macadamian

Usability Test Results

Siemens ACUSON S3000™ Ultrasound System, HELX™ Evolution with Touch Control

Research Goal

Siemens Medical Solutions USA, Inc. Ultrasound Business Area made a concerted effort to improve the usability of their family of premium ultrasound systems, the new ACUSON S Family™ of ultrasounds systems, HELX™ Evolution with Touch Control.

Siemens felt confident that they had achieved their goals and wanted Macadamian, a user experience design and development firm, to conduct an independent usability test to measure user performance and validate user satisfaction with one of these systems, the ACUSON S3000™ Ultrasound System.

Macadamian Technologies (1)

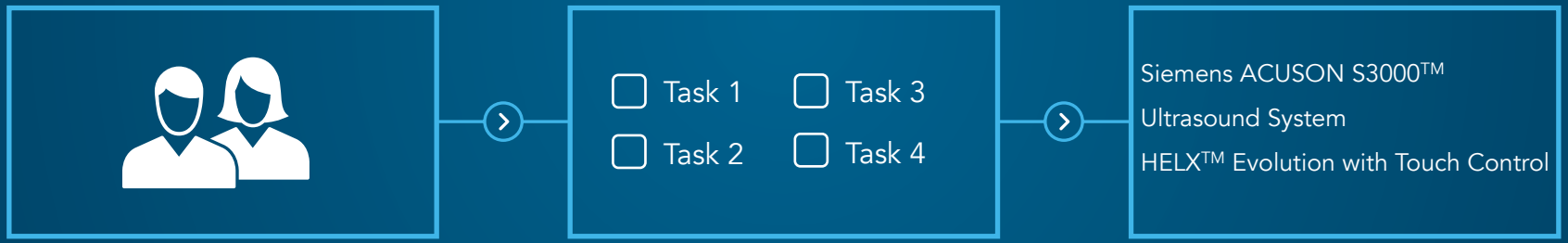
Macadamian provides a complete range of high-quality usability, design and software engineering services to industry leaders across North America. Macadamian's work is founded in user-centered design to deliver context-aware and adaptive experiences.

For over 10 years, Macadamian's User Experience team has conducted usability assessments to better understand the experience users have or want to have with a particular product. These assessments include expert reviews, concept design walkthroughs, and usability testing on new and existing products for a wide variety of industries.

Macadamian Technologies (2)

Usability Test

This test is a user-centered design methodology that evaluates a product or service by testing it with representative users. Users are asked to complete a set of typical tasks while user experience researchers watch, listen, and take notes.



Usability Test Participants

Usability Test Tasks

Usability Test Product

Usability Test Methodology

Participant Demographics

Macadamian recruited 20 practicing sonographers to participate in the usability test. Test participants were screened by third-party recruitment agencies for prior experience, brand attitude, and domain skills to mitigate bias.

100% specialize in abdominal sonography*

Workload ranges:
4 – 15 patients/ day
20 – 50 patients/ week

Sonography experience:
5 – 40 years

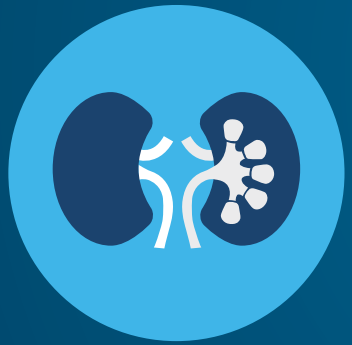
Hospital (12)
Clinic (6)
Both (2)

None of the participants were current Siemens ultrasound users

**The specialty of abdominal sonography was chosen in order to successfully recruit a large group of sonographers with similar demographics and experience in Spring 2015.*

Usability Test Tasks

For the test, research participants were asked to perform a series of tasks that are commonly performed in an abdominal ultrasound exam. These were simulated by representative scanning tasks and were grouped into three categories.



