Apex AEER – Evaluating Biometric Exit Concepts of Operations

Jacob Hasselgren

May 5, 2016

CONOPS Configurations

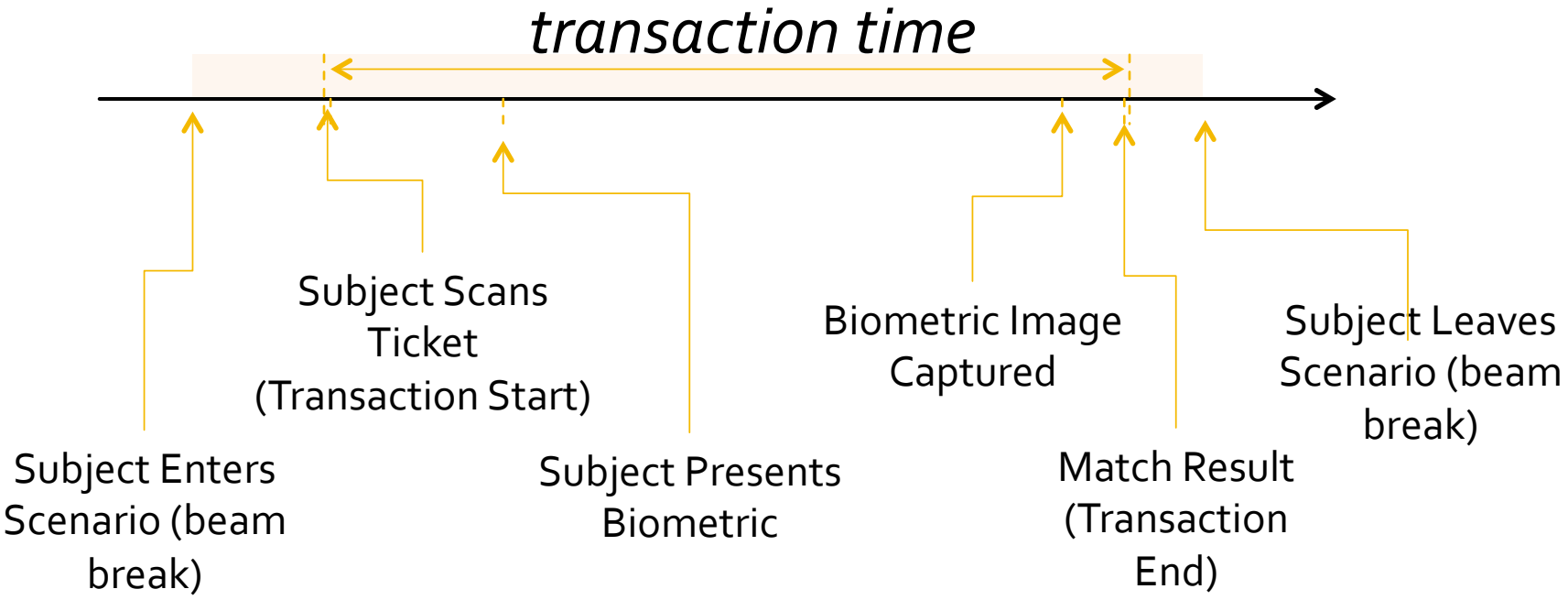
Target Performance Goals

- Should biometrically verify 97% of in-scope travelers
- Should "do no harm" to existing operations
  - Ex: To board a 300 passenger aircraft in under 40 minutes, each transaction must take 8 seconds or less
- Minimize staffing requirements

Success Criteria – Biometric Match Accuracy (Effectiveness)

- Percentage of individuals properly verified at an exit station
- Real time 1:1 (with token)
  - Match results presented to subject before end of transaction
  - Same day matching
- N:N post-processing
  - Bulk matching run after the completion of a sequence
  - Allowed for matches that did not occur in real time (i.e. interoperability, different day matching, multiple algorithms…)

Success Criteria – Transaction Times (Efficiency)



- Time delta between token scan and successful biometric match
- Transaction times used to infer throughput

Success Criteria – Public Satisfaction

- Level of participant acceptance
- Modified System Usability Scale (mSUS)
- Likert Scale
- Calculated a 0-100 score; higher the better

AEER Post Test Interview Questions
AEER Scenario Test Sequence #2

Band Number: _____.

Exit Gate

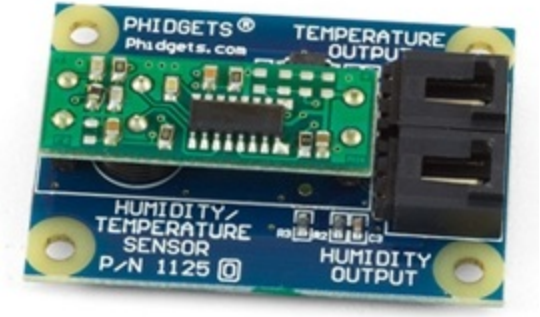
Image of
Device & Gate

		Strongly Disagree				Strongly Agree
1	I think that I would like to use this iris device whenever I travel.	1	2	3	4	5
2	I found the iris device unnecessarily complex.	1	2	3	4	5
3	I thought the iris device was easy to use.	1	2	3	4	5
4	I think that I would need the support of an operator to be able to use this iris device.	1	2	3	4	5
5	I found the iris device to be well integrated into the entry process.	1	2	3	4	5
6	I thought there was too much complexity in the entry process with the iris device.	1	2	3	4	5
7	I would imagine that most travelers would learn to use this iris device very quickly.	1	2	3	4	5
8	I found the iris device very awkward to use.	1	2	3	4	5
9	I felt very confident interacting with the iris device.	1	2	3	4	5
10	I needed many attempts before I figured out how to use the iris device.	1	2	3	4	5

