



## **EHR Usability Test Report Sevocity v12.0**

*Report based on ISO/IEC 25062:2006 Common Industry Format for Usability Test Reports*

Date of Usability Test:           Sept 27, 2017 – Oct 6<sup>th</sup> 2017

Date of Report:                    Dec 11, 2017

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**Note:** The following study was developed using the NISTIR 7742 template as a guide for reporting our findings: *Customized Common Industry Format Template for Electronic Health Record Usability Testing.*

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## Executive Summary

On September 27, 2017 – October 6, 2017, Conceptual MindWorks, Inc conducted a summative usability test of Sevocity v12.0, an ambulatory EHR. The test was conducted in the San Antonio, Texas office of Conceptual MindWorks, Inc over remote teleconferencing sessions using Go To Meeting. The purpose of this test was to test and validate the usability of the current user interface, and provide evidence of usability in Sevocity as the EHR Under Test (EHRUT). During the usability test, 22 healthcare providers and office staff served as participants and used the EHRUT in simulated, but representative tasks.

The study focused on measuring the effectiveness of, efficiency of, and satisfaction with Sevocity among a sample of participants representing users of the system. Performance data was collected on twenty seven (27) typically conducted within an EHR. Tasks created were based upon criteria specified within the test procedure structure for evaluating conformance of Electronic Health Record (EHR) technology to the certification criteria defined in 45 CFR Part 170 Subpart C of the Health Information Technology: 2015 Health Information Technology (Health IT) Certification Criteria to cover the following operations:

1. Add, Update, and Review Medication Orders
2. Add, Update, and Review Laboratory Orders
3. Review and update a patient's medication list.
4. Add, Update, and Review Diagnostic Imaging Orders
5. Drug-Drug, Drug-Allergy Interaction Checks
6. Update Patient Demographics
7. Add and change patients' problem lists.
8. Add, Update, and Review patients' allergy lists.
9. Trigger Clinical Decision Support Alerts, review guidelines for care recommendations, utilize the infobutton to review reference resources, and complete a recommended care option based upon the infobutton resources.
10. Add, Change Status, and Verify Implantable Device Lists in patients' charts.
11. Perform Clinical Information Reconciliation

During the 60 minute one-on-one usability test, each participant was greeted by the administrator and were instructed that they could withdraw at any time. Participants had prior experience with the EHR. The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the EHRUT. During the testing, the administrator timed the test and, along with the data logger recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the task.

Participants screens and audio was recorded for subsequent analysis.

The following types of data were collected for each participant:

- Number of task successfully completed within the allotted time without assistance
- Time to complete the tasks
- Number and types of errors

- Path deviations
- Participants Verbalizations
- Participants satisfaction ratings of the system

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to complete a post-test questionnaire and were compensated with \$100 gift cards for their time. Various recommended metrics, in accordance with examples set forth in the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, were used to evaluate the usability of the EHRUT. Following is a summary of the performance and rating data collected on the EHRUT.

Task\Measure	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings
		Mean	Deviations (Observed/Optimal)	Mean (secs)	Deviations (Observed/Optimal)	Mean (%)	Mean
Add a medication order	12	100%	3/3	79	79/120	0%	1.6
Update a medication order	12	100%	3/3	48	48/60	0%	1.6
Review a medication order	12	100%	2/2	10	10/15	0%	1.6
Add a lab order	12	100%	3/3	26	26/45	0%	1.0
Update a lab order	12	100%	4/4	30	30/60	0%	1.0
Review and verify a lab order	12	100%	2/2	11	11/15	0%	1.0
Add a diagnostic imaging order	12	100%	3/3	23	23/45	0%	1.0
Update a diagnostic imaging order	12	100%	4/4	28	28/60	0%	1.0
Review and verify a	12	100%	2/2	11	11/15	0%	1.0

diagnostic imaging order							
Drug-Drug, Drug-Allergy Interaction Checks	12	100%	2/2	51	51/60	0%	1.2
Update Patient Demographics	10	100%	4/4	99	99/120	0%	1.3
Add a problem to the patient's problem list	19	100%	5/5	62	62/75	0%	1.3
Modify the patient's problem list.	19	100%	6/6	72	72/90	0%	1.3
Add a medication to the patient's medication list.	10	100%	4/4	81	81/120	0%	1.1
Update the medication on the patient's medication list.	10	100%	3/3	72	72/120	0%	1.1
Review the patient's current and historical medication list.	10	100%	3/3	41	41/90	0%	1.1
Add an allergy to the patient's medication allergy list.	10	100%	3/3	48	48/60	0%	1.2
Update the allergy on the patient's medication allergy list.	10	100%	3/3	36	36/60	0%	1.2

Review and verify the patient's medication allergy list	10	100%	2/2	22	22/30	0%	1.2
Retrieve health guidelines and review guideline care recommendations.	12	92%	2/2	54	54/85	8%	1.4
Review referential resources using the infobutton.	12	92%	2/2	55	55/80	8%	1.4
Complete one of the recommended care options for the patient based upon the guideline and infobutton references.	12	92%	2/2	97	97/120	8%	1.4
Add an Implantable Device to the patient's implantable device list.	10	90%	4/4	95	95/180	8%	1.6
Change the status of an implantable device from Active to Inactive.	10	100%	4/3	45	45/60	0%	1.6
Review the Implantable Device in the	10	100%	2/2	37	37/60	0%	1.6

patient's chart and verify you can view the description, identifiers and all attributes of the device.							
Change the status of an implantable device from Inactive to Active.	10	100%	4/3	32	32/60	0%	1.6
Perform Clinical Information Reconciliation	19	89%	5/5	130	130/180	11%	2.6

The results from the System Usability Scale (SUS) scored the subjective satisfaction with the system based on performance with these tasks to be: 89.