OPTIMIZE
E.g. Scan the aorta in color and pulsed wave Doppler modes

ANNOTATE
E.g. Annotate three 2D images of the right kidney

MEASURE
E.g. Measure the liver length and assign the measurement to a label

Usability Test Space

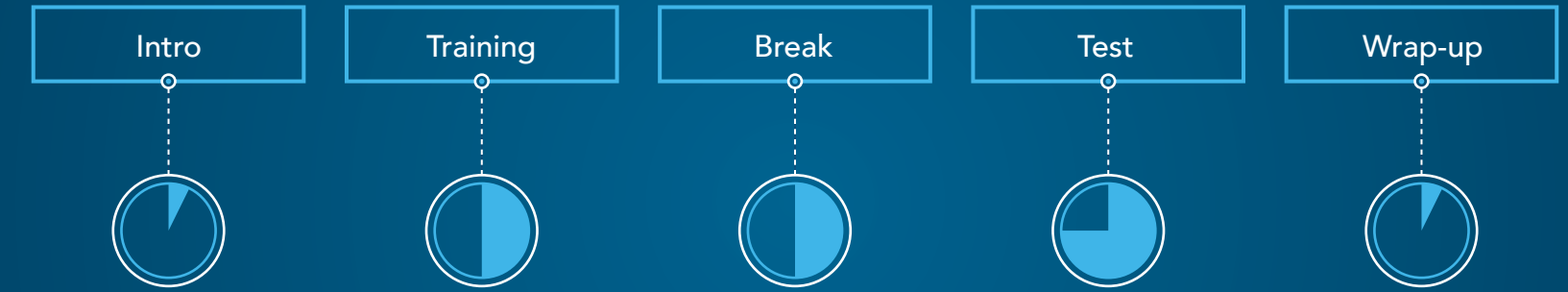
The usability test was conducted at a third party user research facility in the Seattle, WA area equipped with a state-of-the-art usability testing lab.

Human models were involved in the study to act as patients during the usability tests so as to provide sonographers with real physiology to scan.

Both adult males and females, who were generally healthy, fairly easy-to-scan, and with no suspected abnormal anatomy, were recruited as models.

Test Session Breakdown

~120 minutes



An introduction was provided first to participants which detailed the purpose of the study. Participants then watched a training video created by Macadamian that featured an experienced sonographer completing similar tasks with similar features, as included in the usability test tasks.

The usability test participants were instructed to watch the video first, followed by an opportunity to familiarize themselves with the system. Once training was complete, participants were given a break so that the usability test space could be set up for the test.

After completing all of the test tasks, a wrap-up session was conducted that included the System Usability Scale questionnaire.

Usability Metrics (1)

The chosen metrics focused on effectiveness, efficiency and satisfaction, as these three elements define usability.

The international standard, ISO 9241-11, defines usability as:

The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.

Usability Metrics (2)

During the usability test, Macadamian's User Experience Researchers captured the data contained in the table below.

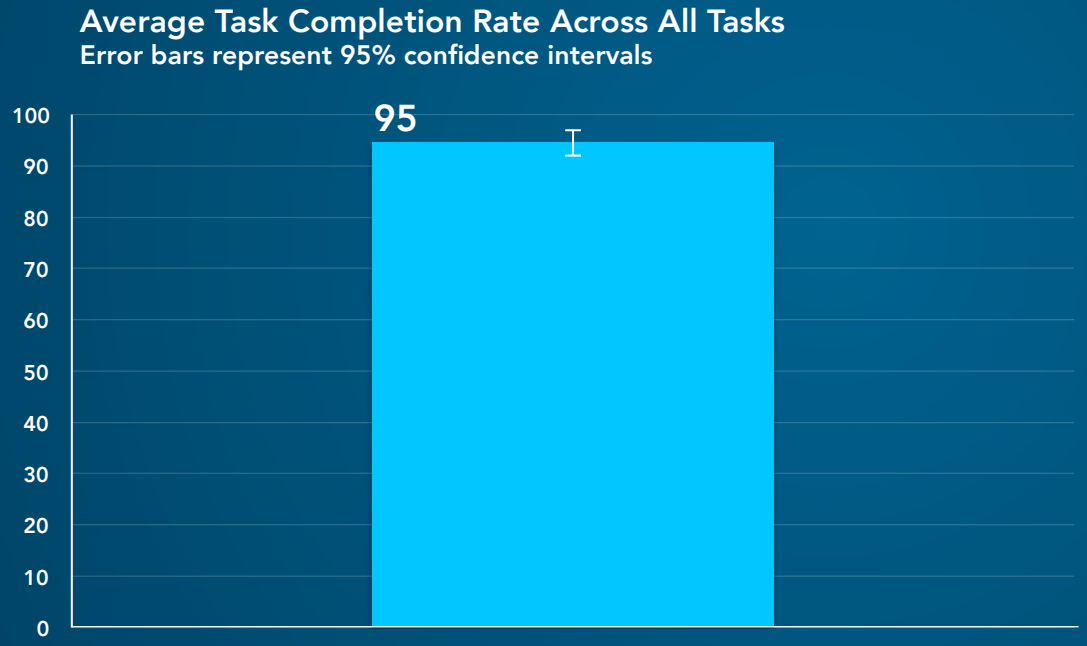
USABILITY ELEMENTS		CAPTURED DATA	
		QUANTITATIVE	QUALITATIVE
EFFECTIVENESS	Can users complete tasks and achieve goals with the system?	Success rates Number of errors	Think-aloud comments
EFFICIENCY	How much effort do users require to complete tasks?	Number of deviations	Think-aloud comments
SATISFACTION	What do users think about the system's ease of use?	Ease of use ratings	Think-aloud comments