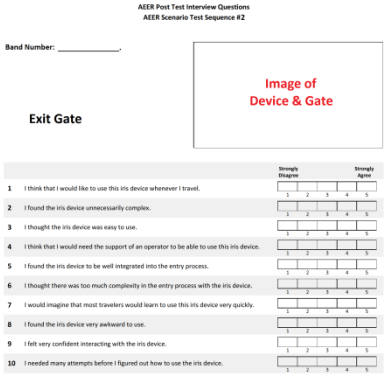
Data Gathering Techniques

Beam Breaks

Audio/Video Recording



Environmental Sensors



AEER Post Test Interview Questions
AEER Scenario Test Sequence #2

Band Number: _____.

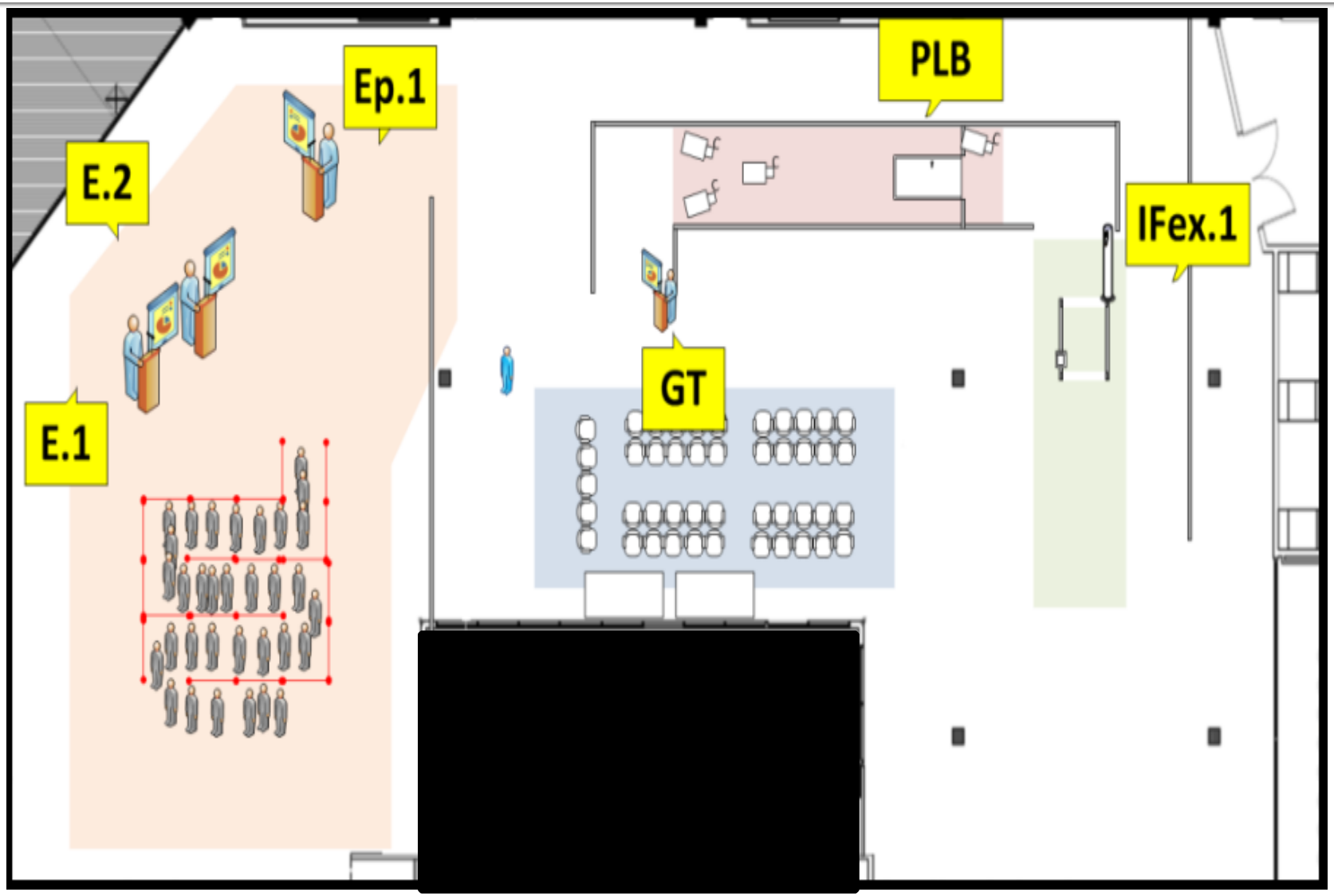
Exit Gate

Image of Device & Gate

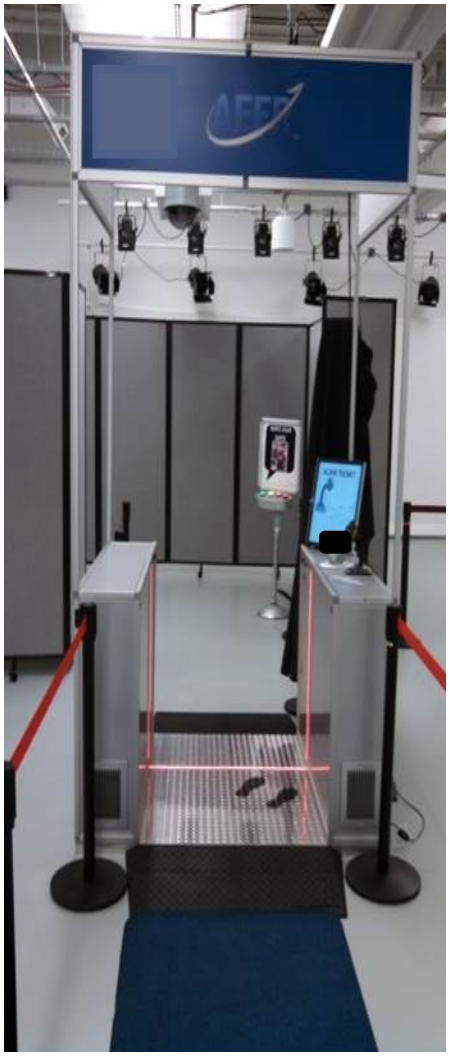
		Strongly Disagree				Strongly Agree
1	I think that I would like to use this iris device whenever I travel.	1	2	3	4	5
2	I found the iris device unnecessarily complex.	1	2	3	4	5
3	I thought the iris device was easy to use.	1	2	3	4	5
4	I think that I would need the support of an operator to be able to use this iris device.	1	2	3	4	5
5	I found the iris device to be well integrated into the entry process.	1	2	3	4	5
6	I thought there was too much complexity in the entry process with the iris device.	1	2	3	4	5
7	I would imagine that most travelers would learn to use this iris device very quickly.	1	2	3	4	5
