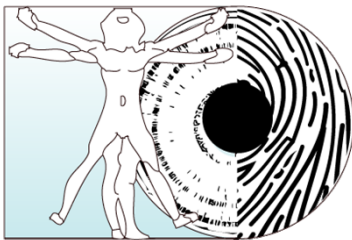


# Factors in Evaluating the Usability of Biometric Systems

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# What is Usability?

## *usability*

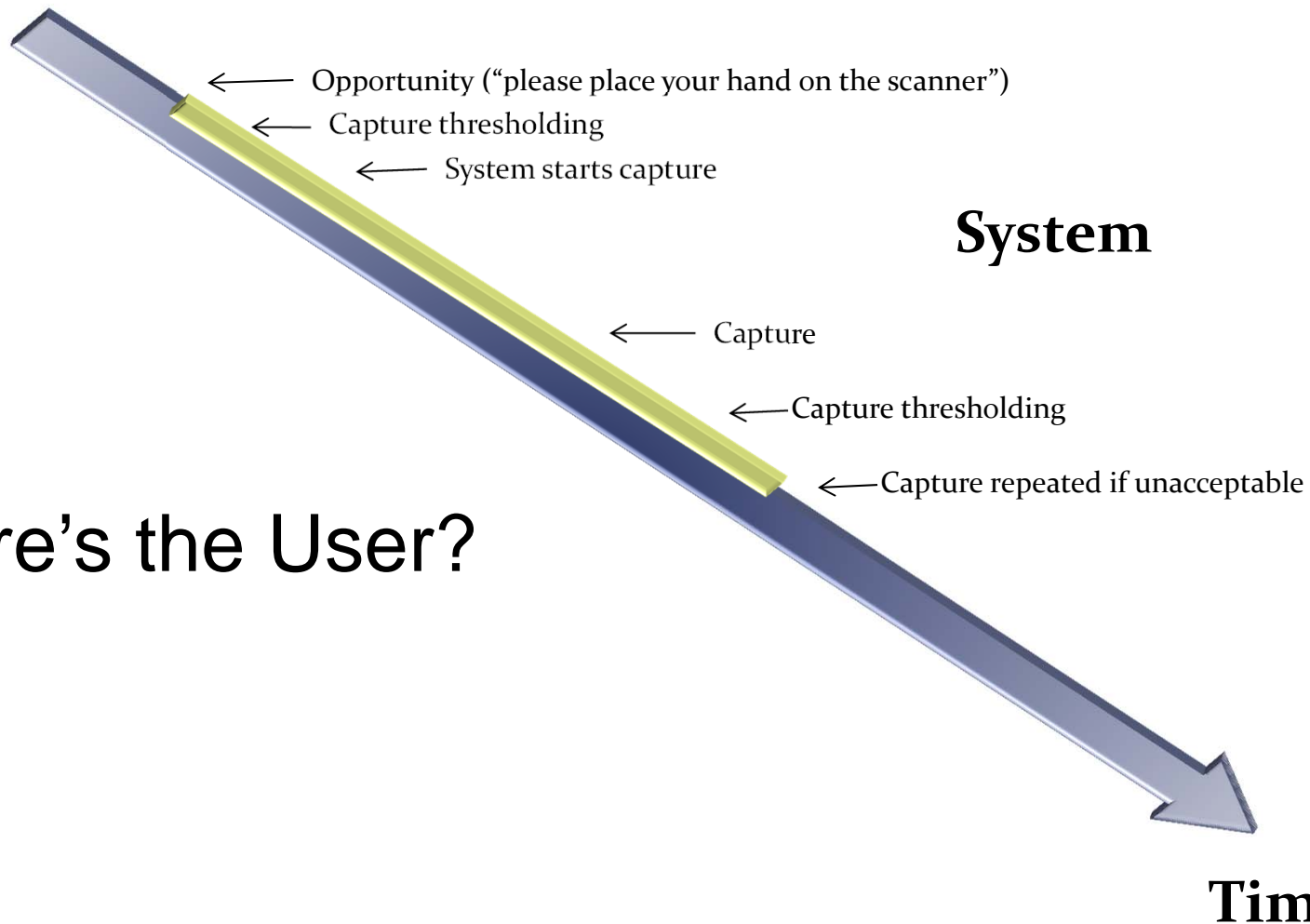
*the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.  
(ISO 9241-11:1998.)*

