

ISO/IEC 205062 Common Industry Format for Usability Test Reports

Essentia Certified Edition v8.00.00

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Netsmart Technologies

Address inquiries to: Carol Reynolds

Phone: 1-913-696-2818

Email: creynolds@ntst.com

Address: 4950 College Blvd. Overland Park, KS 66211

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Executive Summary

For over a decade, Netsmart's Essentia solution has been highly focused on solution usability. As part of this initiative we worked with a leader in user experience research and design to analyze our solutions and create a base set of guidelines. A core part of our Software Development Lifecycle (SDLC) includes integration of a UX (User Experience) team with a focus on usability based upon safety-enhanced design including patient safety, increased individual effectiveness and efficiency through increased user productivity/efficiency, decreased user errors, and increase in safety and improved cognitive support. A user centered design process is integrated into the SDLC to ensure a safety-enhanced design is achieved.

The User Centered Design process that is utilized at Netsmart is the ISO/IEC 25062:2006. This standard is the common industry standard for usability test reports. This format includes the following steps: description of the product, goals of the test, test participants, tasks the users were asked to perform, experimental design of the test, the method or process by which the test was conducted, the usability metrics and data collection methods, and the numerical results. This process is used because it very closely aligns with the requirements set for Safety-Enhanced Design. It also provides the most clarity on what the best practice is for execution of each step.

This standard was applied to the usability test of Essentia Certified Edition v8.00.00 which was conducted January 16, 2018 at Netsmart's facility in Arkansas. This test measured the usability of the application by tracking efficiency, effectiveness, and satisfaction. Ten participants of varying experience levels completed tasks which were reflective of frequently used tasks in the application, such as medication/lab/radiology ordering, recording problems and medication allergies, and viewing drug-drug and drug-allergy interactions.

The test sessions were recorded to assist in measuring data. Experienced usability specialists moderated the tests and compiled the metrics. Key metrics that were tracked included task completion rate, task time, error rate, task deviations, satisfaction ratings, and participant verbalizations and recommendations.

The testing showed a 100% task completion rate and a less than 1 minute average task time.

And while these metrics support the usability of the application, there is always room for improvement. Based on recommendations voiced during the tests and the rate of errors/task times associated with certain tasks, there were a few notable improvement ideas.

Introduction

Full Product Description

The Order Entry component of Essentia Certified Edition is designed to maximize the workflows for managing outpatient lab, radiology and medications orders. Essentia provides our users with an efficient workflow to review, add, and change medication, laboratory, and radiology orders as well as laboratory order results. Information like allergies, diagnoses, and interactions are displayed to the user as they work with the various orders. Users can also review, add, and change problems, demographics, and implantable devices as well.

Test Objectives

This test was to evaluate the usefulness and functionality (does the application work as intended), ease of use (do both physicians and non-physicians understand how to use the application), safety (ability to avoid errors), and satisfaction (what is the desirability of the application of Essentia Certified Edition. The content of the Essentia Certified Edition Outpatient Order Entry Point of View was a similar depiction of what a participant would see in the production application. Aside from test patients in the application, all other libraries were the same as they would be in production, e.g. drug libraries, drug to drug interactions, drug to allergy interactions, diagnosis codes, medication libraries, etc.

The goals for this usability test for the Essentia Certified Edition were to test against 10 different areas being certified:

- 170.315(a)(1) CPOE - Medications
- 170.315(a)(2) CPOE - Laboratory

- 170.315(a)(3) CPOE – Diagnostic Imaging (NEW)
- 170.315(a)(4) Drug-drug, Drug-allergy Interaction Checks
- 170.315(a)(5) Demographics (NEW)
- 170.315(a)(6) Problem List
- 170.315(a)(7) Medication List
- 170.315(a)(8) Medication Allergy List
- 170.315(a)(14) Implantable Device List (NEW)
- 170.315(b)(3) Electronic Prescribing

Methods

Participants

Ten participants were tested in this study. Our intended users are clinicians, so we used participants with a clinical background to give us more accurate and reliable results. We also used participants with varying professional experience and licenses, computer experience levels, and experience with the product. We used these varying experience levels because we understand that in a real-world setting, users would have varying computer and product experience levels. The table below represents the demographics that were collected from each participant. The participants chosen were not compensated fiscally, as to decrease in biased results. These participants were no directly involved in the development of the application.

