

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.

Mobile Apps



by **Lance Whitney**

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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.



Apple Pay is doing well in the US as it also expands abroad.

Apple

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)

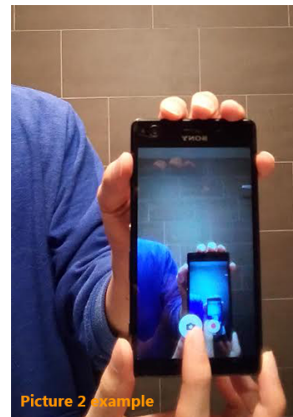
Hypothesis 3: there is no statistically significant difference between the importance of usability and security factors when it comes to using or not using Android Pay

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

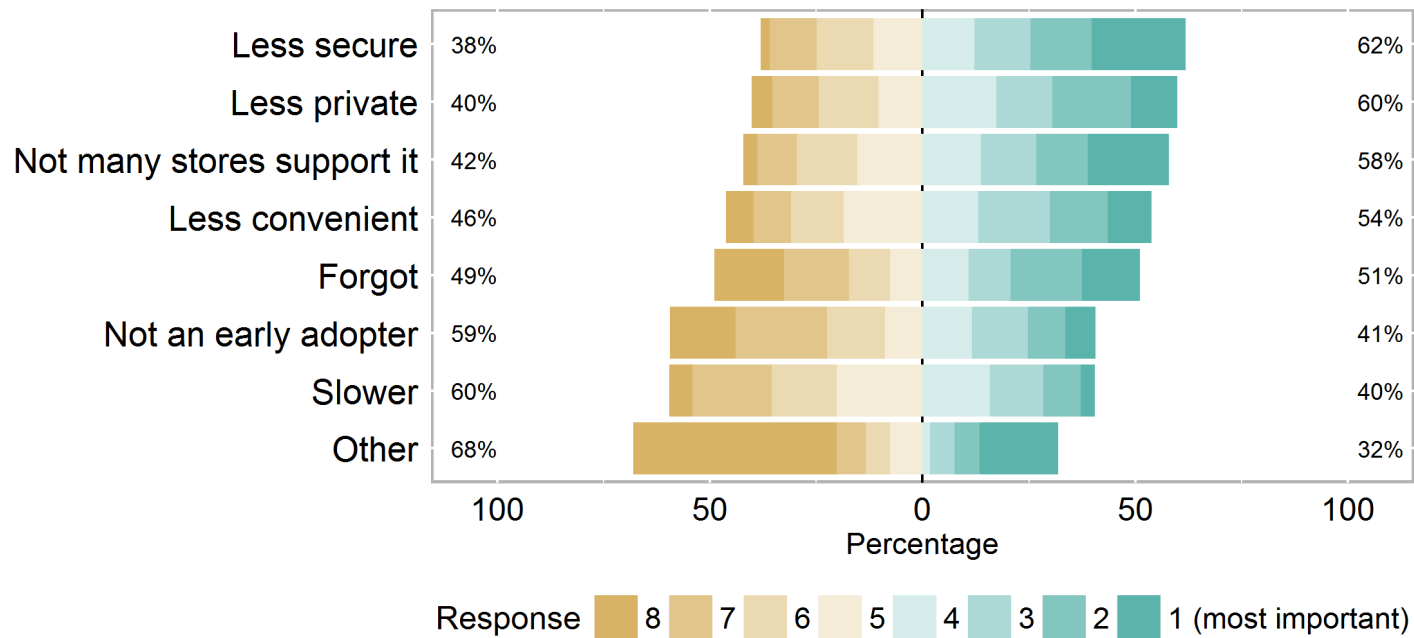


- Excluded responses from those who
 - Didn't provide photos
 - Didn't follow instructions
 - Provided photos that do not match their claimed model
 - Provided photos of devices that do not support Apple (Android) Pay