Results of the study indicated Sevocity system was quite satisfactory with regards to effectiveness and efficiency and the participants were very satisfied with the system.

In addition to the performance data, the following qualitative observations were made:

## Major Findings

Participants overall were very pleased with the product. They all expressed the system is easy to use and navigate through, the system is well organized and has the ability to move easily through the chart and encounter. All the participants testing the adding, updating orders, and problem lists expressed appreciation for the ease of use of entering those items into the medical record.

Participants testing the new feature of Implantable Device list (a.14) expressed appreciation on the ease of use of that feature and the addition to the product.

Participants also expressed the appreciation of the Clinical Information Reconciliation features within the product. They expressed the need for this type of functionality when communicating with other providers and are hopeful this will be of more use in the future. There were some comments noted from participants the desire to see more items from the CCDAs reconciled with the patient's chart, not only the medications, allergies and problems.

Clinical Decision making was also noted by providers as being very valuable and those participants not currently

utilizing the functionality in the product stated this will be something they look into using in the future.

### **Areas of Improvement:**

The Clinical Decision Support tools were noted by the participants as being very valuable and useful, but it would be helpful to see more guidance throughout the encounter to avoid having to go from the chart to the encounter to review care guidelines.

The Implantable Device List was noted by all the participants to be a useful addition to the product, however, there was a notable usability area of improvement expressed by the participants and observed during testing. It was not intuitive for users to click the Change button to update the status of the Implantable Device. Although this is consistent with other behavior in the product, the user interface for Implantable Device List screen also displays radio buttons to view the Inactive and Active lists. Some participants found this confusing. To improve this area, updating the status will need to be clearly identified on the button or the user could be allowed to change the status without clicking the button, directly on the screen.

The Implantable Device List can also become cumbersome when manually entering the UDI number. Bar code scanning would improve this functionality and make it easier to use.

Users did not always easily locate the Clinical Information Reconciliation tool. This can be improved by locating the functionality in a more evident area of the user interface. It also requires multiple steps and users not performing the reconciliation tasks often may not always remember all the steps. More visual guidance/instruction on the user interface would assist with informing the user of the next step of the process to improve efficiency.

## **Introduction**

The Electronic Health Record System Under Test (EHRUT) tested for this study, Sevocity, an ambulatory EHR, was specifically designed to present medical information to the intended users (healthcare providers and staff) on desktop or laptop computers in standard ambulatory medical care settings. The study tested and validated the usability of the current user interface and provides evidence of the usability of Sevocity with representative exercises and in realistic user conditions. Measures of effectiveness and efficiency, such as time on task, number of errors made, and completion rates were captured during usability testing. Satisfaction was assessed and user comments collected using two industry-standard questionnaires.

The purpose of this study was to test and validate the usability of the current user interface, and provide evidence of usability in Sevocity v12.0. To this end, measures of effectiveness, efficiency and user satisfaction, such as time on task, deviations from optimal path, and errors were captured during usability testing.

## **Method**

### **Participants**

A total of 22 individuals (18 women and 4 men) participated in the EHRUT (Sevocity v12.0). Participants in the test were providers, nurses and administrative staff. Participants were recruited by Conceptual MindWorks, Inc.. and were given a 100.00 Gift Card for their time. In addition, participants had no direct connection to the development of or organization producing the EHRUT. Participants were not from the testing or supplier organization. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received.

Participants in the usability test of Sevocity had a mix of backgrounds and demographic characteristics. The following is a table of participants by characteristics, including demographics, professional experience, computing experience, experience with Sevocity and user needs for assistive technology.

A summary of participant characteristics can be found in Appendix A.

Part ID	Gender	Age	Education	Role/Title	Professional Experience (months)	Computer Experience (months)	Sevocity Experience (months)	Assistive Tech Needs
1	Male	60-69	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Medical Assistant/Practice Manager	348	480	108	None
2	Female	40-49	Trade/technical/vocational training	Clinical Manager	240	180	24	None
3	Female	40-49	Master's Degree	Medical Assistant	144	360	84	None
4	Female	30-39	Some college credit, no degree	DO/Provider	144	240	90	None
5	Female	30-39	Doctorate degree (e.g., MD, DNP, DMD, PhD)	MD/Provider	84	240	10	None
6	Female	60-69	Doctorate degree (e.g., MD, DNP, DMD, PhD)	MD/Provider	360	180	120	None
7	Female	20-29	Bachelor's Degree	MD/Provider	24	240	42	None
8	Female	40-49	Associate degree	Nurse Practitioner	228	456	38	None
9	Female	20-29	Trade/technical/vocational training	Nurse Practitioner	162	276	3	None
10	Male	50-59	Doctorate degree (e.g., MD, DNP, DMD, PhD)	MD/Provider	228	396	120	None
11	Female	50-59	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Nurse Manager	360	480	126	None
12	Female	50-59	Doctorate degree (e.g., MD,	Medical Surgical Assistant	324	240	6	None

			DNP, DMD, PhD)					
13	Female	50-59	Doctorate degree (e.g., MD, DNP, DMD, PhD)	Medical Assistance	240	216	108	None
14	Female	30-39	Master's Degree	Office Manager	36	240	12	None
15	Female	40-49	Master's Degree	MD/Provider	60	240	9	None
16	Female	40-49	Doctorate degree (e.g., MD, DNP, DMD, PhD)	MD/Provider	360	324	89	None
17	Female	60-69	Bachelor's Degree	Medical Assistant/Practice Manager	456	300	36	None
18	Female	30-39	High school graduate, diploma or the equivalent (for example: GED)	Clinical Manager	72	288	24	None
19	Female	50-59	High school graduate, diploma or the equivalent (for example: GED)	Medical Assistant	84	240	48	None
20	Female	50-59	Bachelor's Degree	DO/Provider	372	420	84	None
21	Male	50-59	Doctorate degree (e.g., MD, PhD)	MD/Provider	360	156	120	None

			DNP, DMD, PhD)					
22	Male	60-69	Doctorate degree (e.g., MD, DNP, DMD, PhD)	MD/Provider	468	360	120	None

Average professional experience was 234 months, computer experience was 298 months, and experience with the Sevocity application was 66 months amongst the participants.