Usability Test Findings

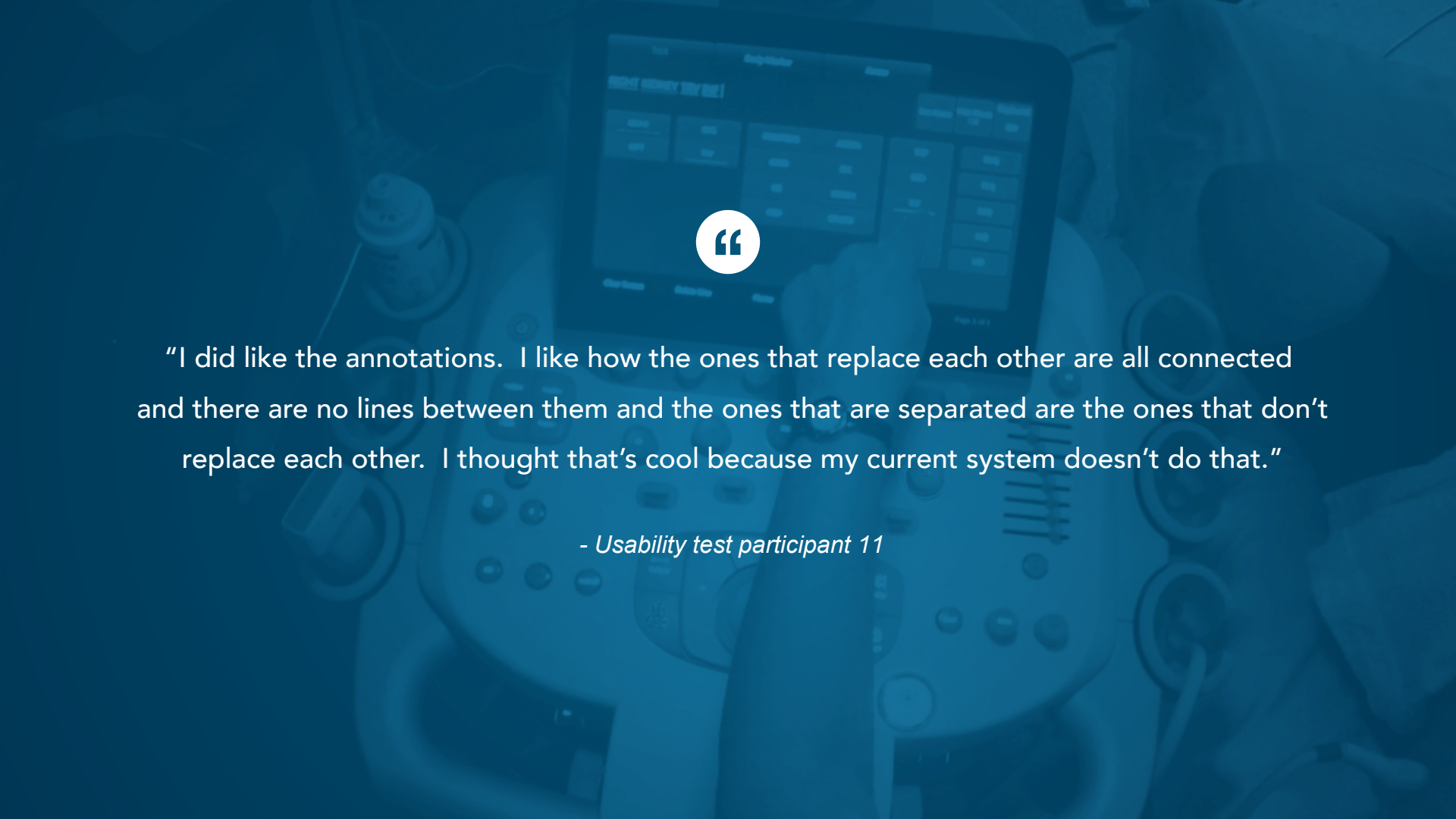
viation ription(s)	Success	Number of Errors	Error Details	Comments	EoU Rating	Path Taken	Number of Deviations	Deviation Description(s)	Success	Number of Errors	Error Details	Comments	EoU Rating	Path Taken	Number of Deviations	Deviation Description(s)
-	1	0	-	It's easy, it's good	5	Dual - Dual - Dual - Update - Freeze - It would be great if you can hit it again to switch onto the	2.00	went in and out of dual, didn't set caliper properly at first	1	0	-	I like the ease of moving your calipers - just grab them and move them	4	ABC - SAG RIGHT KIDNEY - TRANS RIGHT KIDNEY ON tp - ABC - As soon as I hit ABC, it took my measurements off. My	0.00	-
-	1	0	-	Tp buttons are too close together	4	Right Kidney Sag on tp - Adjusted gain - Freeze - Update - Freeze - Freeze - ABC - Clear Screen - TRV -	1.00	had to redo measurements	1	1	unfroze and had to do measurements again	Once you know a different machine, it would be pretty easy to use.	4	Right Kidney sag - freeze - dual - trv annotation	0.00	-
-	1	0	-	Its right there I didn't have to start over with the gb label.	5	me as soon as I hit dual, it cant keep a frozen image - I had to redo it - freeze - dual (off) - size,	5.00	image twice and accessed dual button	1	0	-		3	ABC - Right Kidney Sag - Update - ABC - tb clnes [lost a measurement] - ABC - length on tp - remeasured length - dragged	1.00	selected 'update'
-	1	0	-	3 Because I want to have post processing. 5 for annotations.	5	TGC - Freeze - She hit play by the tb - Freeze (off) - Freeze - Freeze (off) - how did I do it before -	8.00	hit play by the track ball, freeze on and off (three times)	0	1	Hit update twice too fast		3	ABC - Right Kidney Sag on tp - moved trackball - TRV on tp	0.00	-
-	1	0	-	Nice to have a bigger keyboard picture on there	5	focus - zoom knob - that's interesting dual looks like it's multifunction - Freeze - Caliper -	0.00	-	1	0	-	-	5	Refer to 4A	0.00	-
-	1	0	-	They are just right infront of me. Everything that I need.	5	freeze - update - caliper - Length on tp - measured - AP on tp - measured - Width - MEASURED -	1.00	selected dual and unfroze image	1	0	-	Just because when I unfroze it I expected it to go to the next image - when I unfroze it it went back to single.	4	ABC - SAG RIGHT KIDNEY - MOVED Cursor - TRV right kidney - image	0.00	-
-	1	0	-	The ABC button is right there and then your labels come up.	5	live - ABC again - it deleted	1.00	-	1	0	-	hard time figuring out how to	4	ABC - Tb to move - SAG RIGHT KIDNEY on tp - moved tb to other image - SAG - TRV RIGHT KIDNEY - image.	0.00	-
-	1	0	-	Umm I like the annotation is simple, it's just there. Supine and – options.	4	thought it was going to keep the image and just move it to the side but it went live - freeze - pressed	2.00	had to redo image once in dual (twice)	1	0	-		3	ABC - RIGHT KIDNEY SAG pn tp - tb - TRV ON OTHEr side	0.00	-