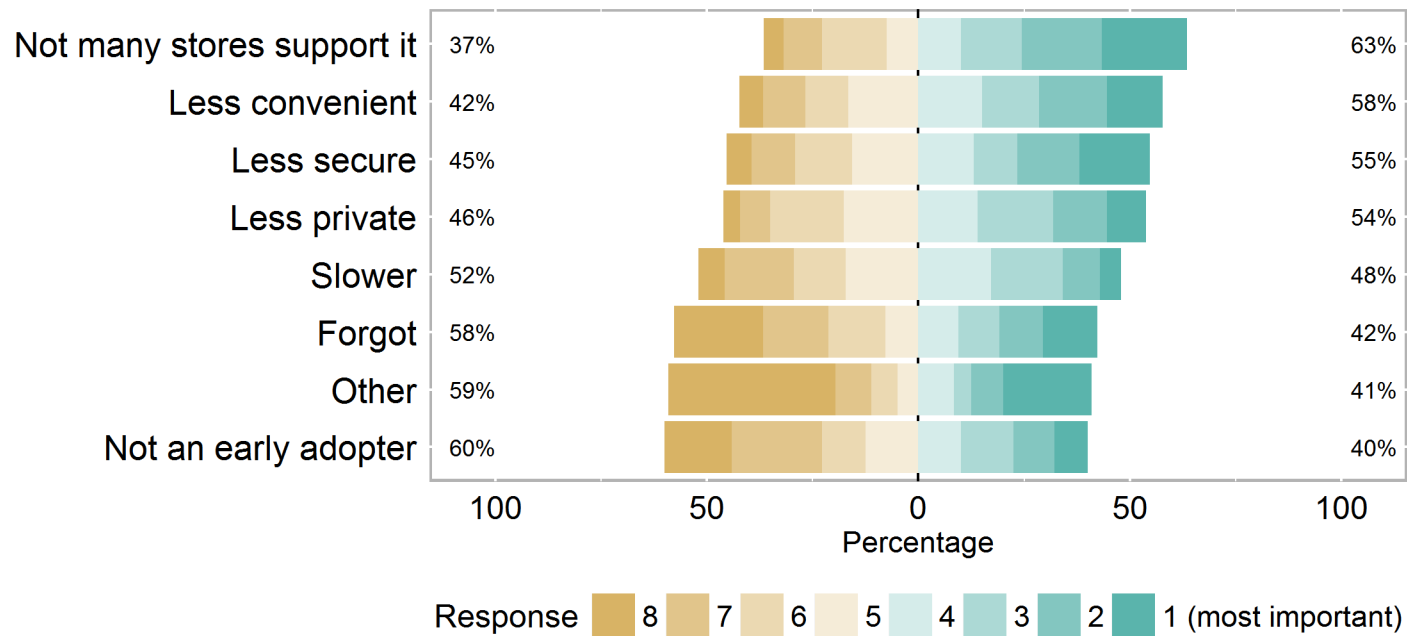
Adoption rates

Option	Apple Pay	Android Pay
No, I have never used it	189 (54%)	330 (64%)
Yes, I use it	124 (36%)	100 (21%)
I was using it in the past but stopped using it	36 (10%)	81 (15%)