- Effectiveness: a measure of the accuracy and completeness (quality)
- Efficiency: a measure of the resources expended (task time)
- User satisfaction: the degree to which the product meets the users' expectations—a subjective response

# What differentiates Usability Testing from Performance Testing ?

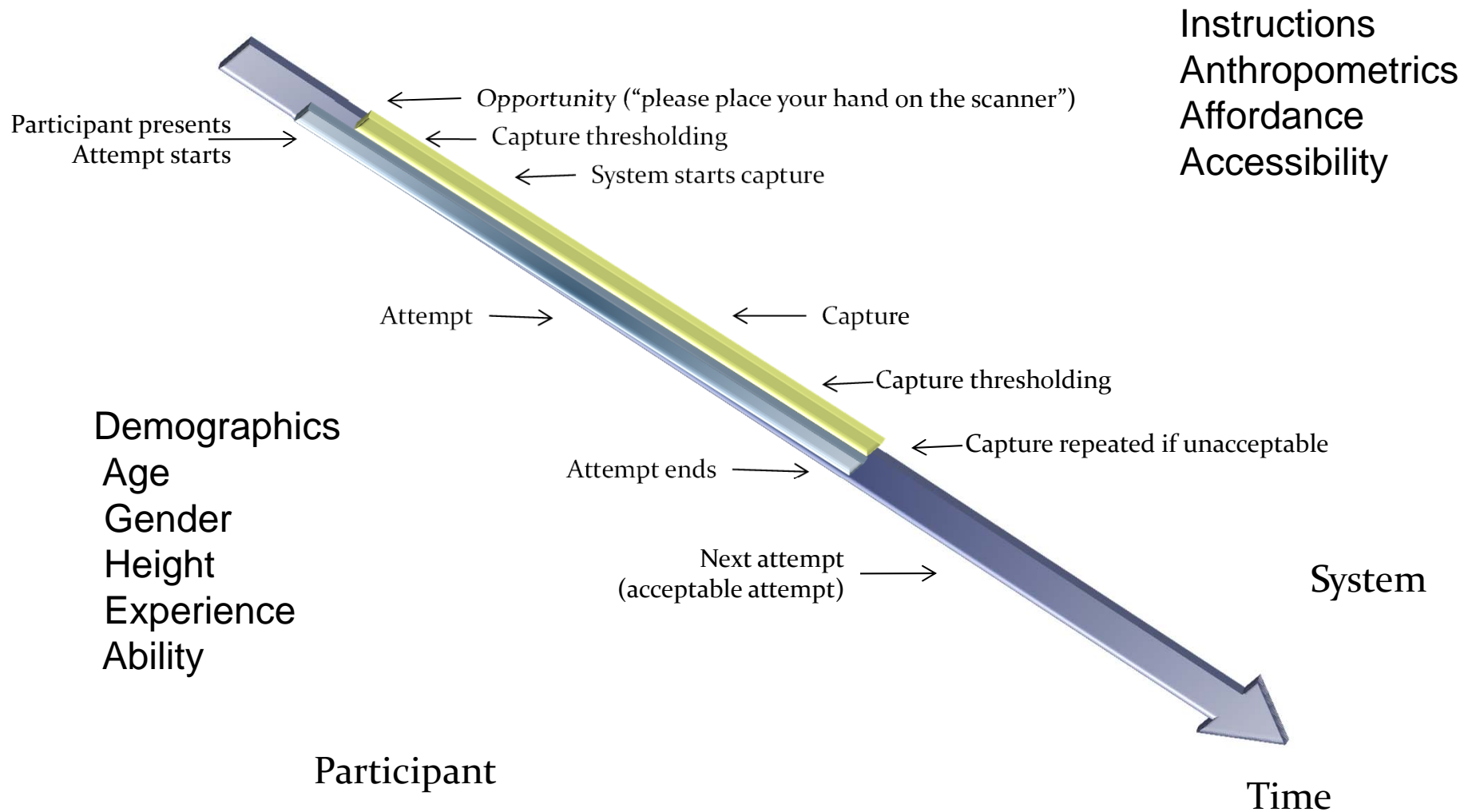
1. Observation
2. Listening
3. Measuring Properties of Affordance
4. Interaction of User and Device
5. Emphasis that Users are not wrong
6. Performance measures are not the whole story

# Traditional Performance View



Where's the User?