-	1	0	-	all I did was hit it and it automatically came up and I can see it.	5	zoom out - depth - freeze - dual - freeze - caliper - measured - dual (off) - dual -dual - dual -	4.00	had to redo image (four times)	0	1	dual (i.e. same plane of the kidney) instad of	When you hit dual I couldn't get them both unless I hit dual live.	2	ABC - TB - sag right kidney on tp - tb to other - TRSright kidney on tp - image. [GB was still there]	0.00	-
ected CBD notation	1	2	Typed CBD twice	hitting the CBD below it and instead of deleting the last word it deleted the line. Oh it's there	3	kidney on tp - Dual - Freeze - ABC - TRV KIDNEY - update - Caliper - set measurements but did not assign	1.00	had to redo image	1	0	-		5	Refer to 4A	0.00	-
-	1	0	-	Two clicks, turn on annotation, it's right there already.	5	freeze - dual - oh oh that wasn't good - scans again - freeze - update - scans other image - TGC -	1.00	went out of dual	1	0	-	Once I hit dual it wasn't intuitive how I got to the image	3	ABC - Delete - SAG Right kidney on tp - tb - TRV on tp - image.	0.00	-
-	1	0	-	this tp is really obvious. Only the stuff that I would need or use readily is on it.	5	gain - Freeze - dual - freeze 3 times - dual - this dual screen isnt as easy to use because I don't	5.00	had to redo image, went out of dual (twice), caliper (twice)	1	0	-	The freezing the image and saving and going to the next one is not convenient.	1	ABC - TRV using kb - tb - SAG using kb	0.00	-
-	1	0	-	You push the ABC button and the annotations come up and it's right there.	5	Freeze - unfreeze - gain - dual - freeze - dual twice - Freeze - okay so I got the first image and then....	1.00	had to redo image	1	0	-	I couldn't figure out how to get the image on the right. Doesn't usually use Dual	4	Update twice - Kidney length on tp - ABC - RIGHT KIDNEY on tp - tb - SAG [on another line] - tb to move to the other image - TRV	0.00	-
-	1	0	-	That was easy because it's what I want - I want delete to do a clear screen function and take me back to home - set home at the bottom	5	sector width - zoom - gain on 2d - the size of the dual screen is not enough to get this kidney in there -	1.00	redo measurments	1	1	Did set 2nd caliper and lost her measurement	This limits the application of the dual function - I had to figure out what I am doing wrong - I had this	2	ABC - SAG RIGHT KIDNEY ON tp - MOVED Cursor - TRV right kidney - image	0.00	-
-	1	0	-	other than me having to push a button when it frozen. I couldn't find the set. Green cursor on the tp?	4	want a marker that has clear screen - now I have to go back inside another menu to delete -	1.00	went out of dual	1	0	-	measurements: 2. I could have gotten the AP that would have taken up the screen - 15 images	2	ABC - RIGHT SAG KINEY on tp - tb - RIGHT TRV KIDNEY on tp	0.00	-
-	1	0	-	It was easy to find the annotation button and it popped up on the tp for me and it was easy to find on	5	looking at the legend to figure out how to bring another screen - update - dual - single image mode	5.00	(twice), had to redo image and	1	2	single view and lost measurments	4 for dual and for the measurement 2.	3	ABC - these buttons are not super responsive - the mechanism is not very good - it's not very solid. It feels cheap - KIDNEY RIGHT SAG	0.00	-

