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Performance Measurement in ABC and Surveillance Scenarios

- Why Automated Border Clearance
- What are ABC Performance measures
- How well do ABC implementations perform
- How well can passive (surveillance) ABC perform
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Why Automated Border Clearance

The Border Control challenge

Facilitate legitimate travel and trade without compromising security or privacy in a cost effective manner

...with increasing demand and limited resources
Why Automated Border Clearance

eGates can authenticate identity claims to assist officials in the inspection process...

- Face, finger, iris,...
- eMRTD, MRTD, no token,...
- One stage, two stage,...
- One door, two door,...
- etc.

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Why Automated Border Clearance

Other types of ABC systems can be used to authenticate identity claims to assist officials in the inspection process...
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What are ABC Performance measures

Document Processing
- Failure to read
- Speed to read
- Failure to detect an illegitimate document
- Failure to accept a legitimate document
- User error

Biometric Processing
- Failure to acquire
- Speed to acquire
- Failure to enroll (sample quality)
- Speed of comparison
- Failure to detect an imposter (FAR)
- Failure to accept a genuine (FRR)

Liveness Detection
- Speed to process
- Failure to detect an attack
- Failure to accept a legitimate sample

Officer Oversight
- False alarms require manual inspection
- False accepts impact security

Utilization
- Outreach (who can use)
- Coverage (how many can use)
- Location (main flow)
- Intuitive
- Availability

Satisfaction
- Speed, Ease-of-Use, Privacy-sensitive
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How well do ABC implementations perform

ABC Outreach, Placement and Configuration

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How well do ABC implementations perform

Overall Processing

In a typical ABC analysis report, over a 1 month period, we see:

<table>
<thead>
<tr>
<th>Passenger Processing</th>
<th>Transactions Count</th>
<th>End-to-end (sec)</th>
<th>To Decision (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Passengers</td>
<td>51276</td>
<td>17.4</td>
<td>9.1</td>
</tr>
<tr>
<td>Success Rate</td>
<td></td>
<td>7.8</td>
<td>4.7</td>
</tr>
<tr>
<td>Successful Median Average</td>
<td></td>
<td>86.0</td>
<td>112.6</td>
</tr>
<tr>
<td>Fastest successful transaction</td>
<td>48527</td>
<td>15.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Slowest successful transaction</td>
<td></td>
<td>17.4</td>
<td>9.1</td>
</tr>
<tr>
<td>Successful 1st Quartile</td>
<td></td>
<td>21.4</td>
<td>12.5</td>
</tr>
<tr>
<td>Successful 2nd Quartile</td>
<td></td>
<td>86.0</td>
<td>112.6</td>
</tr>
<tr>
<td>Successful 3rd Quartile</td>
<td></td>
<td>7.7</td>
<td>5.1</td>
</tr>
<tr>
<td>Successful 4th Quartile</td>
<td></td>
<td>181.3</td>
<td>182.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measure</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Throughput Day</td>
<td>2402</td>
<td>Passengers per day</td>
</tr>
<tr>
<td>Max Throughput 15 Mins</td>
<td>94</td>
<td>Passengers per 15 mins</td>
</tr>
</tbody>
</table>
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How well do ABC implementations perform

Utilization

The percentage of eligible travelers who use the ABC is dependent on factors such as ease-of-use, availability, outreach, and – location, location, location. If not part of the primary process flow, ABC systems will not get the expected traffic

<table>
<thead>
<tr>
<th>January 2014</th>
<th>Monthly eGate Transactions</th>
<th>Eligible Passengers</th>
<th>% of eligible</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHR T1</td>
<td>71,271</td>
<td>146,136</td>
<td>48.8</td>
</tr>
<tr>
<td>LHR T3</td>
<td>125,458</td>
<td>250,294</td>
<td>50.1</td>
</tr>
<tr>
<td>LHR T4</td>
<td>77,682</td>
<td>154,437</td>
<td>50.3</td>
</tr>
<tr>
<td>LHR T5</td>
<td>152,965</td>
<td>307,481</td>
<td>49.7</td>
</tr>
<tr>
<td>Gatwick South</td>
<td>136,343</td>
<td>258,829</td>
<td>52.7</td>
</tr>
<tr>
<td>Overall eGate usage</td>
<td><strong>563,719</strong></td>
<td><strong>1,117,177</strong></td>
<td><strong>50.5%</strong></td>
</tr>
</tbody>
</table>

NOTE
UK: Mixed eligibility groups
NL: Similar metrics; eGates not currently in primary flow; must detour to use. Plan to reconfigure in the next few months
End-to-End Transaction Time: Multiple influencers impact overall transaction time; the user, the technology, and the environment to name a few.
Document Processing

The overall average passport reading time was 5.93 seconds.
Document Processing

In one ABC study which included the processing of 216,546 travel documents that were processed:

