review of the post-interview process). This shows that the tablet was extremely well received by a group that ranged from mid-career investigators to experienced veterans, and from those who work only with DOS to those who hold credentials from multiple agencies.[3]

SUMMARY OF COMMENTS FROM THE FINAL QUESTIONNAIRE

These comments were drawn from answers to the questions on the final questionnaire (Appendix C), including the open-ended items that are not shown in Table 2. Some of the open-ended items were “What did you like best about the tablet?,” “Were there any problems or did you experience any bottlenecks when using the tablet?,” and “What three things would you change about the tablet and software?”

Positives

- The computer integrates a wide range of information and functions into one device
- The computer is potentially much more efficient than printing electronic documents and rekeying all the collected information to generate reports
- The potential for incorporating best practices and reference documents would help to ensure that current standards and guidelines are being used

[3] DOS does not currently employ many inexperienced investigators in the western region (i.e., potential participants). Questions about differences between inexperienced and experienced investigators are discussed in the Summary and Conclusions section.

- Some felt paper is more scattered and difficult to handle than the computer
- Some expressed that Privacy Act (1974) data are more secure with a computer
- Some felt the computer is more professional and contemporary than paper

Negatives

- The investigators are accustomed to conducting interviews in a personal style, and upon first use several commented about the computer software being linear. They often said they thought the problem would go away with greater use.
- Some felt that using the computer was more mechanical than using paper, and it required more attention—but all said this would improve with familiarity.
- The tablet was said to be less useful for conducting leads where only brief contact is made, such as for an uncooperative neighborhood or employment interview.
- Several users had problems caused by the narrow width of scroll bar in the prototype software. This was a known issue but unavoidable due to limitations of the off-the-shelf software.
- Some participants felt the stylus (digital pen) of the research computer was too small or they accidentally pressed one of the buttons. Note that these vary between computer models and the products are regularly updated.

Sample Quotes

- P1: “I liked it. All the information is in there. Easy to use except for a few quirks.”
- P2: “The tablet would be a real plus by adding technology to assist in the job. It is usable technology. It’s a great tool, it would be very good and it would be used.”
- P2: “It brings many tools to the table in one resource.”
- P3: “Depending on how the tablet handles the post-interview process, it would save time over paper.”
- P4: “I hoped you were going to say that this is yours to take home.”
- P4: “It eliminates many risks associated with paper, such as losing it, difficulty reading my own handwriting, and misplacing or shuffling through papers.”
- P5: “I liked that all the case information was there in one place. It would be particularly valuable for inexperienced users and handling rare questions.”
- P6: “I’d use it. I could really like it.”

- P7: "It provides lots of opportunities, a way of staying current with policy and forms, and has a wide range of uses."
- P7: "It is a mobile headquarters."
- P8: "It takes advantage of technology—where we should be going. It eliminates unnecessary steps and would be a real benefit."
- P8: "When is it going to be ready? I'll volunteer to test it in real interviews."

Researcher Observations about Personal Approach and Interview Time

Despite creating two test cases with similar complexity and providing the case documents to the investigators in advance, it was not possible to compare the time required using paper to that of the computer. This resulted from the investigators being accustomed to widely different interview styles with their conventional (paper) method. The tablet computer interviews had a fixed number of questions and some of these were not typically asked by all investigators. Furthermore, the SF-86 and DOS Blue Book questions were divided into separate sections on the computer but some investigators combine these and follow up about each issue the first time it arises.

Based on observation and review of the video recordings, both the tablet and paper require about the same time to cover the same content. The technical flaws of the tablet (e.g., small stylus, narrow scroll bars) were offset by the time required to handle and sort paper documents. Furthermore, the investigators read and spoke at about the same rate using both methods. If deemed necessary, a separate study might be conducted to verify these observations. Also, this study did not assess generating reports with the tablet, which is expected to save investigator time.

While the present project did not examine the completeness of issue coverage, the differences between the interviews conducted with paper clearly demonstrated how a tablet computer might improve the consistency and completeness of investigations. All the investigators were certainly capable, but it is not always apparent what should be discussed for a given case. For example, some investigators asked a wide range of questions about an issue (e.g., foreign family) while others asked one or two and then moved on. Similarly, sometimes an investigator discussed topics not even mentioned by another. A computer could use standard criteria based on case content to present necessary interview questions and require that they be completed.