Effectiveness

task success, number of errors, qualitative feedback



In terms of effectiveness, the results indicated that with the Siemens system very few errors were observed and tasks had high completion rates.

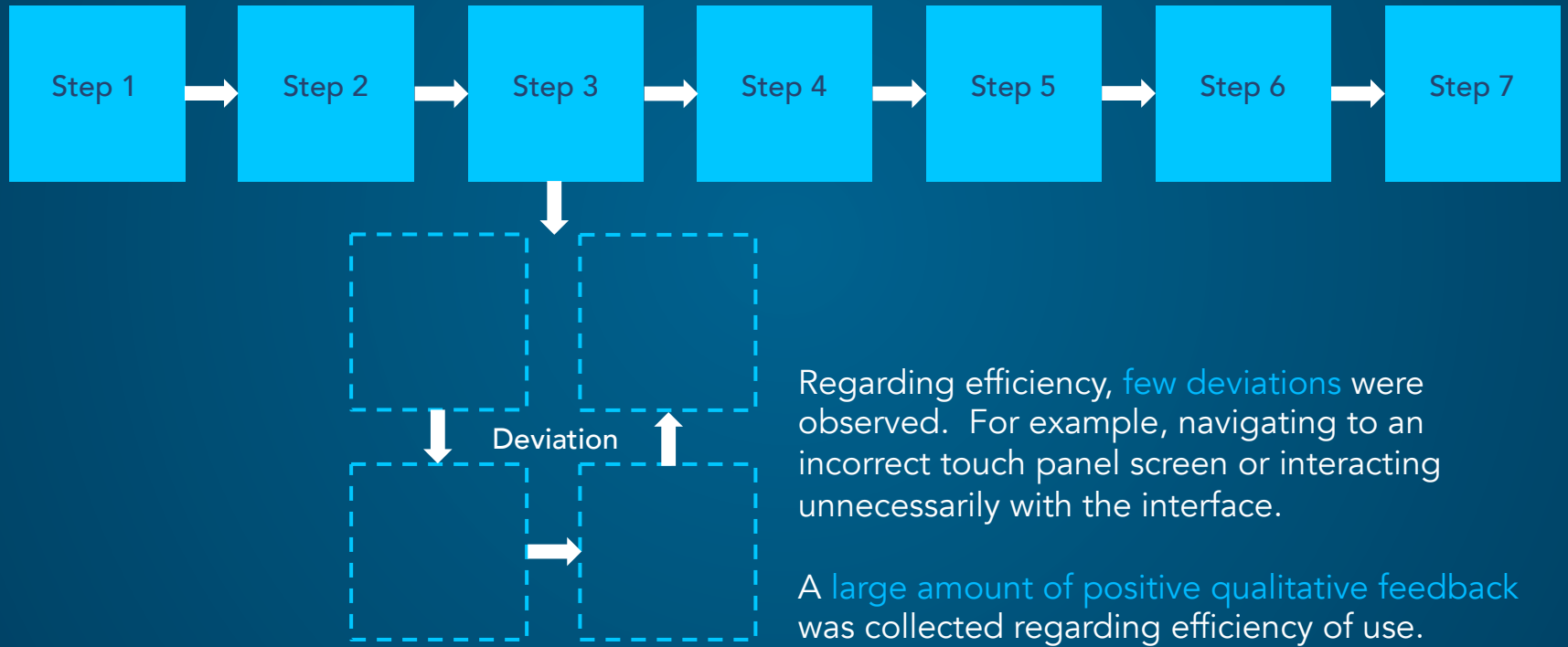


"I did like the annotations. I like how the ones that replace each other are all connected and there are no lines between them and the ones that are separated are the ones that don't replace each other. I thought that's cool because my current system doesn't do that."