8	I found the iris device very awkward to use.	1	2	3	4	5
9	I felt very confident interacting with the iris device.	1	2	3	4	5
10	I needed many attempts before I figured out how to use the iris device.	1	2	3	4	5

Surveys

The Maryland Test Facility



The Maryland Test Facility



Test Participants

- 1551 volunteers recruited for the Scenario Evaluation
- Blocked on age, gender, race/ ethnicity and eye color
- Demographically matched to traveling public
- Over 50 different countries of origin represented

Test Progression

Sequence 1

"Initial Characterization of FIS Entry Booths and Self-Service Portals"

Sequence 2

"Screening Additional Biometric Modalities and Methods at a Self-Service Portal"

Sequence 3

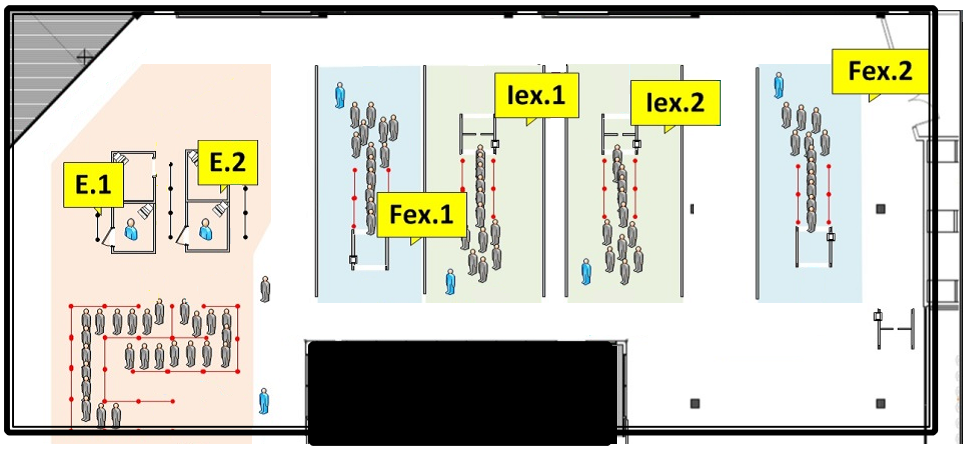
"Evaluate the Impact of Signage and Process at a Self-Service Portal"

Sequence 4

"Evaluate FIS Entry Podiums, Evaluate Optimized PLB, Evaluate Impact of Signage and Feedback at a Self-Service Portal"