SUMMARY AND CONCLUSIONS

This project gathered specific evidence about the potential for using tablet computers in personnel security interviews. It is clear that computers can provide a wide range of benefits over paper, such as automated document handling and integrated consistency checking, but they are only valuable if they can be used efficiently and effectively during interviews. Up to this point many have speculated that tablets either would or would not be appropriate, but no one had attempted to directly test them. The study compared interviews conducted using paper to those performed with a tablet computer. The case content was simulated but based on actual DOS questions and interview procedures. Additionally, feedback about the tablet system and its potential was obtained from the eight active investigators who participated.

The main research questions were about the practicality of tablets for interviews, their potential interference with interpersonal interaction, and how investigators might respond to them. The findings plainly supported use of tablet computers for all of these core concerns. Overall, the investigators liked the tablet a great deal and were very complimentary.

As configured, using the tablet required minimal training. These devices draw on computer literacy (which is necessary in the current investigation process) and the use of a paper notepad, so there is almost nothing new to learn. In general, for all participants, any early concerns about the tablet computer quickly declined or disappeared. It is estimated that an investigator could be trained and comfortable using a tablet within hours or at most a couple days after first use. However, practice interviews must be completed to ensure full understanding of the software and how to handle unexpected situations.

The prototype software received positive feedback and only minor changes were suggested over the course of testing. Other variations on the question-and-answer format may also be appropriate, and additional features could not be evaluated with the current research design (due to the need for custom software development and the time available for each participant). It is crucial to thoroughly test all features and the form structure for usability prior to deployment.

The major findings are summarized below.

- The evidence indicates that tablet computers can be used during interview situations by the ordinary investigators who tried them. Anyone who might refuse to use a tablet (expected to be a minority) is more likely to be unwilling than unable to do so.
- The system was very well received for a prototype and virtually all who chose to participate felt they would prefer a production tablet system over paper.

- The prototype system required minimal training beyond basic computer literacy (i.e., 30 minutes to 1 hour).
- The system had no detected adverse impact on interpersonal interaction (some felt the tablet was better, some felt both were similar, others felt the tablet was worse). All felt the problems would diminish or that the tablet would be superior to paper with greater user experience.
- Many investigators indicated that resource integration was the greatest benefit of the tablet computer. One described the tablet as "a mobile headquarters" with diverse functions (i.e., case file, reference documents, interview tool, etc.).
- An unexpected finding was that issue coverage varied widely among investigators with the current paper process. Specifically, some investigators asked just a few questions about a given concern while others spent much more time or chose to emphasize other issues. The tablet should help reduce differences in issue coverage (e.g., which questions are necessary when a Subject reports foreign associates or financial problems) between investigators and facilitate the use of current documents and standards.

Although tablet computers would likely yield substantial benefits for investigators of all experience levels, the greatest impact is expected for those with less experience. New investigators are less likely to be familiar with policies and procedures, so the context-sensitive guidance possible with a tablet would be an obvious asset. They would know specifically which questions are required for a specific case. The tablet concept was enthusiastically received by the two investigators hired through the DOS/OPM overseas unemployed spouses program contacted for discussion. Also, new investigators might be even more comfortable with computers than the experienced participants in the present study.

Throughout the course of the current and prior tablet computer research, a few investigators have dismissed tablets (and refused participation) because they feel that any device would interfere with eye-to-eye contact and undermine an investigator's ability to detect subtle indications of concealment or deception. Some have also argued that a computer may be more intimidating to interviewees than a pen and paper. The evidence presented in this report and the widespread use of cell phones, notebook computers, and other portable electronics suggest that the concerns are unfounded. In fact, a reduction in paper shuffling by using a tablet may permit greater eye contact than ever before.

At this point management and stakeholders should begin considering if, when, and how quickly to move ahead with tablets. This and prior research suggests that tablets could be highly beneficial to investigations. The remaining questions revolve around determining the costs versus benefits and how tablet development would fit in with the other database systems necessary for background investigations. The

successful deployment of tablets also requires systematic planning, design, and testing of the necessary software.

RECOMMENDATIONS

Overall, the findings were very favorable for tablet computers and the investigators' attitudes ranged from interested to enthusiastic about proceeding. The next steps toward deployment involve two paths: (1) determining the costs, organizational impact, and database integration requirements, and (2) conducting detailed usability research to refine the interview forms, create report generation system, and develop case handling tools. These topics have been discussed with representatives from DOS and there is a similar need to address them with JSSRT stakeholders. The major tasks for each path are outlined below.