- Usability test participant 11

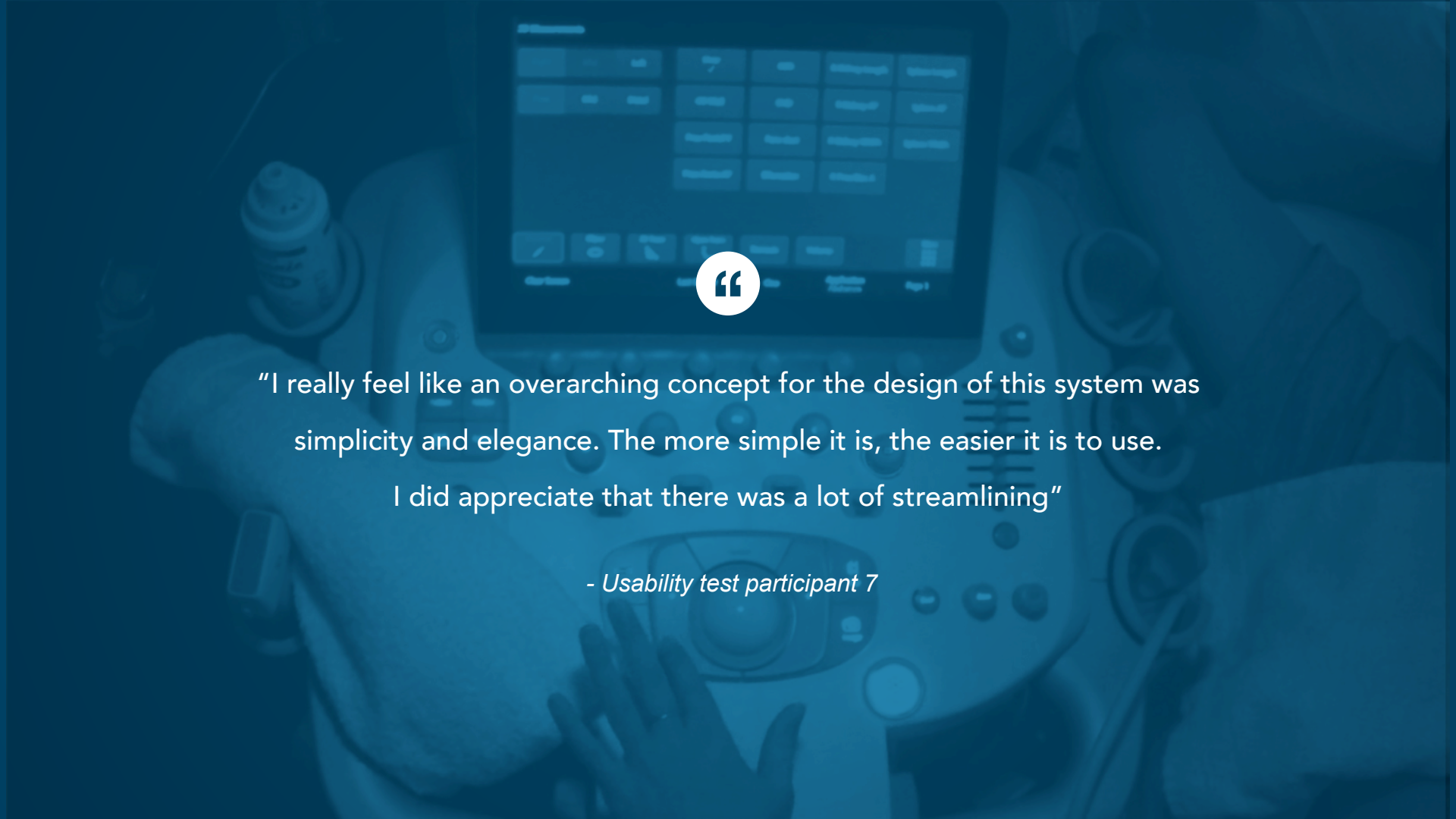
Efficiency

number of deviations, qualitative feedback



Regarding efficiency, few deviations were observed. For example, navigating to an incorrect touch panel screen or interacting unnecessarily with the interface.