# Systems Performance Model



# First Rule: Know thy User

- Understand your users -- Ride along with your PD, sit in an airport and watch
- Observe users in action
- What do and don't they do

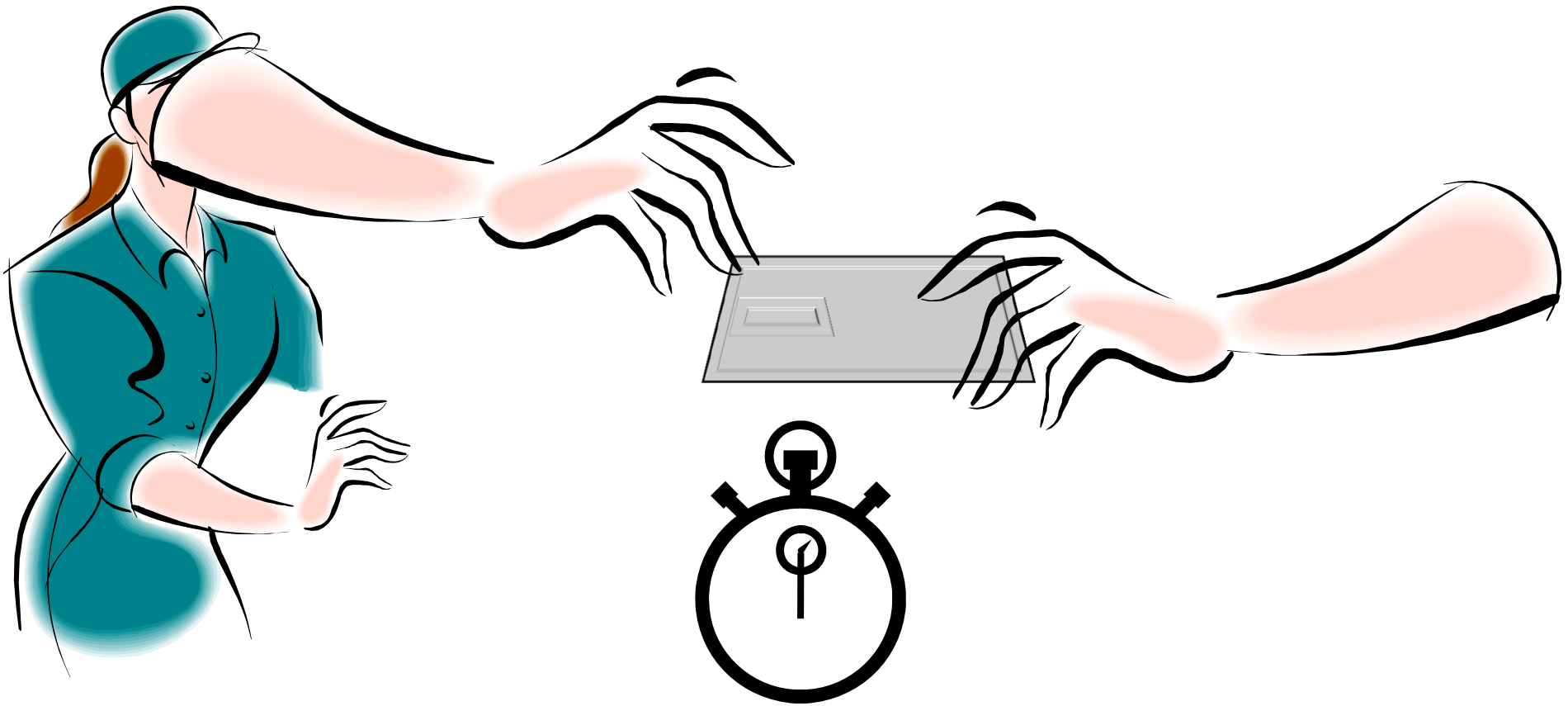




# Determining What to Measure:

Examples:

How long does it take to leave a  
fingerprint?