PLANNING AND COST ANALYSIS

- Assess policy requirements for conducting background interviews with tablet computers and revise as necessary.
- Establish a working group of stakeholders (i.e., data providers, administrators, case managers, investigators, etc.) to reevaluate and redesign investigative workflow in the context of functions made possible by tablets.
- Consult with developers to determine the required features and cost of production software. The tablet will require both interview software and associated case management tools.
- Determine the steps and costs required for importing and exporting data from existing information technology systems. Tablet software generally supports standard data formats (e.g., XML, Excel, CSV/TSV).

REFINEMENT OF SOFTWARE AND FIELD TRIALS

- Test tablets over a longer period of time with each investigator (e.g., several interviews, different types of interviews) and test additional functions (e.g., post-interview reporting, use of reference documents).
- Test tablets in the field with actual cases rather than in a laboratory using simulated data.
- Test tablets with less experienced investigators. All participants in the present study were experienced investigators whereas it has been suggested that new investigators may benefit the most from additional capabilities.

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APPENDIX A:

DETAILS OF THE EQUIPMENT AND MATERIALS

TABLET COMPUTER

A Hewlett Packard 2710p tablet computer running Windows XP for Tablet PC was used for all development and testing. This model was chosen as the most appropriate for research needs at the time of purchase (early 2008) following a systematic product comparison (Leggitt & Lang, 2007). Note that specific models change frequently and current products should be reviewed prior to acquisition. Also, other products may or may not be superior for field deployment.

Much like any other product, tablet computers are used in a wide variety of situations. When shopping for an automobile, shoes, or a tablet computer it is crucial to look at the intended use. It makes no sense placing a Jeep on a race track against a Porsche and it is foolish to buy high-heeled shoes for climbing a mountain. The HP 2710p is a business model with an integrated keyboard, and is built to be somewhat tougher than consumer products but not "ruggedized" or meant to survive direct abuse. It was thought to provide the best balance between durability, features, and portability. Through review of available products at the time of purchase, this model was assessed to be appropriate for typical travel and interview use.

INTERVIEW SOFTWARE

Knight Software Survey System Version 2.1 was used to create the prototype interviews on the tablet computer. This product emerged during prior research as the most appropriate for the lengthy and complex questioning of background interviews. Survey System employs a flexible form structure whereby large sections of each questionnaire can be hidden or displayed as appropriate, and it provides many options for entering answers or notes. The most relevant features are illustrated elsewhere in this report.

Please see Leggitt and Lang (2007) for an overview of how various tablet interview products function, and additional detail about Survey System. Also, any software product would require additional customization for deployment. Some of the development needs include database import and export routines, case management tools, and the creation of questionnaires beyond the prototypes used for research.

CAMCORDER AND MICROPHONE

The interviews were recorded with a Canon VIXIA HF10 high definition camcorder. It was set to record using the default resolution (1,440 x 1,080 pixels), default video quality, and automatic exposure setting. Sound was recorded on a Crown Audio Sound Grabber II tabletop conference microphone attached to the external microphone port of the camcorder. The camcorder was placed on a tripod in the corner of the room and the microphone was taped to the middle of a conference table.

APPENDIX B:

SAMPLE IMAGES OF THE TABLET COMPUTER INTERVIEW SOFTWARE

Subject Interview

File View Writing Recognizer Help

Done Next Size Write Erase Select

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21) **Financial Record (26)** For the following, answer for the last 7 years, unless otherwise specified in the question. Disclose all financial obligations, including those for which you are a cosigner or guarantor, on the following page.

a. Have you ever filed a petition under any chapter of the bankruptcy code? If "Yes," indicate type. *No*
b. Have you had any possessions or property voluntarily or involuntarily repossessed or foreclosed? *No*
c. Have you failed to pay Federal, state, or other taxes, or to file a tax return, when required by law or ordinance? *No*
d. Have you had a lien placed against your property for failing to pay taxes or other debts? *No*
e. Have you had a judgment entered against you? *No*
f. Have you defaulted on any type of loan? *No*
g. Have you had bills or debts turned over to a collection agency? *No*
h. Have you had any account or credit card suspended, charged off, or cancelled for failing to pay as agreed? *No*
i. Have you been evicted for non-payment of financial obligations? *No*
j. Have you been delinquent on court imposed alimony or child support payments? *No*
k. Have you had your wages, benefits, or assests garnished or attached for any reason? *No*
l. Have you been counseled, warned, or disciplined for violating terms of agreement for a travel or credit card provided by your employer? *No*
m. Have you been over 180 days dedlinquent on any debt(s)? *No*
n. Are you currently over 90 days delinquent onany debt(s)? *No*
o. Have you EVER experienced financial problems due to gambling? *No*
p. Are you currently delinquent on any Federal debt? *No*

For the following, answer for the last 7 years, unless otherwise specified in the question. Disclose all financial obligations, including those for which you are a cosigner or guarantor. If you answered "Yes" on the previous page (a-p), provide the information listed below. For each "Yes" answer, provide the corresponding letters.