A large amount of positive qualitative feedback was collected regarding efficiency of use.



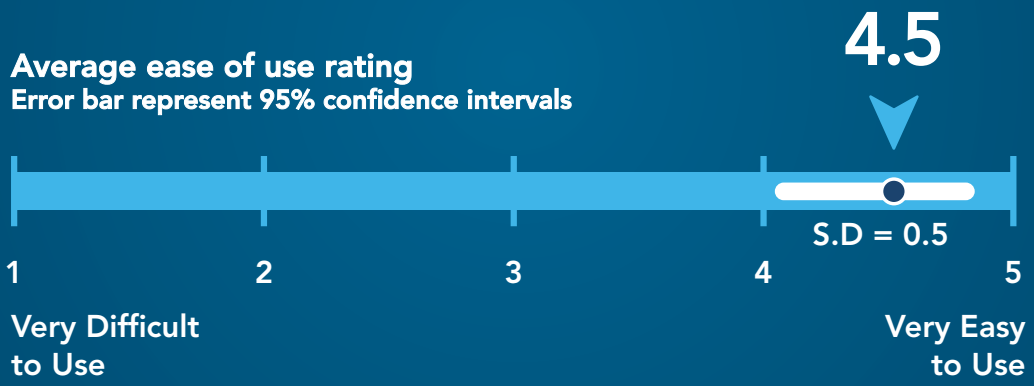
"I really feel like an overarching concept for the design of this system was simplicity and elegance. The more simple it is, the easier it is to use. I did appreciate that there was a lot of streamlining"