	Occupation/Role	Professional Experience	Age	Sex	Education	Computer Experience	Product Experience
1	General Manager	N/A		M	Bachelor's	26 years	17 years
2	Senior Business Analyst	N/A		F	Bachelor's	35 years	20 years
3	Senior Support Manager	N/A		M	Bachelor's	20 years	7 years
4	Solution Architect	N/A		F	Bachelor's	32 years	17 years
5	Solution Architect	N/A		M		20 years	10.5 years
6	Solution Support Analyst II	N/A		F		10 years	5 years
7	Software Engineer	N/A		M	Bachelor's	12 years	2.5 years
8	Solution Support Analyst II	N/A		F		15 years	5 years
9	Solution Support Analyst II	N/A		M	Bachelor's	12 years	4 months
10	Senior System Engineer	N/A		M	Bachelor's	20 years	12 years

Participant Instructions

All participants were given a short explanation of what the tests entail and were given the ability to ask questions before the test was administered. The test moderator read the tasks/scenarios off to each participant and the participant then attempted the explained task. Participants had the opportunity to ask for clarification of tasks. We measured task completion rate, task time, error rate, and satisfaction ratings. We observed their behavior and documented verbalizations to see patterns of across participants. The information captured with Morae includes audio, screen capture, and mouse and keyboard inputs. GoToMeeting allowed us to record remote users' screens, audio, and mouse movements. This information was reviewed after the session to collect metrics.

Experimental/Study Design

The objective of this test was to measure effectiveness, efficiency, and satisfaction. The participants' vocal feedback and reactions were recorded. This qualitative feedback was analyzed for patterns in their responses. This feedback was used to inform the design. Quantitative observations were made through the dependent variables below. The quantitative metrics measured were task success rate, task failure rate, task deviation rate, error rate, task time, and user satisfaction rating. The participants filled out the SUS questionnaire to assess the satisfaction of the participant after using the application.

Tasks/Scenarios

The participant was given the set of tasks below which reflect tasks that a user of the application would complete. The tasks were chosen because of their importance in regards to functionality, criticality in regards to safety, and frequency of use in the application. The participants were welcome to ask the moderator questions and refer back to the task sheet given. Below are the scenarios that were given to participants.

Scenario 1 – Patient A – Tasks: Record demographics (170.315 (a)(5))

- A new client comes in for an appointment. You want to check if they are in your system.
- You see that there are no clients that match your search so you will need to add this client into the system.
- Enter in a Social Security Number for the client
- Enter their Last Name
- Enter their First Name
- Select clients Sex
- Enter in a birth date for the client
- Click, Save
- Upon completing a message will pop-up noting the new client's case number and ask if you would like to activate the client at this time. Select, OK.
- Select the Client Demographics tab and enter additional demographics for this client.
- Fill out Client Type (*New Contact*)
- Fill out Home Address
- Fill out Home Telephone
- Fill out Ethnicity
- Fill out Race
- Fill out Preferred Language
- Fill out Sexual Orientation
- Fill out Gender Identity
- Click, Save

Scenario 2 – Patient B – Tasks: View demographics (170.315 (a)(5)), Change demographics (170.315 (a)(5))

- This client has told you that they have gotten divorced since the last visit, and that they are now working part time 16 hours instead of full time.
- Update the client's marital status and employment status.

Scenario 3 – Patient B – Tasks: View medications/medication list (170.315 (a)(1)) & (170.315 (a)(7)), View medication allergy list (170.315 (a)(8)), Change medication/medication list (170.315 (a)(1)) & (170.315 (a)(7)), Electronically Prescribe (170.315 (b)(3))

- As you talk with your client during the appointment, they state that they continue to have trouble sleeping. You decide to prescribe Lunesta.
- You review the EMR's active medication list and medication history list and realize the patient has been prescribed Ambien, 10 mg, as needed at bedtime.
- You also see the patient's current medication allergy list and see they are allergic to Lunesta.
- Select, Launch EssentiaRx
- In order to prevent prescribing more than one sleep agent (e.g., same-class polypharmacy) and avoid an allergic reaction, you discontinue the Ambien 10 mg.
- You prescribe a new drug, Trazodone, 150 mg tablet, as needed at.
- Upon completing the prescription will send via eRx to the LWSITest pharmacy.
- Verify the order was made by reading back the new medication list.