Indicate (a-p), Date Satisfied Month/Year, Amount of Property Value Involved, Loan/Account Number/Bankruptcy Type, Names of Agency/Organization/Individual to Whom Debt is/was Owed

Name/Address of Company, Court, or Agency Handling Case, State, ZIP Code, Name Action/Debt is Recorded Under, Status of Action or Debt

#1 *$14,500, Auto loan, Navy Federal Credit Union, Merrifield, VA 22059, Calvin W. Bradford, Current*

Update
Confirm

Writing | Typing/Handwriting Recognition

21n > 90 DAYS M/C #650
PCS MOVE TO SAN DIEGO
FROM OKINAWA EXPENSES
WILL PAY THIS MONTH

22) **Use of Information Technology Systems (27)** The following questions ask about your use of information technology systems. Information technology systems include all related computer hardware, software, firmware, and data used for communication, transmission, processing, manipulation, storage, or protection of information. You are required to answer the questions fully and truthfully, and your failure to do so could be grounds for an adverse employment decision against you. Neither your truthful responses not information derived from your responses will be used as evidence against you in any subsequent criminal proceeding.

a. In the last 7 years, have you illegally or without proper authorization entered into any information technology system? *No*

start | Report Appen... | State Dept | 2 Study Arch... | 10:13 AM

Figure B-1 Tablet Computer Interview Software (1)

Subject Interview

File View Writing Recognizer Help

Done Next Size Write Erase Select

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FOREIGN PREFERENCE

57) Has Subject ever exercised any right, privilege or obligation of foreign citizenship after becoming a U.S. citizen or through the foreign citizenship of a family member?

○ No ○ Yes - Update

58) Does Subject currently hold or held in the past, dual citizenship with any foreign country? If currently a dual citizen with another foreign country, ask Subject if he or she is willing to sign the Departments Do Not Exercise Dual Citizenship memorandum? If willing, sign and forward to Headquarters. If unwilling, obtain detailed reason(s).

○ No ○ Yes - Update

59) As a result of his heritage or through the birth of his parents or grandparents, does Subject have the ability to apply for citizenship with another foreign country? If so, explain.

○ No ○ Yes - Update

60) Is Subject currently exercising or has Subject exercised dual citizenship in the past?

○ No ○ Yes - Update

61) Has Subject possessed or used a foreign passport?

○ No ○ Yes - Update

62) Has Subject served in the military service of a foreign country or indicated a willingness to bear arms for a foreign country?

○ No ○ Yes - Update

63) Has Subject accepted educational, medical, or other benefits such as retirement and social welfare, from a foreign country?

○ No ○ Yes - Update

64) Has Subject resided in a foreign country to meet citizenship requirements?

○ No ○ Yes - Update

65) Has Subject used foreign citizenship to protect financial or business interests in a foreign country?

○ No ○ Yes - Update

66) Has Subject sought or held political office in a foreign country?

○ No ○ Yes - Update

67) Has Subject voted in foreign elections?

start State ... Report... 2 Stu... 8:08 AM

Figure B-2 Tablet Computer Interview Software (2)