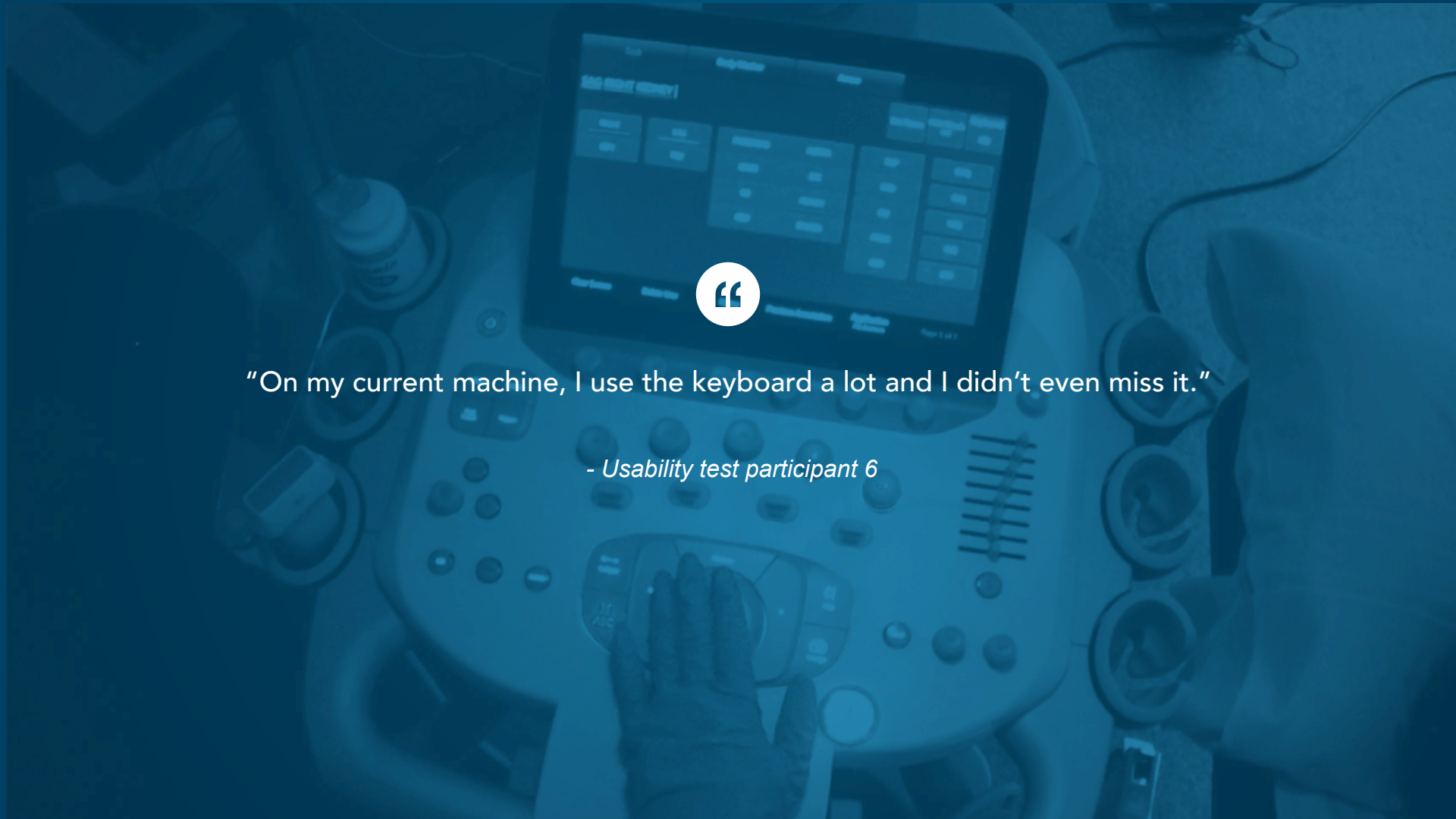
- Usability test participant 7

Satisfaction

ease of use ratings, qualitative feedback

The Siemens system scored very high for ease-of-use and also received a large amount of positive qualitative feedback.



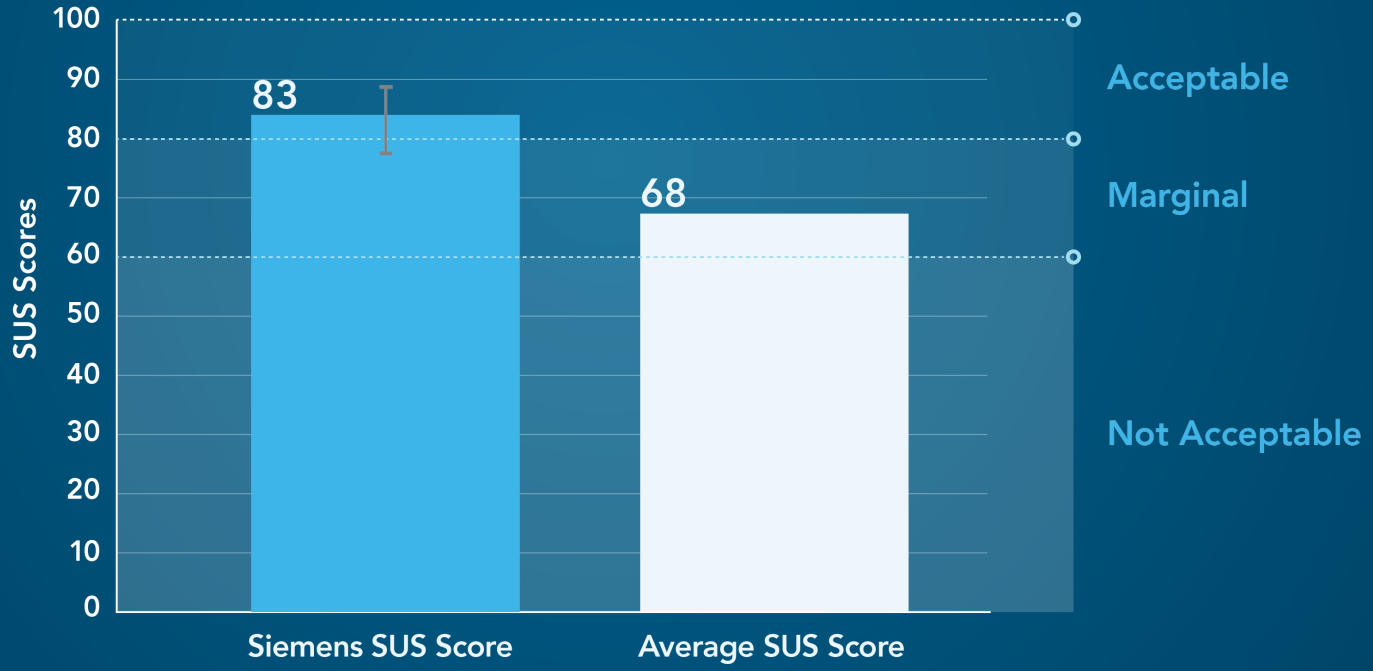


“On my current machine, I use the keyboard a lot and I didn’t even miss it.”

- Usability test participant 6

System Usability Scale

At the end of each usability test, the sonographers completed the industry standard System Usability Scale questionnaire to measure perceived system usability and learnability.



For more information about this research and to learn more about how our test was conducted:

please email us at: info@macadamian.com
please visit: http://www.macadamian.com/work-customer-experience/case-studies-software-application-developer/usability-testing-for-siemens-medical/

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Thank you.