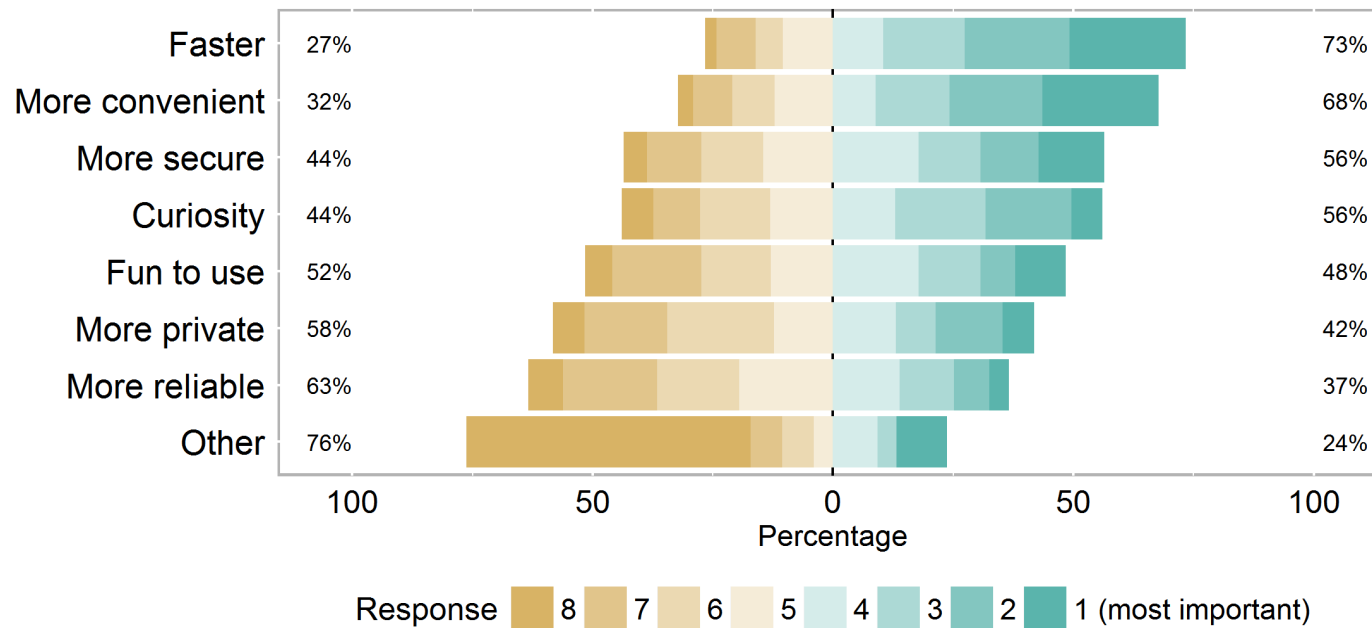
Reasons for *not using* Apple Pay



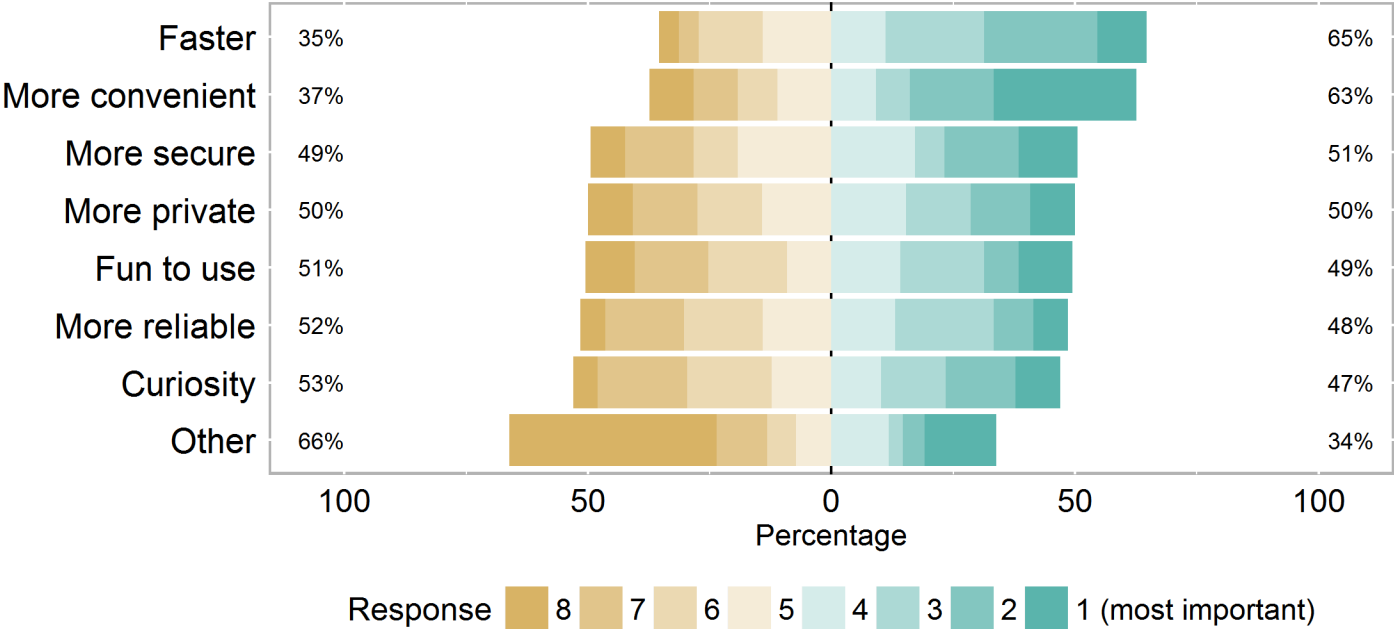
Reasons for *not using* Android Pay



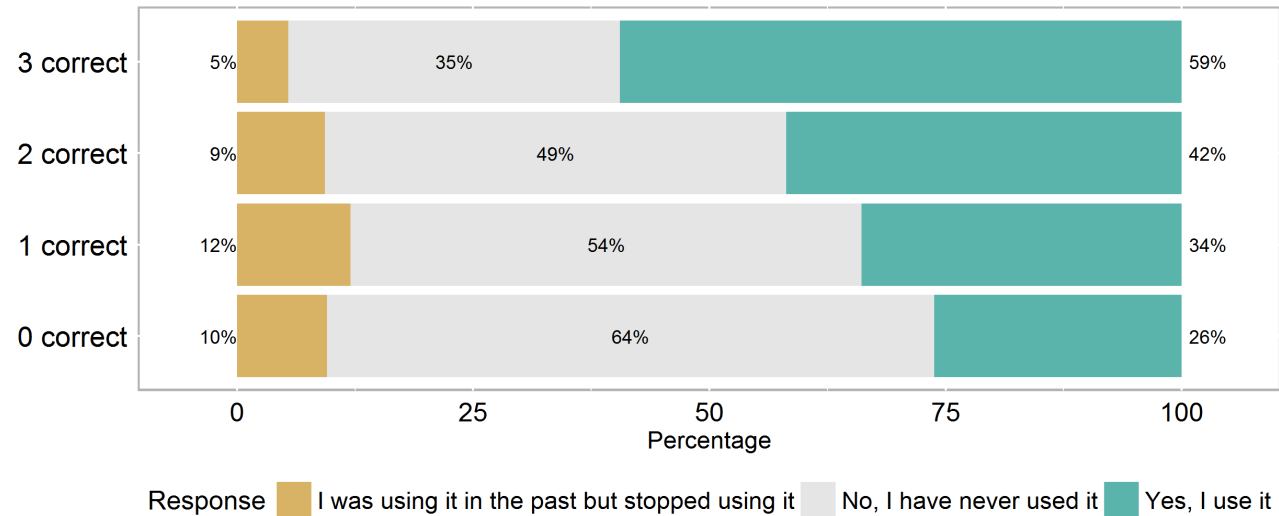
Reasons for *using* Apple Pay



Reasons for *using* Android Pay