User Perspective

Technology Perspective

# What did we see, why did they do that?

- Mental Models
- Attitudes
- Behaviors
- Past experiences influence their use

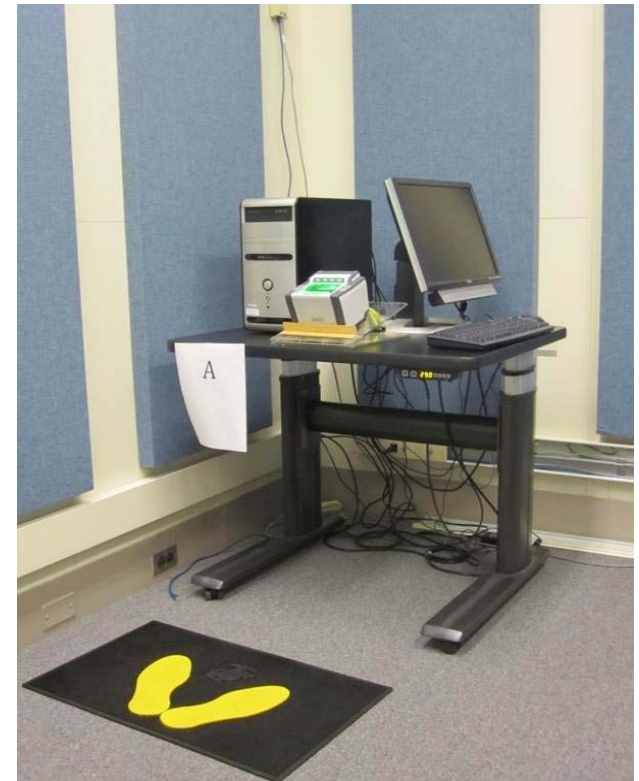
How do you design the study to identify these factors?

Let's look at some examples from testing



# Testing Contactless Scanners

- Task 1: No instructions on use scanners:  
Verbally told to step up on to the mat  
“when you believe the device is ready to  
collect prints” and to step off “when you  
think the device has collected both sets  
of prints”.
- Task 2 : Watched an instructional video,  
then asked to complete the collection  
again using verbal instructions of Task 1.
- Task 3: Detailed verbal instructions  
walking participants through each step  
of collection process.



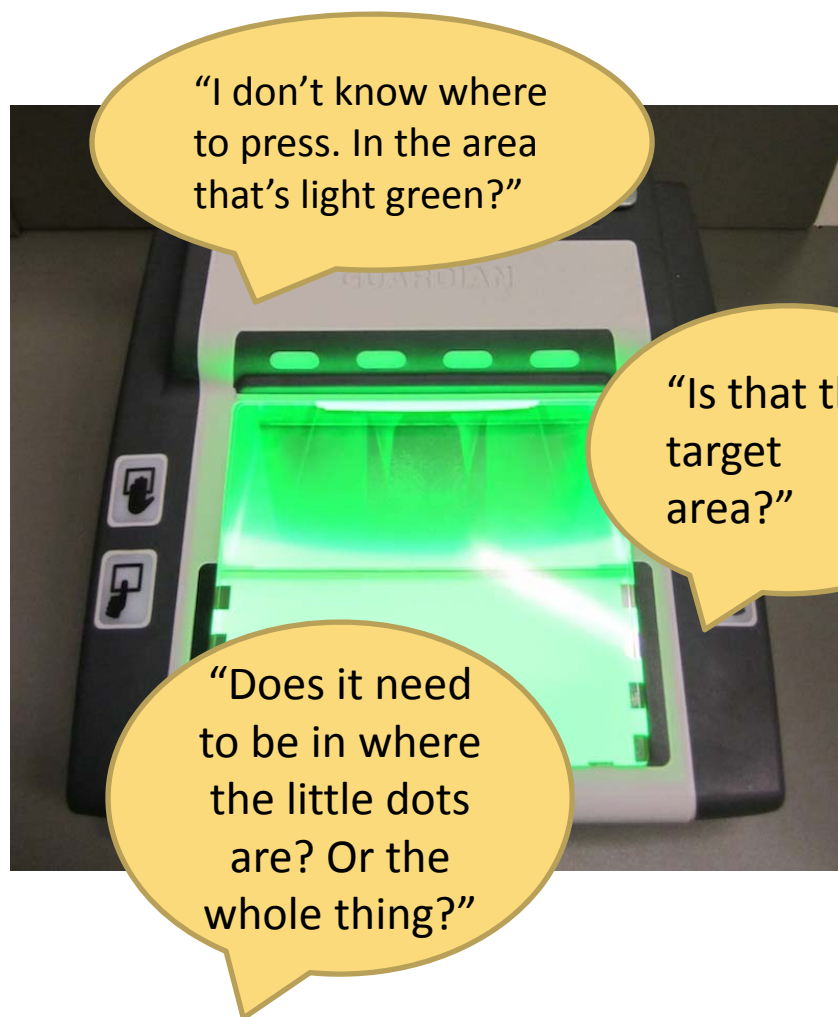
# Mental Models of Fingerprinting



Participants placed their hands on the glass surface of the contactless scanners.

