I Don’t Use Apple Pay Because It’s Less Secure ...: Perception of Security and Usability in Mobile Tap-and-Pay

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Apple Pay

• In October 2014, Apple launched iPhone 6 and Apple Pay

• Marketing pitch was: tap-and-pay with iPhones in stores is faster and more secure

• Apple Pay quickly became the biggest tap-and-pay mobile payment system in the US
  • Accounting for $2 out of every $3 processed through contactless payment
Apple Pay notches 3 of every 4 contactless payments in US, says CEO Tim Cook

Even as Apple grapples with lower iPhone sales, its mobile payments service continues to make gains.

Apple Pay is the leader in contactless payments in the US, according to CEO Tim Cook.

Cook touted the performance of the Apple Pay service on Tuesday during a conference call to discuss the company’s financial results last quarter. Though Apple continues to grapple with lower iPhone and iPad sales, Apple Pay is one area that’s growing, both in the US and abroad.

Apple’s CEO said that 3 million retail locations in the US now accept Apple Pay, which lets you make a purchase by simply waving your phone near certain point-of-sale registers — hence the term “contactless.”

The service is also available in nine other countries, and more than half of Apple Pay transactions now originate from non-US markets, Cook added, according to a transcript from Seeking Alpha.
Android Pay

• Google launched their own mobile payment solution called Android Pay around September 2015

• Also claiming that Android Pay is more convenient and secure than swipe-and-pay with traditional credit cards
Research questions

• How popular are the two technologies?

• Why do people use or not use them? How important are security and usability factors in affecting people’s decisions?

• What are specific usability and security concerns?

• Are there any security or usability misconceptions?
First study: in-person interviews

- Conducted semi-structured interviews to identify hypotheses

- Conducted on two different participant pools within the US:
  - 21 participants from a university
  - 15 participants through online advertisements (e.g., Craigslist)

- Conducted by two researchers together to ensure all questions were asked consistently
  - Average time taken was 35 minutes
  - Separately performed thematic analysis of each interview, independently creating list of themes (“codes”)
Interview questions

• **Usage:** we asked about their familiarity with Apple (Android) Pay, and whether they use it to pay in stores

• **Why use or not use**
  • Asked why they use, not use, or stopped using Apple (Android) Pay
  • Asked how they feel about security and usability

• **Familiarity with security:** asked whether they understand
  • How Apple (Android) Pay protect their tap-and-pay transaction privacy and security
  • How it protects card details
  • How it ensures only they can pay with their phone
Apple Pay results

• After merging the codes from both groups, the three dominant factors for using Apple Pay were
  • More secure (12)
  • Faster (11)
  • More convenient (12)

Hypothesis 1: usability is a more important factor than security for using Apple Pay
“It’s more convenient.. rather than taking my wallet, finding my card, and swiping it..” (P7)

“.. you have to .. authorize [its use] with the thumb print. So that makes [Apple Pay] very secure.” (P13)
Apple Pay results

• For not using Apple Pay the dominant factors were
  • Not many stores support it (6)
  • Less secure (6)

Hypothesis 2: security is a more important factor than usability for not using Apple Pay
“It is not obvious where you can and cannot use Apple Pay” (P1)

“If my PIN is compromised, I can reset it to another PIN. But my biometric information cannot be reset..” (P14)
Android Pay results

- For using Android Pay the dominant factors were
  - More convenient (4)
  - More private (4)

- For not using Android Pay,
  - Not many stores support it (6)
  - Less secure (5)
  - Less convenient (5)

Hypothesis 3: there is no statistically significant difference between the importance of usability and security factors when it comes to using or not using Android Pay
Second study: online survey

• A large-scale online survey was conducted to address limitations of the first study, and test hypotheses

• Designed based on the codes identified in the first study, following the same structure

• Recruited participant through Amazon Mechanical Turk between March and April 2016
  • Limited to US participants
  • Participate only if they have some familiarity with Apple (Android) Pay, and owns a phone that supports it
Validating responses