### Study Design

Overall, the objective of this test was to uncover areas where Sevocity system performed well – that is effectively, efficiently, and with satisfaction – and areas where the application failed to meet the needs of the users. The data from this test may serve as a baseline for future tests of updated versions of the Sevocity and/or comparison with other EHRs provided the same tasks are used. In short, this testing serves as both a means to record or benchmark current usability, but also to identify areas where improvements must be made.

Participants completed the test of Sevocity usability during individual 60-minute Go To Meeting sessions. During the test, each participant interacted with various components of the Sevocity system. Each participant was provided with the same instructions.

Sevocity was evaluated for effectiveness, efficiency and satisfaction as defined by measures collected and analyzed for each participant:

- Number of tasks successfully completed within the allotted time without assistance
- Time to complete the tasks
- Number and types of errors
- Path Deviations
- Participant’s Verbalizations (comments)
- Participant’s satisfaction ratings of the system

### Tasks

A number of tasks were constructed to be realistic and representative of the kinds of activities a user might engage with Sevocity in actual ambulatory care medical settings. The twenty-seven (27) tasks were created based upon the criteria specified within the test procedure structure for evaluating conformance of Electronic Health Record (EHR) technology to the certification criteria as defined in 45 CFR Part 170 Subpart C of the Health Information Technology: Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology.

The tasks focused on the following issues:

- Section 170.315(a)(1) Computerized provider order entry – medications
- Section 170.315(a)(2) Computerized provider order entry – Labs
- Section 170.315(a)(3) Computerized provider order entry – Imaging
- Section 170.315(a)(4) Drug-drug, drug-allergy interaction checks
- Section 170.315(a)(5) Demographics
- Section 170.315(a)(6) Problem List
- Section 170.315(a)(7) Medication Allergy List
- Section 170.315(a)(9) Clinical Decision Support
- Section 170.315(a)(14) Implantable Device List
- Section 170.315(b)(2) Clinical Information Reconciliation and Incorporation

A copy of the tasks presented to participants in the usability test of Sevocity can be found in Appendix B.

## **Test Location**

All participants were test on the Sevocity system during remote conferencing sessions using Go To Meeting. Each participant performed their testing on their personal computers, in their office setting and was requested in advance to secure a quiet room with minimal distractions and be sure to have access to the Internet to connect to the Go To Meeting session. Although the type of computer, operating system and display resolution of the remote participant system was unknown, the system used by the test administrator and controlled by the remote participant was a Dell laptop running the Windows 7 operating system at a resolution of 1600x900. During the Go To Meeting session, only the test administrator and participant communicated with one another.

The Go To Meeting usability test session was conducted by a test administrator from the testing organization (Conceptual MindWorks, Inc) working from an office at the San Antonio, Texas office. During the session the test administrator took detailed notes, including user comments and satisfaction ratings following each task. A second person served as the data logger and took notes on task success, path deviations, number and types of errors, and comments. During the session, the test administrator could only see the participant performing the tasks on the screen and her the participant's comments, questions and responses,

## **Test Environment**

While the EHRUT would be typically used in a healthcare office or facility, testing of the Sevocity system was conducted via remote connection during individual Go To Meeting sessions. Each participant called into a Go To Meeting session and was connected by the test administrator to the application.

The Sevocity application itself ran on an internet enabled platform on a LAN connection using a sample database that was set up specifically for the test. Participants used a mouse and keyboard when interacting with the EHRUT and were given remote control of the administrator's workstation to perform tasks.

## **Test Forms and Tools**

As part of the usability test, various documents and instruments were used. Examples of the documents used during the usability test, including the tasks, informed consent, and post-test questionnaires, can be found in Appendices B to E, respectively.

Participants' interaction with the Sevocity system was captured and recorded digitally using the Go To Meeting recording functionality. Verbal responses were also recorded through the audio functionality of Go To Meeting recording functionality. This information was saved and logged after each individual testing session.

## **Participant Instructions**

The administrator read the following instructions aloud to all participants:

"Thank you for participating in this study. Your input is very important. Our session today will last about 60 minutes. During that time you will use an instance of an electronic health record. I will ask you to complete a few tasks using this system and answer some questions. You should complete the tasks as quickly as possible making as few errors as possible. Please try to complete the tasks on your own following the instructions very closely. Please note that we are not testing you we are testing the system, therefore if you have difficulty all this means is that something needs to be improved in the system. I will be here in case you need specific help, but I am not able to instruct you or provide help in how to use the application.

Overall, we are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. Should you feel it necessary you are able to withdraw at any time during the testing."

Following the procedural instructions, participants were shown the EHR and as their first task, were given time (5 minutes) to explore the system and make comments. Once this task was complete, the administrator gave the following instructions:

"For each task, I will read the description to you and say "Begin". At that point, please perform the task, once you believe you have completed the task successfully, please record the time it took you to complete the task. I would like to request that you not talk aloud or verbalize while you are doing the tasks. I will ask you your impressions about the task once you are done."

To achieve a minimum of ten (10) participants for each task, each participant was given a test packet with tasks from the to complete.