Peoples' Mental Model of Fingerprint Collection involves pressing their fingers against a surface.

# Talk Aloud involves participants telling us what they are doing

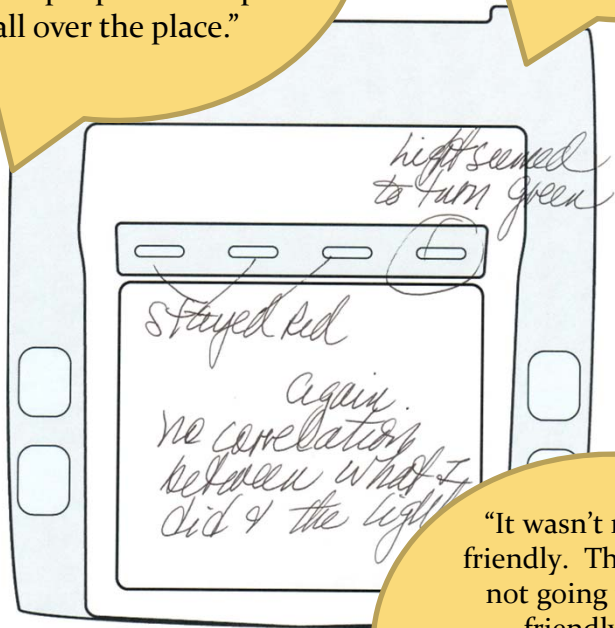


| Captured...             | Number of Participants | Percentage of Participants |
|-------------------------|------------------------|----------------------------|
| Full set of prints      | 10                     | 16.13%                     |
| Some but not all prints | 9                      | 14.52%                     |
| No prints               | 43                     | 69.35%                     |
| Total                   | 62                     | 100%                       |

## Recall Task: please draw on this sheet anything you remember seeing while seeing it do

"There are no instructions. Hope they don't use this machine. They will have people lined up all over the place."

"There were red lights that did not change. It was probably telling me that I was not doing it correctly and there were no instructions about what to do."



"It wasn't really user friendly. The process is not going to be user friendly. I had problems with figuring out what to do. There was nothing to tell me what to do."

| Affordance type | Condition                   | Prints captured |             |             |
|-----------------|-----------------------------|-----------------|-------------|-------------|
|                 |                             | Zero<br>n=43    | Some<br>n=9 | All<br>n=10 |
| LED lights      | Noticed lights              | 38              | 9           | 10          |
|                 | Provide labeling for lights | 37              | 9           | 10          |
|                 | Correct labeling for lights | 4               | 2           | 7           |
| Icons           | Notice icons                | 25              | 2           | 9           |
|                 | Provide labeling for icons  | 23              | 2           | 9           |
|                 | Correct labeling for icons  | 7               | 2           | 9           |
|                 | Notice beep                 | 9               | 8           | 10          |
|                 | Provide description of beep | 8               | 8           | 10          |
|                 | Correct description of beep | 4               | 6           | 10          |

# Observing users positioning



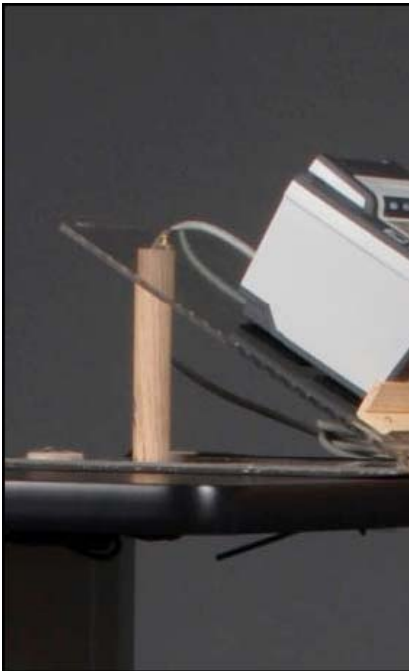
Shorter participants  
struggling with tall counters  
and flat scanners.



Taller participants struggling  
with short counters and the  
30° angle.