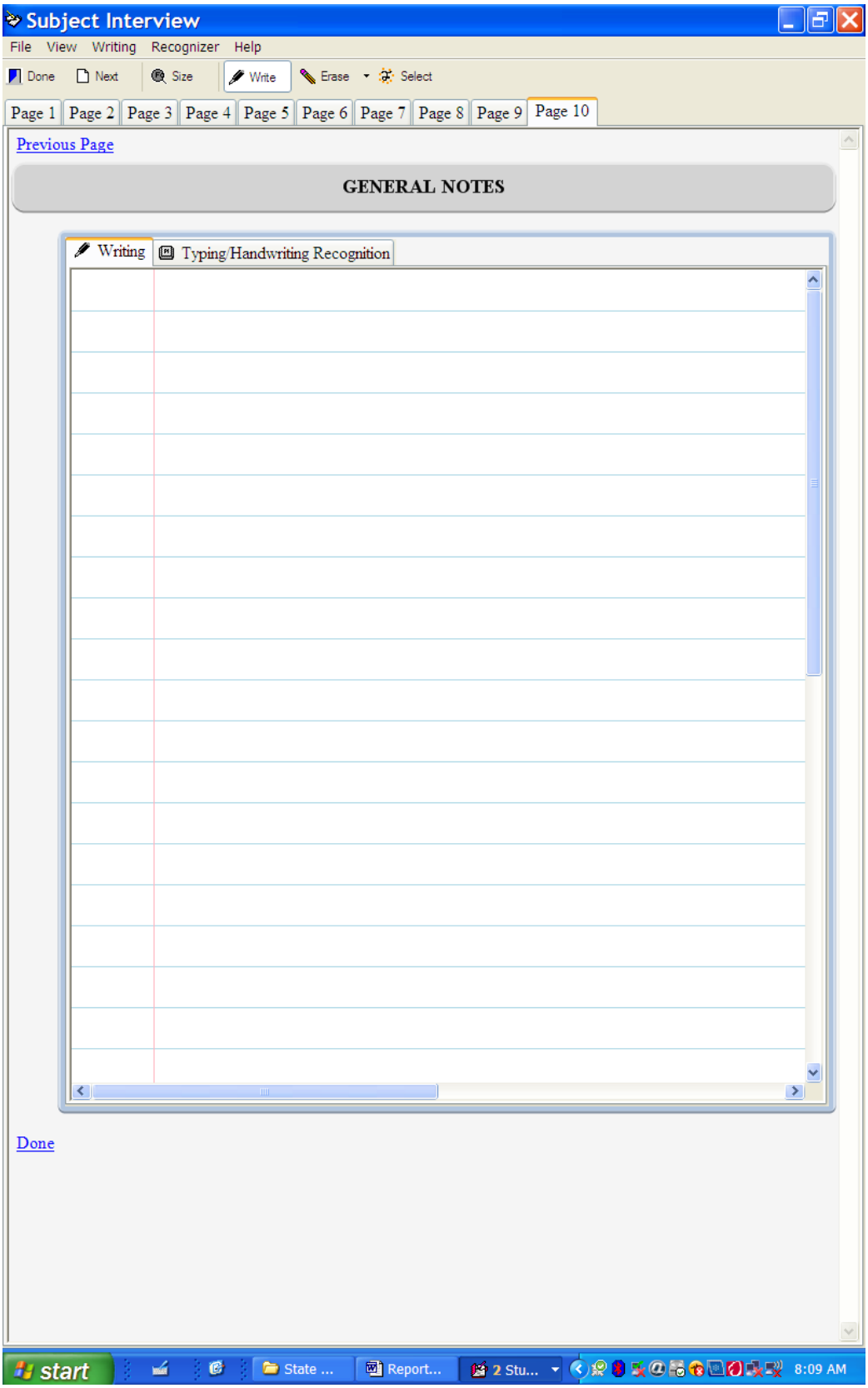

Figure B-3 Tablet Computer Interview Software (3)

APPENDIX C:

QUESTIONNAIRES

Tablet Feedback

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. I think that I would like to use this system frequently	1	2	3	4	5
2. I found the system unnecessarily complex	1	2	3	4	5
3. I thought the system was easy to use	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5. I found the various functions in this system were well integrated	1	2	3	4	5
6. I thought there was too much inconsistency in this system	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly	1	2	3	4	5
8. I found the system very cumbersome to use	1	2	3	4	5
9. I felt very confident using the system	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system	1	2	3	4	5

System Usability Scale

© Digital Equipment Corporation, 1986.

Session Feedback

1. What are your impressions about using the tablet computer?

2. How would you describe working on the computer?

3. What did you like best about the tablet?

4. What did you like least about the tablet?

5. What impact did the tablet have on your ability to conduct interviews?

   Very Negative – Negative – None – Positive – Very Positive

6. What was the impact of the tablet on the mechanics of the interview (i.e., handling papers and notes versus viewing information on the display)?

   Very Negative – Negative – None – Positive – Very Positive

7. What was the impact on the efficiency of collecting information?

   Very Negative – Negative – None – Positive – Very Positive

8. What was the apparent impact of the tablet on the social dynamics of the interview?

   Very Negative – Negative – None – Positive – Very Positive

9. Were there any problems or did you experience any bottlenecks when using the tablet?

10. What 3 things would you change about the tablet and software?

11. How much value do you perceive in the additional features demonstrated today?

    None – Too small to be worthwhile – Nice to have – Important impact – Major impact

12. Considering that you have tried a rough prototype and the final product would be more capable and complete, which method do you think you would prefer for conducting interviews?

    Strongly paper – Slightly paper – Equal – Slightly tablet – Strongly tablet