<table>
<thead>
<tr>
<th>FAILURE RATE</th>
<th>FAILURE DESCRIPTION</th>
<th>FAILURE REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.13%</td>
<td>Background Check</td>
<td>Blacklisted traveler</td>
</tr>
<tr>
<td>3.41%</td>
<td>Document is not an ePassport</td>
<td>User Error</td>
</tr>
<tr>
<td>1.20%</td>
<td>Passive Authentication Failure</td>
<td>Some Country Signer Certificates were not available</td>
</tr>
<tr>
<td>0.67%</td>
<td>Document MRZ data differs from Electronic data</td>
<td>Typically Read Error due to OCR problem</td>
</tr>
<tr>
<td>0.52%</td>
<td>Document Issued to a Traveler Under 18</td>
<td>User Error</td>
</tr>
<tr>
<td>0.27%</td>
<td>Document MRZ Checksum is Invalid</td>
<td>Typically Read Error due to OCR problem</td>
</tr>
<tr>
<td>0.11%</td>
<td>Document Issued to a Non-EEA National</td>
<td>User Error</td>
</tr>
<tr>
<td>0.01%</td>
<td>Document not a Passport (ID Card, Residence Permit, etc.)</td>
<td>User Error</td>
</tr>
<tr>
<td>0.07%</td>
<td>Document Issued by a Non-EEA Country</td>
<td>User Error</td>
</tr>
<tr>
<td>0.02%</td>
<td>Document Expired</td>
<td>User Error</td>
</tr>
</tbody>
</table>
Overall Processing

In a typical ABC analysis report, over a 1 month period, we see a breakdown of UNSUCCESSFUL transactions:

**Failure by Reason**

- Document Placement Error: 44%
- Visual Authentication Error: 20%
- Passenger too young: 0%
- Chip was not captured: 4%
- Document face to Chip face match failed: 0%
- Live face to Chip face match failed: 4%
- Nationality not allowed / recognised: 1%
- Other: 10%

**Border Service:** 17%

**NOTE:**

Passengers will be allowed to try twice; after the second attempt, it will result in manual inspection on the spot

*Improved instructional video and animations inside the gate.*
Biometric matching error rates are sensitive and the government agencies we are working with did not wish to share this information to the general public.

That said, the error rates are in line with Frontex’s *Best Practice Technical Guidelines for Automated Border Control (ABC) Systems*, where their recommendations are:

**FACE:** FAR 0.1%, FRR 5%

*The configuration of the face verification algorithm SHALL ensure a security level in terms of the False Accept Rate (FAR) of at least 0.001 (0.1 per cent). At this configuration (comparison threshold) the FRR SHOULD NOT exceed 0.05 (5 per cent). It is RECOMMENDED that the achievable performance of the face verification algorithm is measured by an independent test laboratory or an official agency. The operating agency SHOULD NOT rely on performance figures given by the algorithm provider only.*

**FINGER:** FAR 0.1%, FRR 3%

*The configuration of the fingerprint verification algorithm SHALL ensure a security level in terms of FAR of 0.001 (0.1 per cent). At this configuration (comparison threshold) the FRR SHOULD NOT exceed 0.03 (3 per cent).*
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How well can passive (surveillance) ABC perform

1 - Passenger Timing

- Passenger Journey
  - Location A
  - Location B

- FitC Steps
  - Face captured
  - Anonymous passenger record created
  - Face captured
  - If identified against an enrollment made at Location A, journey time is determined and the passenger record deleted.

2 - Face Watchlisting

- Passenger Journey
  - Location A

- FitC Steps
  - Enrollment
  - Identification
  - Passenger’s face is captured and matched against a pre-defined watchlist. If there is a match, an alert is raised.

3 - Forgotten Origin

- Passenger Journey
  - Air Bridge
  - Immigration desk

- FitC Steps
  - Face captured
  - Anonymous passenger record created
  - Face captured manually by BFO, and matched against database of arriving passengers. If a match is obtained then the passenger can be traced back to a specific flight.

4 - Passive Identification

- Passenger Journey
  - Pre-Clearance Kiosk or Mobile Device
  - Immigration Fast-Lane

- FitC Steps
  - Face captured, documents authenticated
  - Passenger record created
  - Face captured
  - If correctly identified and authenticated, the Fast-Lane will allow the passenger to exit. Otherwise the passenger is instructed to go to an Immigration desk for manual processing.

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How well can passive (surveillance) ABC perform

<table>
<thead>
<tr>
<th>CSF</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture Rate</td>
<td>≥70%</td>
<td>75%</td>
</tr>
<tr>
<td>TPIR</td>
<td>≥10%</td>
<td>12.5% / 11.3%</td>
</tr>
<tr>
<td>FNIR</td>
<td>≤2%</td>
<td>1.4% / 0.0%</td>
</tr>
</tbody>
</table>

1 - Passenger Timing

<table>
<thead>
<tr>
<th>CSF</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture Rate</td>
<td>≥70%</td>
<td>78%</td>
</tr>
<tr>
<td>TPIR</td>
<td>≥90%</td>
<td>100%</td>
</tr>
<tr>
<td>FNIR</td>
<td>≤1%</td>
<td>0%</td>
</tr>
</tbody>
</table>

2 - Face Watchlisting

<table>
<thead>
<tr>
<th>CSF</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture Rate</td>
<td>≥90%</td>
<td>Unknown</td>
</tr>
<tr>
<td>TPIR</td>
<td>≥95%</td>
<td>100%</td>
</tr>
<tr>
<td>FNIR</td>
<td>&lt;0.5%</td>
<td>0%</td>
</tr>
</tbody>
</table>

3 - Forgotten Origin

<table>
<thead>
<tr>
<th>CSF</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 – Passive Identification
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