- You want to make note that the Trazodone was prescribed over Lunesta because of a drug allergy. Access the Manage Meds tab and modify the Trazodone record by adding the comment.
- Select, Return to EMR

Scenario 4 – Patient B – Tasks: View medication allergies (170.315 (a)(8)), Record medication allergy (170.315 (a)(8)), Change medication allergy (170.315 (a)(8)), View lab tests (170.315 (a)(2)), Order lab test (170.315 (a)(2)), Record medication (170.315 (a)(1)), View drug-allergy interactions (170.315 (a)(4)), View drug-drug interactions (170.315 (a)(4)), Change medication (170.315 (a)(1)), Change the level of severity for drug-drug interactions (170.315 (a)(4))

- Your patient comes in for their regular appointment. You discuss the current symptoms they have been experiencing. They mention they are having a mild reaction of swelling when taking their Abilify. Open EssentiaRx and add Aripiprazole (medication name for Abilify brand) as an allergy to the chart with a severity of low.
- View all allergies for the patient. Verify that the Aripiprazole allergy appears in the client’s known allergies list.
- The client also indicates that their peanut allergy has gone away and they no longer have any reactions to eating peanuts. Discontinue the peanut allergy. Return to allergies, change the severity of the Abilify allergy to Moderate, because the patient indicated that their swelling gets pretty bad after taking their Abilify.
- The patient complains about being overly fatigued, achy and has trouble urinating. You suspect it’s a simple urinary tract infection from the symptoms described, but want to be sure.
- You plan to order a urinalysis.
- But you notice that a urinalysis has already been ordered for the patient.
- You also want to prescribe Bactrim for the suspected UTI.
- Proceed to prescribe Bactrim.
- After you speak to your client more, you decide to add a Comprehensive Metabolic Panel.
- The patient reports they don’t feel like the Flonase has been working, so you decide to discontinue Flonase as well as Abilify, since the client reported the allergic reaction.
- Return to EMR

Scenario 5 – Patient B – Tasks: View implantable device list (170.315 (a)(14)), Change implantable device list (170.315 (a)(14)), Record implantable device list (170.315 (a)(14))

- The client tells you that they just had an implantable device removed. You want to see if the history of this implantable device is in their record. Open the Implantable Device List.
- Enter the unique device identifier. Review the information that has been returned.
- You see that the device has not been added to their record, so file the device to the client and set the status as inactive.

Scenario 6 – Patient B – Tasks: View problem list (170.315 (a)(6)), Record problem (170.315 (a)(6)), Change problem (170.315 (a)(6))

- The patient has been complaining of a migraine.
- Add the problem Migraine to the patient’s problem list and the Date Identified.
- The patient also tells you they no longer have the flu. Add the Date Resolved to change the flu to inactive.

Scenario 7 – Patient C – Tasks: View lab test results (170.315 (a)(2)), Change lab test (170.315 (a)(2)), Add radiology order (170.315 (a)(3)), Change radiology order (170.315 (a)(3)), View radiology order (170.315 (a)(3)), Change medication (170.315 (a)(1))

- At the last visit you ordered a urinalysis lab test. Review the lab test results for the order.
- To be thorough, you decide to order a CT scan to determine if the patient’s symptoms could be related to a stroke.

- After placing the order, the patient tells you that they will be out of town for the next three days, so you will need to change the order's start date to 3 days later. Edit the placed order and re-order the new order with the new start date. Confirm the order change.
- Return to EMR

Test Procedure

The tests were moderated by experienced usability specialists. The moderators gave each participant a brief explanation of what they could expect in the test, read through each task and scenario to the user, and tracked comments and behaviors of the participants. Participants were instructed that they could ask for clarification along the way and were able to refer to a printed copy of the task. Task timing began at the point that the task had begun and ended once the participant had completed that task. Following the test, the participant was given an SUS questionnaire to complete. Metric information was stored into a report following the testing.

Test Location

Testing was conducted on January 16, 2018 at Netsmart Technologies, 6001 Valley Ranch Drive, Little Rock, Arkansas. In-person tests were conducted with participants who were onsite and virtually with remote participants. The tests were completed in a quiet meeting room with, at most, one other user test being conducted at the same time.

Test Environment

The intended facility would be an inpatient or outpatient behavioral health facility where orders are recorded and used in a clinical setting. In this instance, the testing was conducted in the Little Rock Netsmart building. Testing was conducted on 1366 x 768 resolution Lenovo laptops. The laptops were provided and setup by Netsmart for the duration of the test. The participants used a standard keyboard and mouse for input. The Essentia application being used was a production environment accessed on Internet Explorer. The environment had content similar to what appears in the field on this application. The system performance during the testing is reflective of what would be experienced in the field.

Test Forms and Tools

The laptops were equipped with GoToMeeting (screen recording/audio recording tool).