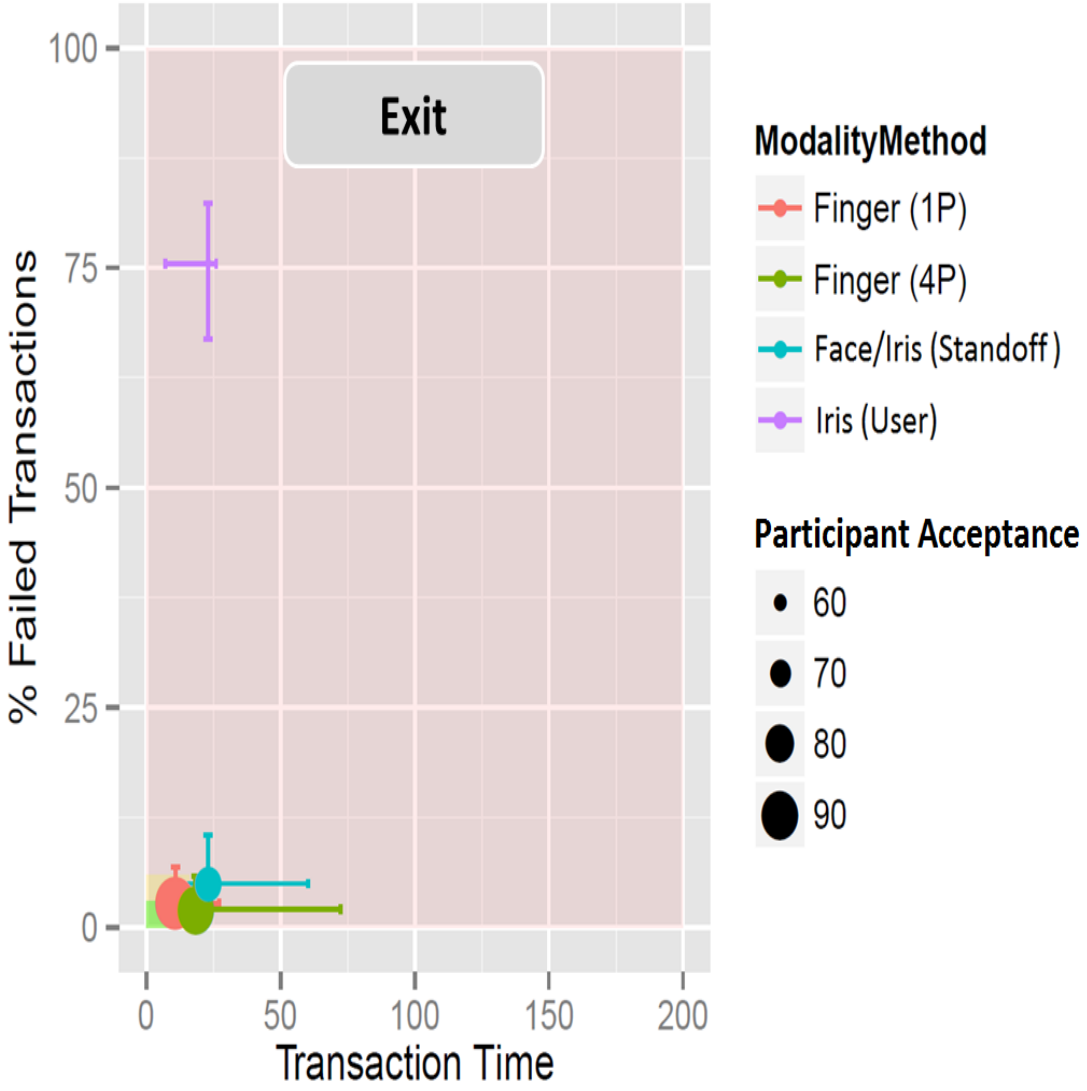
Sequence 1

- Defined and characterized entry and exit CONOP configurations
- Human factors; examined learning
  - Controlled experience with each technology
  - Used scenarios multiple times



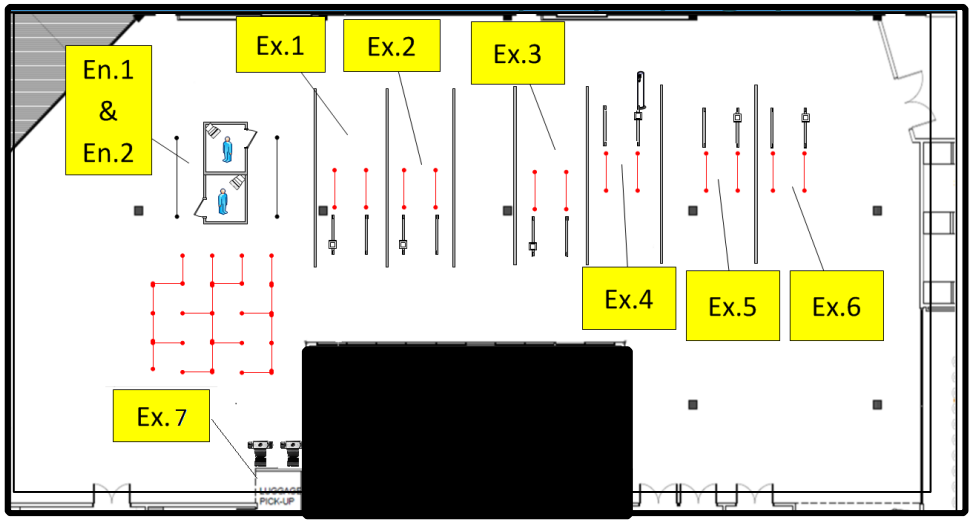
Sequence 1 Takeaways

- Both finger methods performed comparably well, warranted investigation into additional finger methods
- Performance could improve if usability optimizations were made to the standoff iris method
- User positioned iris posed usability challenges (Sirotin)
- Minimal learning effect



