Empirical Measurement of Systemic 2FA Usability

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Two-Factor Authentication

- 96% of executives predict expanding their use of 2FA\(^1\)
- Cisco Acquired Duo Security for $2.35 Billion\(^2\)

What are the organizational impacts of 2FA?
What are the organizational impacts of 2FA?

How do impacts vary with system design decisions?
How much time does 2FA consume?
What are the greatest error causes?
What are the impacts of errors?
What burdens tech support?
How quickly do new users learn?
Are demographics burdened unequally?
How much time does 2FA consume?
What are the greatest error causes?
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<table>
<thead>
<tr>
<th></th>
<th>6.2M</th>
<th>31.3M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time</strong></td>
<td>9 months</td>
<td>12 months</td>
</tr>
<tr>
<td><strong>Support Tickets</strong></td>
<td>6.7K</td>
<td>-</td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td>✔️</td>
<td>-</td>
</tr>
</tbody>
</table>
How much time does 2FA take?
How much time does 2FA take?

- **UIUC**
  - 29.5K hrs/yr
  - 23 min/yr per user

- **UCB**
  - 37.4K hrs/yr
  - 15.6 min/yr per user
On the order of tens of minutes/yr per user
“Remember Me” vs Session Timeouts
“Remember Me” vs Session Timeouts

● UIUC
  ○ Longer web session timeouts
  ○ 60% fewer auths per user than UCB
“Remember Me” vs Session Timeouts

- **UIUC**
  - Longer web session timeouts
  - 60% fewer auths per user than UCB

- **UCB**
  - 30 day “Remember Me” (opt in)
  - waived ~70% of 2FA auths
Errors

● 10-20% of 2FA ceremonies fail
● Most common error types:
  ○ Cancellation & Timeouts
  ○ Invalid Code
● Most erring 2nd factors:
  ○ Phone Call & SMS
  ○ Using Recovery Codes
# Most Common Tech Support Issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Prevalence at UIUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolling a 2FA device</td>
<td>34.4%</td>
</tr>
<tr>
<td>Update enrolled devices</td>
<td>13.8%</td>
</tr>
<tr>
<td>Phone Call or SMS 2FA issue</td>
<td>10.2%</td>
</tr>
<tr>
<td>Device lost or nonfunctional</td>
<td>8.4%</td>
</tr>
<tr>
<td>Account recovery issues</td>
<td>8.2%</td>
</tr>
</tbody>
</table>
Distribution of Error Recovery Time

Recovery Time (log scale)

User Fraction

UIUC Mean
UIUC Median
UCB Mean
UCB Median

10s  2m  30m  3h  24h  2w
Distribution of Error Recovery Time

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Recovery Time (log scale)

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UIUC Mean
UIUC Median
UCB Mean
UCB Median

0 0.2 0.4 0.6 0.8 1

10s 2m 30m 3h 24h 2w
Possible productivity loss
2FA costs tens of minutes/yr per user

Minimize user burden by tuning “Remember Me” and web session timeouts

Avoid SMS/Phone 2FA

Productivity impacts