12 participant test packets included tasks for some or all of the following criteria:

- Section 170.315(a)(1) Computerized provider order entry – medications
- Section 170.315(a)(2) Computerized provider order entry – Labs
- Section 170.315(a)(3) Computerized provider order entry – Imaging
- Section 170.315(a)(4) Drug-drug, drug-allergy interaction checks
- Section 170.315(a)(6) Problem List
- Section 170.315(a)(9) Clinical Decision Support
- Section 170.315(b)(2) Clinical Information Reconciliation and Incorporation

10 participants' test packets included tasks for some or all of the following criteria:

- Section 170.315(a)(1) Computerized provider order entry – medications
- Section 170.315(a)(5) Demographics
- Section 170.315(a)(6) Problem List
- Section 170.315(a)(7) Medication Allergy List
- Section 170.315(a)(14) Implantable Device List
- Section 170.315(b)(2) Clinical Information Reconciliation and Incorporation

## Procedure

Upon connection to the online meeting with Go To Meeting, participants were greeted; their identity was verified and matched with a name on the participant schedule. Participants were then assigned a participant ID so a given individual's data cannot be linked to his/her identity. Prior to beginning testing, each participant reviewed and signed an informed consent (Appendix C) and emailed or faxed it to the organization conducting the test (Conceptual MindWorks, Inc).

The administrator moderated the session including administering instructions and tasks. The administrator also monitored task times, obtained post-task rating data, and took notes on participant comments. A second person served as the data logger and took notes on task success, path deviations, number and types of errors, and comments.

Participants were instructed to perform the tasks (see specific instructions below):

- As quickly as possible making as few errors and deviations as possible.
- Without assistance; administrators were allowed to give immaterial guidance and clarification on task, but not instructions on use.
- Without using a think aloud technique.

For each task, the participants were given a written copy of the task. Task timing began once the administrator finished reading the question. The task time was stopped once the time allotted was reached. If a participant failed to complete a task before the expected amount of time for each task, that task was marked as "not completed". After each task, the test administrator asked the participant, "On a scale from 1- 5 were 1 is "Very Easy" and 5 is "Very Difficult", how satisfied were you with the ease of use for this task. This same procedure was conducted for each of the tasks,

Following the session, the administrator gave the participant the post-test questionnaire, informed them of the process of receiving their gift card for their time, and thanked each individual for their

participation.

Participants' demographic information, task success rate, time on task, errors, deviations, verbal responses, and post-test questionnaire were recorded into a spreadsheet.

The system was then reset to proper test conditions for the next participant.

## Usability Metrics

According to the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, EHRs should support a process that provides a high level of usability for all users. The goal is for users to interact with the system effectively, efficiently and with an acceptable level of satisfaction. To this end, metrics for effectiveness, efficiency and user satisfaction were captured during the usability testing. The goals of the test were:

- Effectiveness of Sevocity by measuring participant success rates and errors
- Efficiency of Sevocity by measuring the average task time and path deviations
- Satisfaction with Sevocity by measuring ease of use ratings

## Data Scoring

The following table details how tasks were scored, errors evaluated, and the time data analyzed.

Measures	Rationale and Scoring
<b>Effectiveness:</b> Task Success	<p>A task was counted as a “success” if the participant was able to achieve the correct outcome, without assistance, within the time allotted on a per task basis.</p> <p>The total number of successes were calculated for each task and then divided by the total number of times that task was attempted. The results are provided as a percentage.</p> <p>Task times were recorded for successes. Observed task times divided by the optimal time for each task is a measure of optimal efficiency.</p>
<b>Effectiveness:</b> Task Failures	<p>If the participant abandoned the task, did not reach the correct answer or performed it incorrectly, or reached the end of the allotted time before successful completion, the task was counted as a “failure”. No task times were taken for</p>

	<p>errors.</p> <p>The total number of errors was calculated for each task and then divided by the total number of times that task was attempted.</p>
<p><b>Efficiency:</b> Task Deviations</p>	<p>The participant’s path (i.e. steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal steps to provide a ration of path deviation.</p>
<p><b>Efficiency:</b> Task Time</p>	<p>Each task was timed from when the administrator said “Begin” until the participant said, “Done.” If he or she failed to say “Done” the time was stopped when the participant stopped performing the task. Only task times for tasks that were successfully completed were included in the average task time analysis. Average time per task was calculated for each task. Variance measures (standard deviation and standard error) were also calculated.</p>
<p><b>Satisfaction:</b> Task Rating</p>	<p>Participant’s subjective impression of the ease of use of the application was measured by administering both a simple post-task question as well as a post-session questionnaire. After each task, the participant was asked to rate “Overall, this task was:” on a scale of 1 (very easy) to 5 (very difficult). These data are averaged across participants.</p>

## Results

### Data Analysis and Reporting

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above. Participants who failed to follow session and task instructions had their data excluded from the analyses.