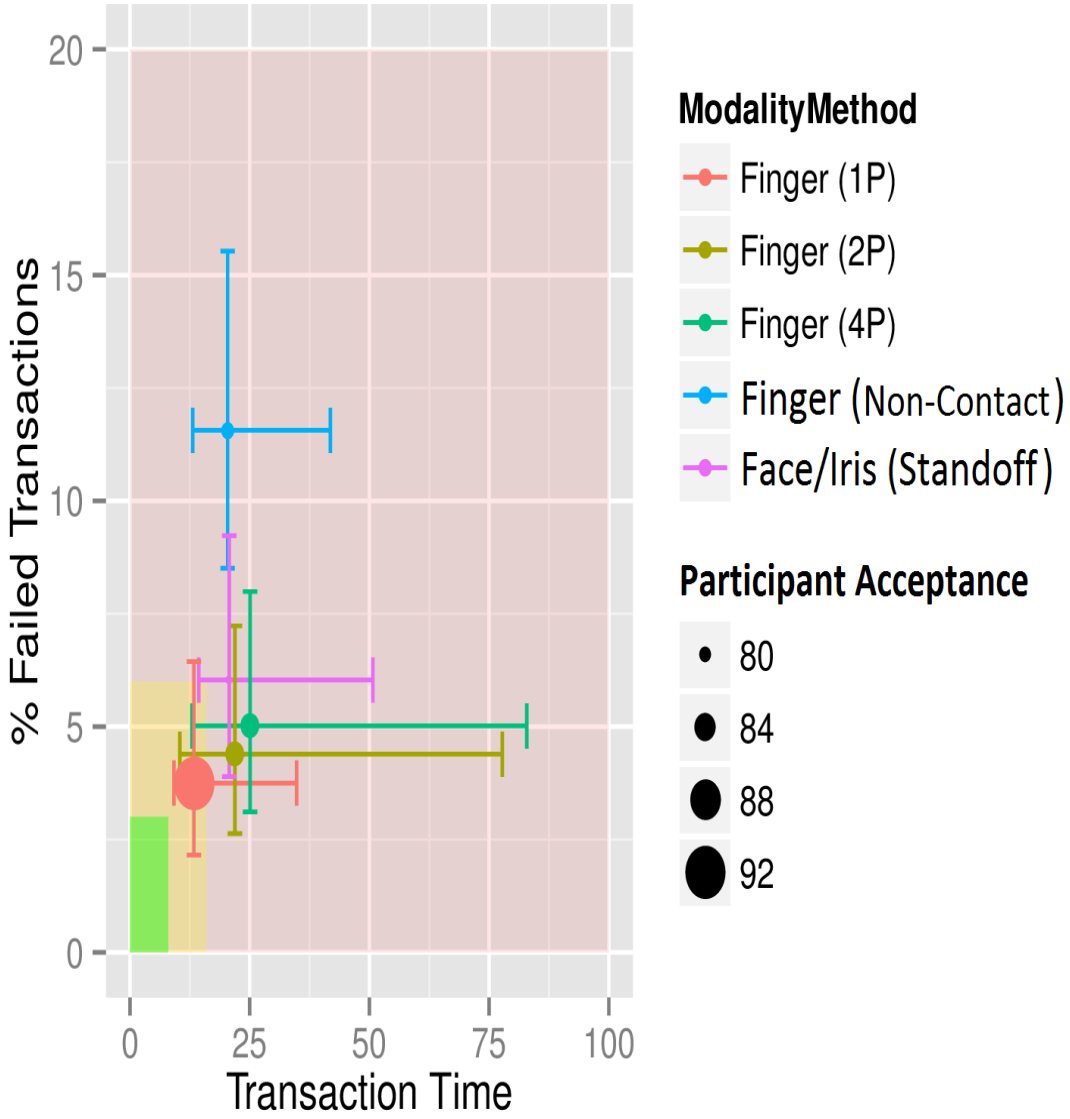
Sequence 2

- Introduced two additional finger methods
- Integrated usability optimizations to standoff iris
- Preliminarily examined the passenger loading bridge configuration and an additional passive face method