Usability Metrics

The usability metrics captured during the test were based on the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records. These metrics include effectiveness, efficiency, and satisfaction. Effectiveness was measured by tracking success and error rates. Efficiency was measured through task time and deviations. Satisfaction was measured with a satisfaction questionnaire (SUS).

Effectiveness

A task was considered a success if the user was able to complete the task. If the participant abandoned the task, it was counted as a failure. If a participant deviated away from the optimal path to complete a task, but ultimately was still able to accomplish the task, then the task was marked as a success. A percentage was measured for success and failure rate. Any errors that occurred during tasks were recorded as well. An error was defined as an action taken that disrupted the completion of the task.

Efficiency

Task time was measured for each task based on when the user first began a task to when the user finished the task. An average task time was measured at a task level and individual level and the standard deviation of these times were also measured. Task deviation was recorded to measure the amount of deviation from the optimal or quickest path through the task.

Satisfaction

In systems engineering, the SUS is a simple, ten-item attitude Likert scale giving a global view of subjective assessments of usability. It was developed by John Brooke at Digital Equipment Corporation in the UK in 1996 as a tool to be used in

usability engineering of electronic office systems. An SUS questionnaire was given to each participant after completing the tasks in the application. Common conventions find that systems with a rating of 66 or higher can be seen as easy to use. See [J. Sauro, Measuring Usability With the System Usability Scale \(SUS\)](#)

Results

Data Analysis and Reporting

The findings and details of the usability testing are detailed below. The results were measured based on explanations in the “Usability Metrics” section above.

Analysis (Test Averages)

Task	Success Rate	Number/Type of Errors	Task Time (seconds)	Standard Deviation (seconds)
CPOE Medications	100%	0	48.7	0
CPOE Laboratory	100%	0	46.5	0
CPOE Radiology	100%	0	48.7	0
Drug-drug, Drug-allergy Interaction Checks	100%	0	36.0	0
Demographics	100%	0	75.1	0
Problem List	100%	0	27.4	0
Medication List	100%	0	10.2	0
Medication Allergy List	100%	0	18.2	0
Implantable Device List	100%	0	32.1	0
E-Prescribing	100%	0	36.8	0

Analysis (Participant)

Participant	Success/Failure	Number/Type of Errors	Verbalizations/Recommendation	Standard Deviation (seconds)	Avg Task Time (seconds)	SUS
ID1	100% Success	0	0	0	37.1	82.5
ID2	100% Success	0	0	0	36.6	82.5
ID3	100% Success	0	0	0	37	82.5
ID4	100% Success	0	0	0	36.4	82.5
ID5	100% Success	0	0	0	38.2	82.5
ID6	100% Success	0	0	0	37.9	82.5
ID7	100% Success	0	0	0	36.9	82.5
ID8	100% Success	0	0	0	37.6	82.5
ID9	100% Success	0	0	0	41.3	82.5
ID10	100% Success	0	0	0	37.5	82.5

Effectiveness

100% of the tasks were successfully completed by the participants. There were tasks that involved more effort than others, but even so, every task was successfully completed by all of the participants. There were no system errors that presented themselves during the test.

Efficiency

The average task time for all tasks and all participants was under one minute.

Satisfaction

We used the System Usability Scale (SUS) to gauge participant satisfaction. This is a 10 question weighted scale that scores the application from 0 – 100 with 100 being the most usable. See the “Usability Metrics” section above for more details about this scale. Common conversions find that a system with a rating of 66 or higher can be seen as easy to use. Each of our participants were given an SUS questionnaire after testing. The average SUS score amongst the participants was 82.5.

Major Findings

It can be deduced that with a 100% task completion rate, a less than 1 minute average task time, and an SUS of 82.5, the applications are indeed user-friendly based on the three criteria above that were measured. In addition, there were no critical safety concerns that presented themselves during the test.

In all instances where specific safety /risk scenarios were presented, the participants were supplied with accurate information and were able to use that information to keep from risking the patient’s safety. For example, when the participant was tasked to consider placing an order for Lunesta while the patient has a Lunesta drug allergy, the system effectively presented the user with the critical information and the participant was able to avoid a safety issue.

Areas for Improvement

Although the application measured well in regards to efficiency, effectiveness, and satisfaction, there is always room for improvement.

The application overall performed very well in the three areas being measured: efficiency, effectiveness, and satisfaction. We take pride in these results and the user-centered design and safety-enhanced design that our application includes.



Carol J Reynolds, SVP Client Experience

1/16/2018

Date