The usability testing results for Sevocity v12.0 are detailed below. The results should be seen in light of the objectives and goals outlined in Section Study Design. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Task\Measure	N	Task Success	Path Deviation	Task Time		Errors	Task Ratings
		Mean	Deviations (Observed/Optimal)	Mean (secs)	Deviations (Observed/Optimal)	Mean (%)	Mean
Add a medication order	12	100%	3/3	79	79/120	0%	1.6
Update a medication order	12	100%	3/3	48	48/60	0%	1.6
Review a medication order	12	100%	2/2	10	10/15	0%	1.6
Add a lab order	12	100%	3/3	26	26/45	0%	1.0
Update a lab order	12	100%	4/4	30	30/60	0%	1.0
Review and verify a lab order	12	100%	2/2	11	11/15	0%	1.0
Add a diagnostic imaging order	12	100%	3/3	23	23/45	0%	1.0
Update a diagnostic imaging order	12	100%	4/4	28	28/60	0%	1.0
Review and verify a diagnostic imaging order	12	100%	2/2	11	11/15	0%	1.0
Drug-Drug, Drug-Allergy Interaction Checks	12	100%	2/2	51	51/60	0%	1.2
Update Patient Demographics	10	100%	4/4	99	99/120	0%	1.3
Add a problem to	19	100%	5/5	62	62/75	0%	1.3

the patient's problem list							
Modify the patient's problem list.	19	100%	6/6	72	72/90	0%	1.3
Add a medication to the patient's medication list.	10	100%	4/4	81	81/120	0%	1.1
Update the medication on the patient's medication list.	10	100%	3/3	72	72/120	0%	1.1
Review the patient's current and historical medication list.	10	100%	3/3	41	41/90	0%	1.1
Add an allergy to the patient's medication allergy list.	10	100%	3/3	48	48/60	0%	1.2
Update the allergy on the patient's medication allergy list.	10	100%	3/3	36	36/60	0%	1.2
Review and verify the patient's medication allergy list	10	100%	2/2	22	22/30	0%	1.2
Retrieve health guidelines and	12	92%	2/2	54	54/85	8%	1.4

review guideline care recommendations.							
Review referential resources using the infobutton.	12	92%	2/2	55	55/80	8%	1.4
Complete one of the recommended care options for the patient based upon the guideline and infobutton references.	12	92%	2/2	97	97/120	8%	1.4
Add an Implantable Device to the patient's implantable device list.	10	90%	4/4	95	95/180	8%	1.6
Change the status of an implantable device from Active to Inactive.	10	100%	4/3	45	45/60	0%	1.6
Review the Implantable Device in the patient's chart and verify you can view the description, identifiers and	10	100%	2/2	37	37/60	0%	1.6

all attributes of the device.							
Change the status of an implantable device from Inactive to Active.	10	100%	4/3	32	32/60	0%	1.6
Perform Clinical Information Reconciliation	19	89%	5/5	130	130/180	11%	2.6

The results from the SUS (System Usability Scale) scored the subjective satisfaction with the system based on performance with these tasks to be: 89.

### **Discussion of the Findings**

The following presents the discussion of the findings of effectiveness, efficiency, and satisfaction:

#### **Effectiveness**

Sevocity scores quite high on effectiveness because most participants were able to attempt all the tasks and complete them with success. The path deviation had also been minimum, signifying the intuitiveness of the system. One participant did not update Implantable Devices List with success. Similarly, clinical information reconciliation was not completed by two participants due not locating the functionality and the steps involved. However, there was minimum path deviation even on these tasks.

#### **Efficiency**

Most of the participants were able to complete almost all tasks within the expected duration and with either no or minimum task time deviation, with the exception of Clinical Information Reconciliation. Additional guidance will be added to the user interface to inform the user of the next step of the process, improving efficiency.

## **Satisfaction**

All participants were highly satisfied with the system. They rated most tasks as easy to attempt and did not seem to need any help nor seeking any answers. The open-ended questions at the end revealed that most participants liked one or more features of the Sevocity system compared to what they were using and desired to recommend this system to their colleagues.

## **Major Findings**

Based on participant comments, the system is not only easy to navigate, but the functions are well integrated and easy to use. The majority of the clients would like to use the system often and have or would recommend it to a colleague.

Participants overall were very pleased with the product. They all expressed the system is easy to use and navigate through, the system is well organized and has the ability to move easily through the chart and encounter. All the participants testing the adding, updating orders, and problem lists expressed appreciation for the ease of use of entering those items into the medical record.

Participants testing the new feature of Implantable Device list (a.14) expressed appreciation on the ease of use of that feature and the addition to the product.

Participants also expressed the appreciation of the Clinical Information Reconciliation features within the product. They expressed the need for this type of functionality when communicating with other providers and are hopeful this will be of more use in the future. There were some comments noted from participants the desire to see more items from the CCDAs reconciled with the patient's chart, not only the medications, allergies and problems.

Clinical Decision making was also noted by providers as being very valuable and those participants not currently utilizing the functionality in the product stated this will be something they look into using in the future.

## **Areas of Improvement**

The Clinical Decision Support tools were noted by the participants as being very valuable and useful, but it would be helpful to see more guidance throughout the encounter to avoid having to go from the chart to the encounter to review care guidelines.

The Implantable Device List was noted by all the participants to be a useful addition to the product, however, there was a notable usability area of improvement expressed by the participants and observed during testing. It was not intuitive for users to click the Change button to update the status of the Implantable Device. Although this is consistent with other behavior in the product, the user interface for Implantable Device List screen also displays radio buttons to view the Inactive and Active lists. Some participants found this confusing. To improve this area, updating the status will need to be clearly identified on the button or

the user could be allowed to change the status without clicking the button, directly on the screen.

The Implantable Device List can also become cumbersome when manually entering the UDI number. Bar code scanning would improve this functionality and make it easier to use.

Users did not always easily locate the Clinical Information Reconciliation tool. This can be improved by locating the functionality in a more evident area of the user interface. It also requires multiple steps and users not performing the reconciliation tasks often may not always remember all the steps. More visual guidance/instruction on the user interface would assist with informing the user of the next step of the process to improve efficiency.