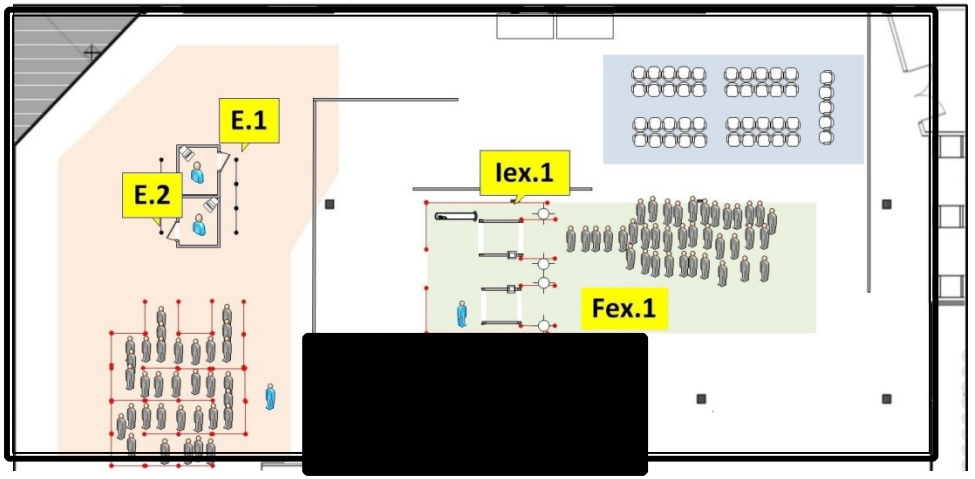
Sequence 2 Takeaways

- Able to differentiate performance between finger methods
- Additional usability optimizations for the non-contact finger could yield performance improvements
- Usability optimizations to standoff iris improved performance



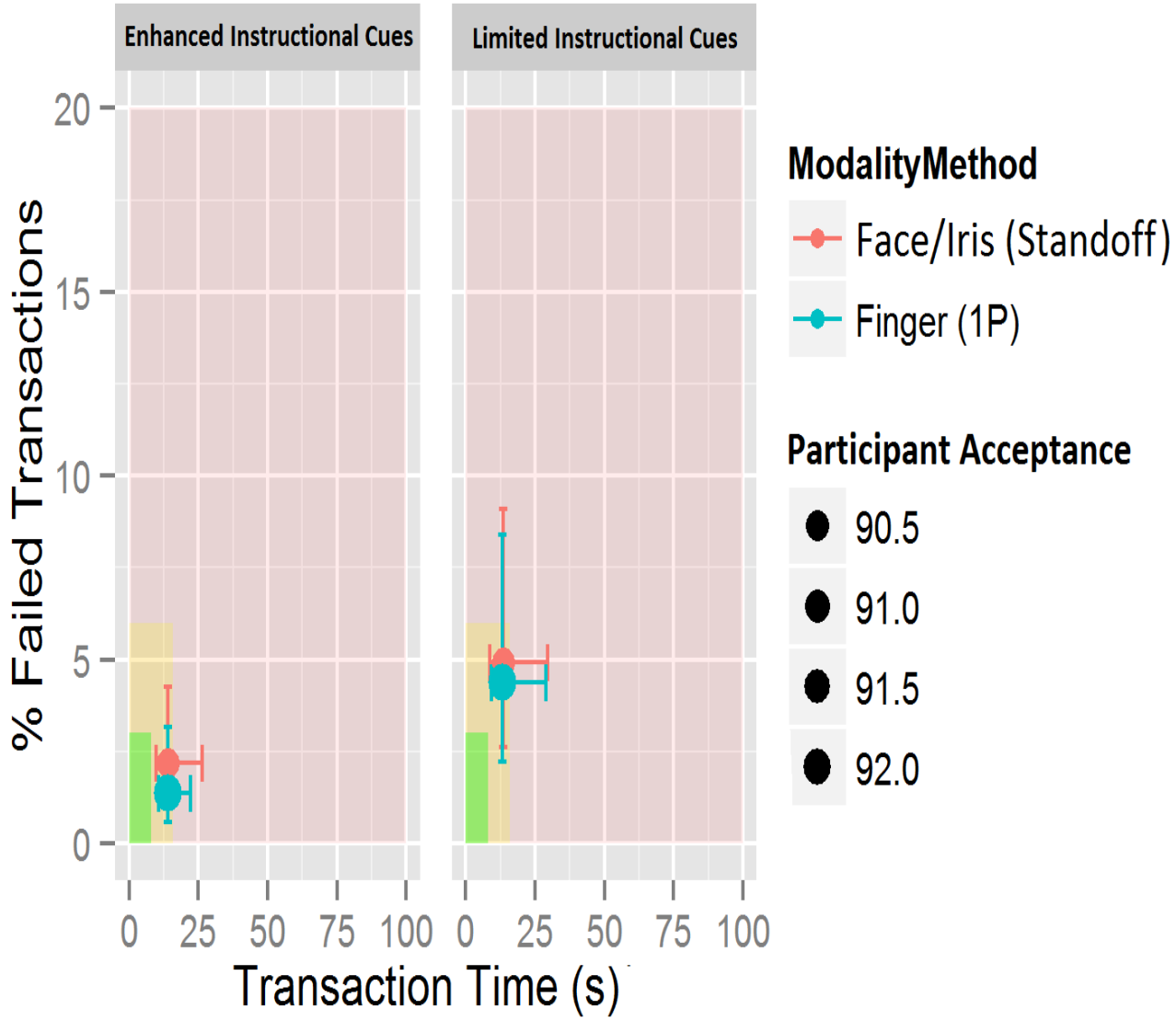
Sequence 3

- Compared different levels of signage/ feedback
- Enhanced instructional cues vs. limited instructional cues