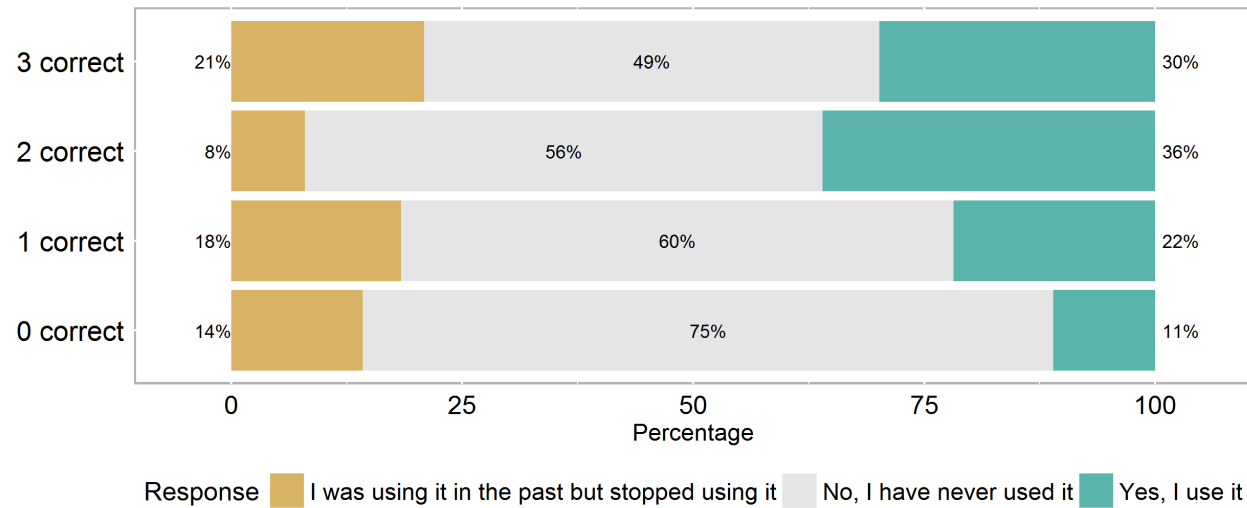


Security knowledge and Apple Pay adoption rate



Using Pearson's correlation, we found a positive correlation ($\rho = 0.19$, $p < 0.0001$)

Security knowledge and Android Pay adoption rate



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**