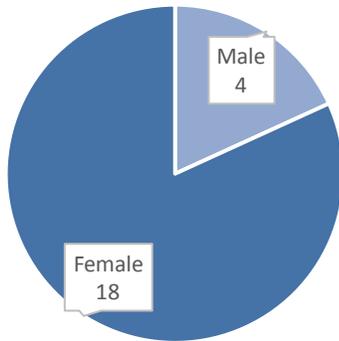
## Appendices

The following appendices include supplemental data for this usability test report. Following is a list of the appendices provided:

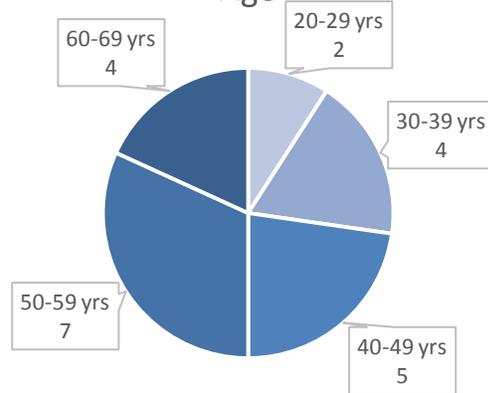
- A. Participant Characteristics
- B. Example Moderator's Guide with all tasks
- C. Informed Consent
- D. Post-test Questionnaire
- E. System Usability Scale

## Appendix A: Participant Characteristics

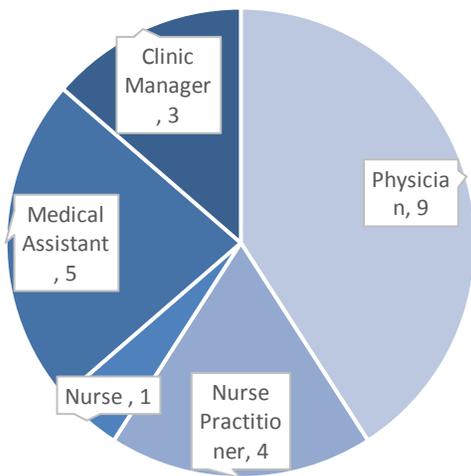
### Gender



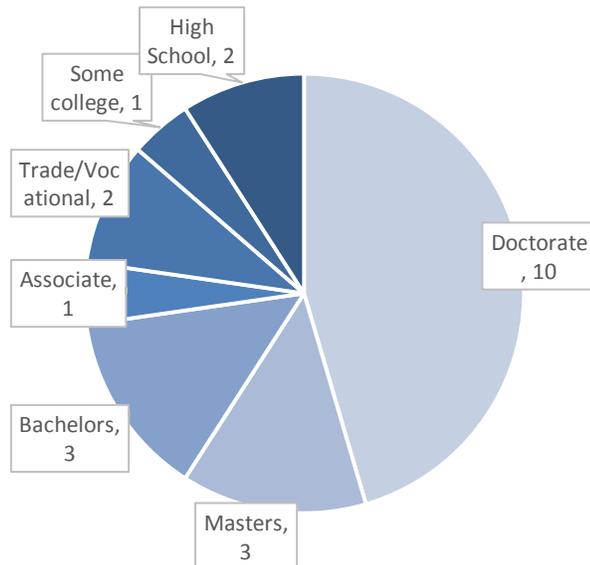
### Age



### Occupation/Role



### Education



## Appendix B: Sample Moderator's Guide and Tasks

### Moderator's Guide

Administrator \_\_\_\_\_

Data Logger \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_

Participant # \_\_\_\_\_

Location \_\_\_\_\_

#### Prior to testing

- Confirm schedule with Participants
- Ensure EHRUT lab environment is running properly
- Ensure lab and data recording equipment is running properly

#### Prior to each participant:

- Reset application
- Start session recordings with *tool*

#### Prior to each task:

- Reset application to starting point for next task

#### After each participant:

- End session recordings with *tool*

## Orientation (5 minutes)

Thank you for participating in this study. Our session today will last 60 minutes. During that time you will take a look at the an electronic health record system.

I will ask you to complete a few tasks using this system and answer some questions. We are interested in how easy (or how difficult) this system is to use, what in it would be useful to you, and how we could improve it. You will be asked to complete these tasks on your own trying to do them as quickly as possible with the fewest possible errors or deviations. Do not do anything more than asked. If you get lost or have difficulty I cannot answer help you with anything to do with the system itself. Please save your detailed comments until the end of a task or the end of the session as a whole when we can discuss freely.

I did not have any involvement in its creation, so please be honest with your opinions.

The product you will be using today is *describe the state of the application, i.e., production version, early prototype, etc.* Some of the data may not make sense as it is placeholder data.

We are recording the audio and screenshots of our session today. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time.

Do you have any questions or concerns?

## First Impressions (5 minutes)

Tester signs in:

***This is the application you will be working with. Have you heard of it?*** \_\_\_\_Yes      \_\_\_\_No

If so, tell us what you know about it.

***Please don't click on anything just yet. What do you notice? What are you able to do here?  
Please be specific.***

*Notes / Comments:*

## Task a.1: Modifying and Verifying Medications

*For this usability test, you'll be prescribing and updating medications for your patient. Please follow the tasks provided to you for Test 3 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.*

1. Order the following medication for your patient without prescribing:

- Prozac 20mg 1 tablet orally per day

2. Update the following medication and send the prescription to the pharmacy already in the patient's favorites:

- Prozac 40 mg 1 tablet orally per day

OR

- Prozac 20 mg 2 tablets orally per day

3. Return to EMR and review the prescription you just entered and verify that it reflects your most recent update.

**Success:**

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

*Comments:*

**Tasks Times:** \_\_\_\_\_ Seconds

**Optimal Path:**

*a.1.1 Add Medication>Enter Info>Save*

*a.1.2 Modify Medication>Change Medication Details>Save*

*a.1.3 Return to chart>Verify Medication Order Information*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

*Comments:*

**Observed Errors and Verbalizations:**

*Comments:*

**Rating:**

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

**Administrator / Notetaker Comments:**

## Task a.2: Entering, Modifying, and Verifying Lab Orders

For this usability test, you'll be looking at drug-drug and drug-allergy interactions for your patient. Please follow the tasks provided to you for Test 4 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.