## But Also Observed Hand Positioning



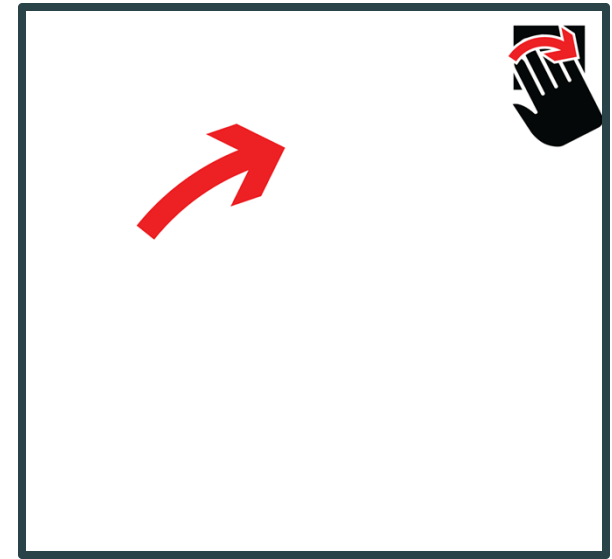
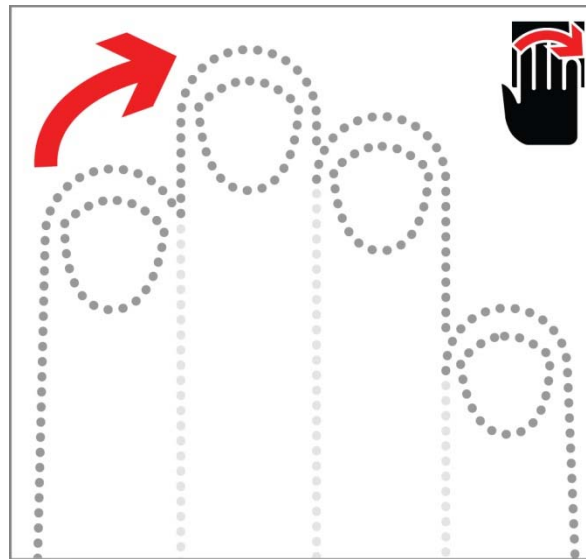
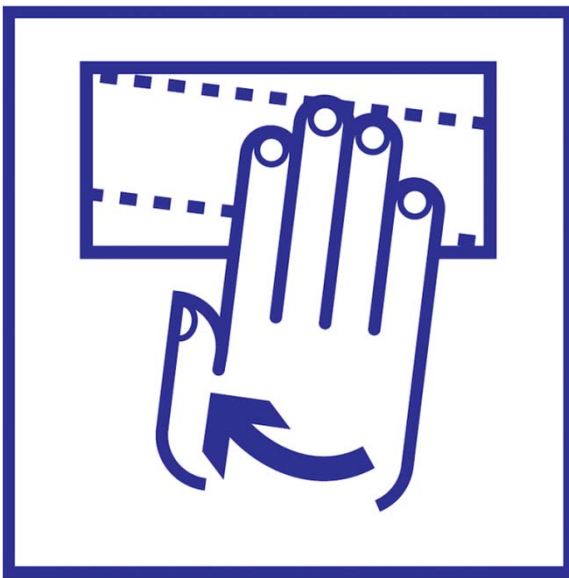
Resulting in Thumb Rotations

# Ask Questions about Impressions

- *"It is less daunting as opposed to when doing it in front of a custom agent. So, it feels less criminal. Before I started, I actually thought it would take a longer process and a lot of re-doings. The instructions were very simple and easy to comprehend. It was an enjoyable process. Everything was very easy to use."*
- *"I like it. It's very user friendly, and easy to follow, so you don't have to do a lot of reading. And, it's right there on the screen so somebody who is even illiterate can say, "move your hand" as the machine kind of indicated. Very easy to follow because you don't have to worry about languages or anything so it'll be easier for anyone just able to follow because they are going by the pictures. It's picture-guided."*



# The Users Are Not Wrong



Keep Refining

# Performance measures are not the whole story

Measure:

- Efficiency – time to collect image, throughput
- Effectiveness – Quality (NFIQ) and number of errors
- Satisfaction – Semantic Difference Scale

But must Pay Attention to the details of user interaction

- Look
- Listen
- Engage

# Contact Information

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Acknowledge: Department of Homeland Security Science  
and Technology for their support of this research