• Participants were asked to submit two photos

  Picture 1 example
  Picture 2 example

• Excluded responses from those who
  - Didn’t provide photos
  - Didn’t follow instructions
  - Provided photos that do not match their claimed model
  - Provided photos of devices that do not support Apple (Android) Pay
Adoption rates

<table>
<thead>
<tr>
<th>Option</th>
<th>Apple Pay</th>
<th>Android Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>No, I have never used it</td>
<td>189 (54%)</td>
<td>330 (64%)</td>
</tr>
<tr>
<td>Yes, I use it</td>
<td>124 (36%)</td>
<td>100 (21%)</td>
</tr>
<tr>
<td>I was using it in the past but stopped using it</td>
<td>36 (10%)</td>
<td>81 (15%)</td>
</tr>
</tbody>
</table>
Reasons for *not using* Apple Pay

- Less secure: 38%
- Less private: 40%
- Not many stores support it: 42%
- Less convenient: 46%
- Forgot: 49%
- Not an early adopter: 59%
- Slower: 60%
- Other: 68%

Response: 8, 7, 6, 5, 4, 3, 2, 1 (most important)
Reasons for not using Android Pay

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not many stores support it</td>
<td>37%</td>
</tr>
<tr>
<td>Less convenient</td>
<td>42%</td>
</tr>
<tr>
<td>Less secure</td>
<td>45%</td>
</tr>
<tr>
<td>Less private</td>
<td>46%</td>
</tr>
<tr>
<td>Slower</td>
<td>52%</td>
</tr>
<tr>
<td>Forgot</td>
<td>58%</td>
</tr>
<tr>
<td>Other</td>
<td>59%</td>
</tr>
<tr>
<td>Not an early adopter</td>
<td>60%</td>
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<tr>
<td></td>
<td>63%</td>
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<td></td>
<td>58%</td>
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<td>48%</td>
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<td>42%</td>
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<td></td>
<td>41%</td>
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<td>40%</td>
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</table>

Response: 8 7 6 5 4 3 2 1 (most important)
Reasons for using Apple Pay

- Faster: 73% (76% most important)
- More convenient: 68% (76% most important)
- More secure: 56% (58% most important)
- Curiosity: 56% (58% most important)
- Fun to use: 48% (52% most important)
- More private: 42% (58% most important)
- More reliable: 37% (63% most important)
- Other: 24% (76% most important)
Reasons for *using* Android Pay
Security knowledge and Apple Pay adoption rate

Using Pearson’s correlation, we found a positive correlation ($\rho = 0.19$, $p < 0.0001$)
We found a positive correlation ($\rho = 0.20, p < 0.0001$)
Perception of security

• To the nonusers who chose less secure as the top concern, we asked
  • Why do you feel it’s less secure?
  • If you learn that using Apple (Android) Pay is more secure, would you then use it to pay in stores?

• For Apple Pay, 10 out of 12 said yes to the second question. For Android Pay, 8 out of 14 said yes.

• To the first question,
  • Insecure storage of card information was most frequently mentioned (13 out of 26)
  • But only 2 out of that 13 correctly answered the question about card protection mechanisms
  • Stealing phone and making purchases was also popular (7 out of 26)
Overcoming security misconceptions

• **Insecure storage of card information**
  • Educating nonusers about the card information protection technologies could help them overcome this security misconception

• **Stealing phone and making purchases**
  • Learning about authentication mechanisms and lost/stolen phone features (that allows one to quickly disable mobile tap-and-pay remotely)
  • Help nonusers realize that using stolen phones to make purchases is harder than physically using stolen cards
Conclusions

• Mobile tap-and-pay adoption rate is actually quite low!!

• Security was the top concern for many nonusers
  • Common security misconception was that the card information are not securely stored, and stealing phone and making purchases is easy

• We found a positive correlation between the security knowledge levels and the likelihood of using mobile tap-and-pay
  • Further investigation is needed to study the causal relations
  • Many nonusers mentioned that if they learn mobile tap-and-pay is more secure, they would use it

• Apple and Google could potentially improve adoption rates by educating people about the security protections, and addressing their security misconceptions