1. Order a lab for your patient
2. Delete the lab order you just put in for your patient and add a different lab order.
3. Verify that you can view the updated lab in the patient's encounter.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Tasks Times: \_\_\_\_\_ Seconds

### Optimal Path:

*a.2.1 Add lab>Enter Info>Save*

*a.2.2 Delete lab>Add Lab>Enter info>Save*

*a.2.3 View patient's encounter> Verify updated lab order displays*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task a.3: Entering, Modifying, and Verifying Diagnostic Imaging Orders

For this usability test, you'll be incorporating data from a CCD (Continuity of Care Document) for your patient. Please follow the tasks provided to you for Test 5 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.

1. Order a diagnostic imaging procedure for your patient.
2. Delete the diagnostic imaging order you added. Order a different diagnostic imaging procedure.
3. Verify that you can view the updated diagnostic imaging order in the patient's encounter and that the original imaging procedure ordered is not visible.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Tasks Times: \_\_\_\_\_ Seconds

### Optimal Path:

*a.3.1 Add Diagnostic Imaging Order>Enter Info>Save*

*a.3.2 Delete Diagnostic Imaging Order>Add Diagnostic Imaging Order>Enter Info>Save*

*a.3.3 Return to enter>Verify the updated diagnostic imaging order displays*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task a.4: DDDA Interaction Checks

*For this usability test, you'll be looking at drug-drug and drug-allergy interactions for your patient. Please follow the tasks provided to you for Test 2 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.*

Prescribe Ibuprofen 800mg for your patient

If you received a drug-drug interaction alert, document which drug it is interacting with.

If you received a drug-allergy alert, document which drug allergy the system is alerting you of.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Tasks Times: \_\_\_\_\_ Seconds

### Optimal Path:

Add Medication to Prescribe>Note DDDA Interaction Alerts

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task a.5: Demographic Changes

*For the first usability test, you'll be making demographic changes for your patient. Please follow the tasks provided to you for Test 1 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.*

1. Update your patient's birth sex to Female
2. Update your patient's race to Vietnamese, Ethnicity to Not Hispanic or Latino, Preferred Language to Vietnamese
3. Update your patient's sexual orientation to "Don't Know" and Gender Identity to Male
4. Save changes. Verify changes were saved and are viewable.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Task Time: \_\_\_\_\_ Seconds

### Optimal Path:

*Update Demographics>Update Info >Save>Verify*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task a.6: Problem List

*For this usability test, we'll be looking at the problem list for your patient. Please follow the tasks provided to you for Test 4 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.*

1. Add pulmonary hypertension to your patient's encounter.

Map the new diagnosis to an appropriate SNOMED CT code.

Verify that you can see the appropriate SNOMED CT code and ICD-10 code in the assessments and that you can mark this combination as assessed.

2. Delete this problem and add a different problem. Map it to an appropriate SNOMED CT code. Verify that the updated code combination is seen in the patient's encounter.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

*Comments:*

**Tasks Times:** \_\_\_\_\_ Seconds

### Optimal Path:

a.6.1 Add Assessment>Enter Info>Save>Map SNOMED>Verify

a.6.2 Delete Assessment>Add Assessment>Enter Info>Save>Map SNOMED>Verify

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

*Comments:*

### Observed Errors and Verbalizations:

*Comments:*

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task a.7: Medication List

For the third usability test, we'll be looking at the medication list for your patient. Please follow the tasks provided to you for Test 3 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.

1. Review the current list of medications the patient is taking

Add an OTC medication to this patient's medication list.

2. Update the OTC medication you just entered to a different OTC medication and/or strength.
3. Verify that you can view both the patient's current medications with the updates you've made, as well as their historical medications.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Tasks Times: \_\_\_\_\_ Seconds

### Optimal Path:

a.7.1 Review List>Add Medication>Enter Info>Save

a.7.2 Modify Medication>Enter Info>Save

a.7.3 Return to patient's chart>Verify Medications>View Historical Medications

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

Administrator / Notetaker Comments:

## Task a.8: Medication Allergy List

For the second usability test, we'll be looking at the medication allergy list for your patient. Please follow the tasks provided to you for Test 2 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.

1. Add an allergy to codeine for this patient. Patient experiences vomiting when they take this medication.
2. Update the allergy you just added to show that the patient experiences headaches when taking codeine instead of vomiting.
3. Verify that you can see the updated allergy as well as any other medication allergies the patient has.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Tasks Times: \_\_\_\_\_ Seconds

### Optimal Path:

*a.8.1 Manage Allergies>Add Allergy Info>Save*

*a.8.2 Manage Allergies>Modify Allergy>Save*

*a.8.3 Return to chart>Review Allergy list*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task a.9: Clinical Decision Support

*For this usability test, you'll using Sevocity for Clinical Decision Support. Please follow the tasks provided to you for Test 1 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.*

Your patient is John Wethersby, DOB 11/24/1968. Begin by opening his chart.

1 Trigger Health Guidelines (CDS interventions and reference information added based upon: Problem list, medication list, med allergy list, demographics, labs, vitals signs and/or combination of these) for a patient

2 Go to Medications/Assessments and click on the infobutton next to the diagnosis most closely related to the guideline you received an alert for. View the CDS intervention/resource information using the Infobutton for data element most relevant to the health guideline (problem list, medication list) and access the attributes of one of the resources.