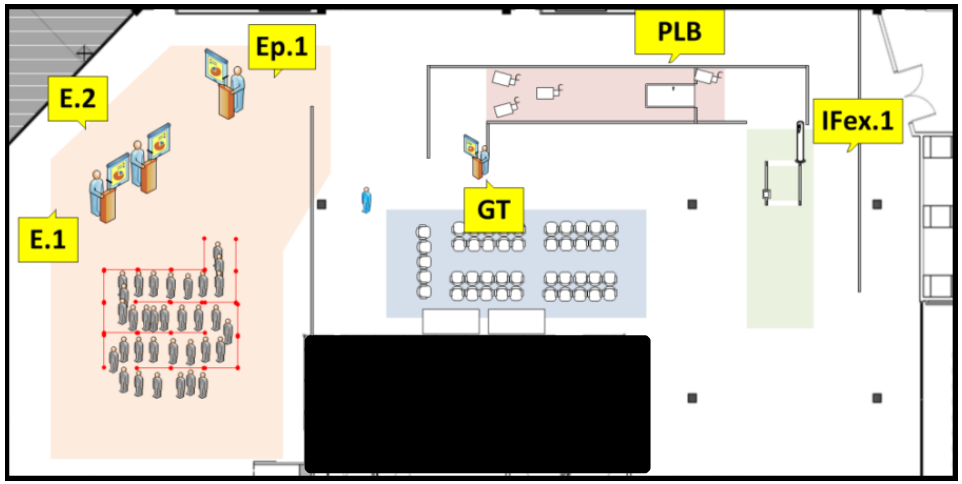
Sequence 3 Takeaways

- Enhanced instructional cues have a notable, positive effect on system performance