3 Open an encounter for this patient and complete one of the recommended care options (CDS interventions) for this patient's diagnosis based on the guideline and infobutton references.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Tasks Times: \_\_\_\_\_ Seconds

### Optimal Path:

*a.9.1 Health Guidelines/Disease Management>Retrieve*

*a.9.2 Medications/Assessments>Infobutton*

*a.9.3 Encounter>Vitals/Orders*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task a.14: Implantable Device List

*For this usability test, we'll be documenting implantable device information. Please follow the tasks provided to you for Test 5 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.*

1. Add an implantable device to your patient's chart using the following UDI (Unique Device Identification):  
(01)10884521062856(11)141231(17)150707(10)A213B1(21)1234  
Set the active date to 1/1/2001.
2. Change the status to inactive and add the inactive date as today's date.
3. Verify that you can view the UDI, device description, Identifiers and attributes for the device you just added.
4. Change the status back to active.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

*Comments:*

**Tasks Times:** \_\_\_\_\_ Seconds

### Optimal Path:

*a.14.1 Add Implantable Device>Enter Info>Verify with FDA>Save*

*a.14.2 Change Implantable Device>Update Status>Save*

*a.14.3 View Implantable Device>Verify Information*

*a.14.4 Change Implantable Device>Update Status>Save*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

*Comments:*

### Observed Errors and Verbalizations:

*Comments:*

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Task b.2: Clinical Information Reconciliation and Incorporation

*For this usability test, you'll be incorporating data from a CCD (Continuity of Care Document) for your patient. Please follow the tasks provided to you for Test 6 of your testing packet provided prior to this session. Do you have any questions before we start? Please begin the test.*

There is a C-CDA on the desktop which needs to be imported and reconciled for one of your patients. From Sevocity's desktop, begin the process of importing the C-CDA titled "CCD\_Usability" on your desktop.

1. Match the patient from your clinic to the patient in the C-CDA and incorporate all the information from the C-CDA into your patient's chart. Open the patient's chart.

### Success:

- Easily completed
- Completed with difficulty or help (Describe below)
- Not Completed

Comments:

Task Time: \_\_\_\_\_ Seconds

### Optimal Path:

*Import CCDA>Match Patient>Reconcile Meds, Problems, and Allergies >Review Consolidated list> Reconcile to Chart*

- Correct
- Minor Deviations / Cycles (Describe below)
- Major Deviations (Describe below)

Comments:

### Observed Errors and Verbalizations:

Comments:

### Rating:

Overall, this task was: \_\_\_\_\_ (1 – Very Easy to 5 – Very Difficult)

### Administrator / Notetaker Comments:

## Appendix C: Informed Consent

### Non-Disclosure Agreement and Informed Consent Form

MU3 Usability Testing – Sevocity EHR

Sevocity would like to thank you for participating in this study. The purpose of this study is to evaluate an electronic health records system. If you decide to participate, you will be asked to perform several tasks using the prototype and give your feedback. The study will last about 60 minutes. At the conclusion of the test, you will be compensated for your time.

#### ***Agreement***

I understand and agree that as a voluntary participant in the present study conducted by Sevocity, I am free to withdraw consent or discontinue participation at any time. I understand and agree to participate in the study conducted and videotaped by the Test Company.

I understand and consent to the use and release of the videotape by Sevocity. I understand that the information and videotape is for research purposes only and that my name and image will not be used for any purpose other than research. I relinquish any rights to the videotape and understand the videotape may be copied and used by Sevocity without further permission.

I understand and agree that the purpose of this study is to make software applications more useful and usable in the future. I understand and agree that the data collected from this study may be shared with outside of Sevocity and Sevocity's client.

I understand and agree that data confidentiality is assured, because only deidentified data – i.e., identification numbers not names – will be used in analysis and reporting of the results. I agree to immediately raise any concerns or areas of discomfort with the study administrator. I understand that I can leave at any time.

By signing below, I am stating that I have read the above statement and agree to be a participant in the Sevocity EHR Usability Testing.

**Please print your name:** \_\_\_\_\_

**Please sign your name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Thank you! We appreciate your participation!**

**The Sevocity Team**

## **Appendix D: Post Test Questions**

**What was your overall impression of this system?**

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**What aspects of the system did you like most?**

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**What aspects of the system did you like least?**

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**Were there any features that you were surprised to see?**

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**What features did you expect to encounter but did not see? That is, is there anything that is missing in this application?**

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**Compare this system to other systems you have used. Would you recommend this system to your colleagues?**

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## Appendix E: System Usability Scale Questionnaire

### System Usability Scale – Sevocity EHR MU3 Usability Testing

	Strongly Disagree								Strongly Agree
1. I think that I would like to use this system frequently	<input type="checkbox"/>								
	1	2	3	4	5				
2. I found the system unnecessarily complex	<input type="checkbox"/>								
	1	2	3	4	5				
3. I thought the system was easy to use	<input type="checkbox"/>								
	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	<input type="checkbox"/>								
	1	2	3	4	5				
5. I found the various functions in this system were well-integrated	<input type="checkbox"/>								
	1	2	3	4	5				
6. I thought there was too much inconsistency in this system	<input type="checkbox"/>								
	1	2	3	4	5				
7. I would imagine that most people would learn to use this system very quickly	<input type="checkbox"/>								
	1	2	3	4	5				
8. I found the system very cumbersome to use	<input type="checkbox"/>								
	1	2	3	4	5				
9. I felt very confident using the system	<input type="checkbox"/>								
	1	2	3	4	5				
10. I needed to learn a lot of things before I could get going with this system	<input type="checkbox"/>								
	1	2	3	4	5				