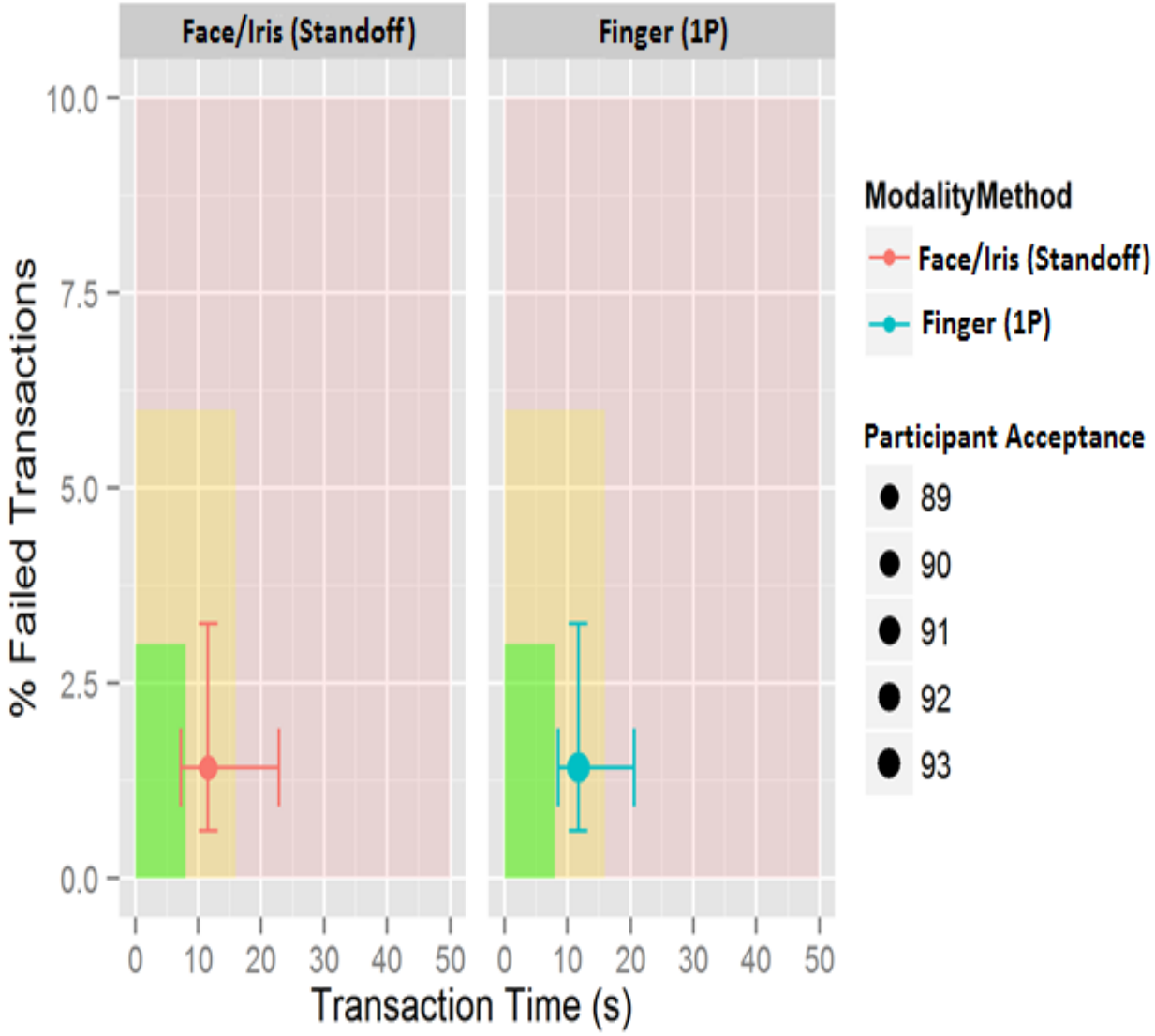
Sequence 4

- Examined the presence of audio cues as an additional method of feedback
- Examined the presence/absence of text within presented signage and feedback



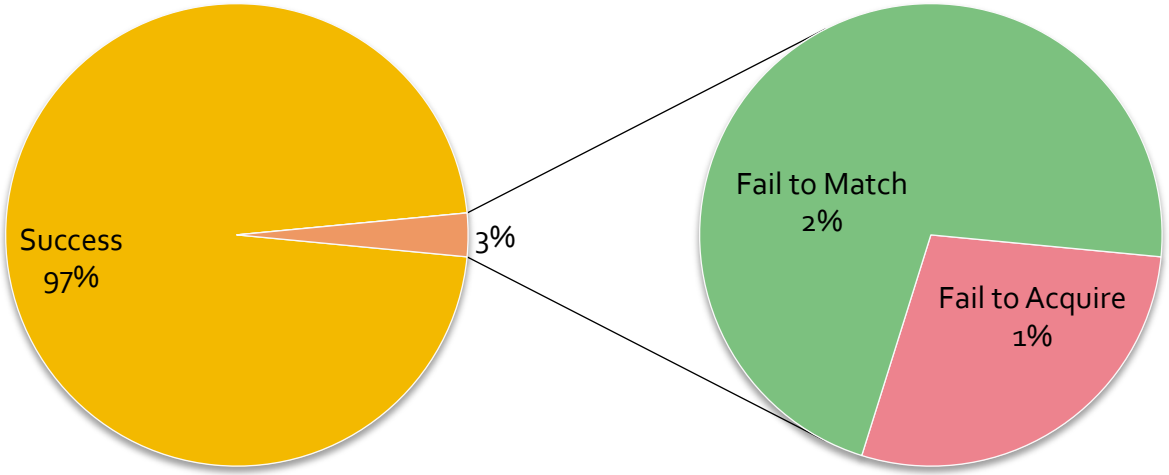
Sequence 4 Takeaways

- The presence of audio and text improved system performance



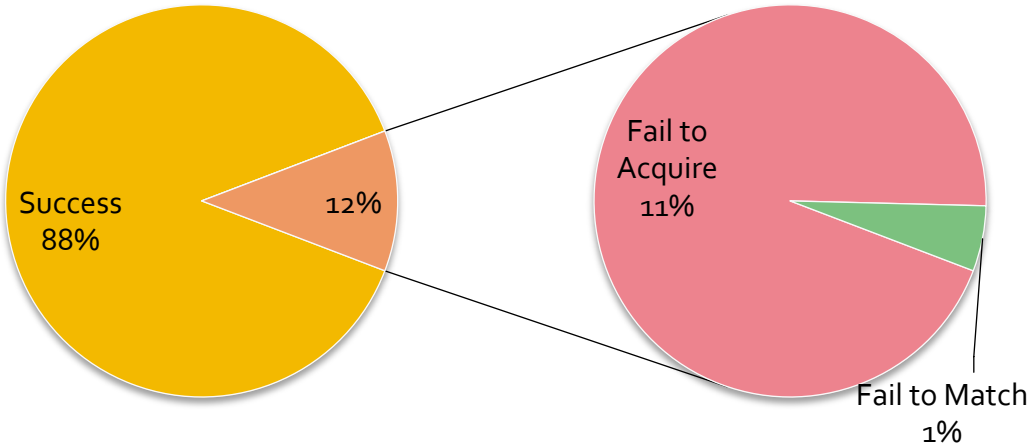
What We Have Learned

- **Some** collection methods **may be viable** for airport operations
  - High biometric verification accuracy and short transaction times due to ample feedback and the accommodation of both naïve and returning volunteers



What We Have Learned

- **Some** collection methods **may not be viable** for airport operations
  - Poor biometric verification accuracy due to high failure to acquire rates for naïve subjects
  - The scenarios that did not meet the targeted performance levels were mainly due to usability issues



- **Instruction cues and process** play an **important role** in biometric collection
  - Must convey clear understanding of needed action

Outcome

- **Select combinations of CONOP configuration, biometric modality/ method and traveler process can meet a 97% biometric true accept rate and produce average boarding transaction times to support boarding 300 passengers in 40 minutes, for in-scope departing travelers.**

Thank you.

The research for this presentation was fully funded by the Department of Homeland Security Science and Technology Directorate on contract number W911NF-13-D-0006-0003.