Mobile Payments & Technology Landscape

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Disclaimer: The views expressed in this presentation are those of the presenter and do not necessarily reflect the views of the Federal Reserve Bank of Boston or the Federal Reserve System

Agenda

- Mobile Payment Trends
- Mobile Payment Opportunities
- Security Issues
- Regulatory Landscape
- Mobile Payments Industry Status
- Conclusions

Mobile Payment Trends

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Key Mobile Terms

- **Mobile Banking**
  - Use of mobile device to connect to FI and access bank/credit account information
  - View balances, transfer funds between accounts, pay bills, receive account alerts, locate ATMs, deposit checks
- **Mobile Payment**
  - Use of mobile device to make a purchase at POS or internet for goods and services or digital content, pay for transit, transfer money
- **NFC (near field communication)**
  - Communication protocol that enables contactless transactions, data exchange, and wireless connections between two devices (e.g., mobile phone and merchant terminal) in close proximity

Key Mobile Terms

- **Secure Element**
  - Encrypted, tamper-proof chip in mobile phone that stores payment credentials, applications, and financial data, and where execution of payment application occurs
- **Mobile Wallet**
  - Application stored in secure element that controls access to payment credentials (payment cards, checking account, coupons, loyalty, transit tickets, etc.)
- **Mobile Payments in the Cloud**
  - Mobile payment credentials and account information stored on remotely located network servers – in "the cloud." Payment credentials accessible via an app on mobile phone, with a phone number and PIN, or a physical card

U.S. Mobile Payment Trends

- Consumer mobile payments are increasing
  - PayPal mobile transactions increased 500% from 2010 to 2011, estimate $3B in mobile payments in 2012
  - Google mobile shopping searches grew 220% from 2010 to 2011
  - Driven by more smartphones and mobile apps
  - Incented by mobile coupons, discounts, and rewards
- Online, mobile, and POS channels are converging
- Mobile wallet developments
- EMV Chip + PIN security in U.S.
- Non-bank activity in payment system (Google, PayPal, Apple, Square, carrier billers)
- Cloud alternative for storing mobile payments

Q. Do you have a smartphone?

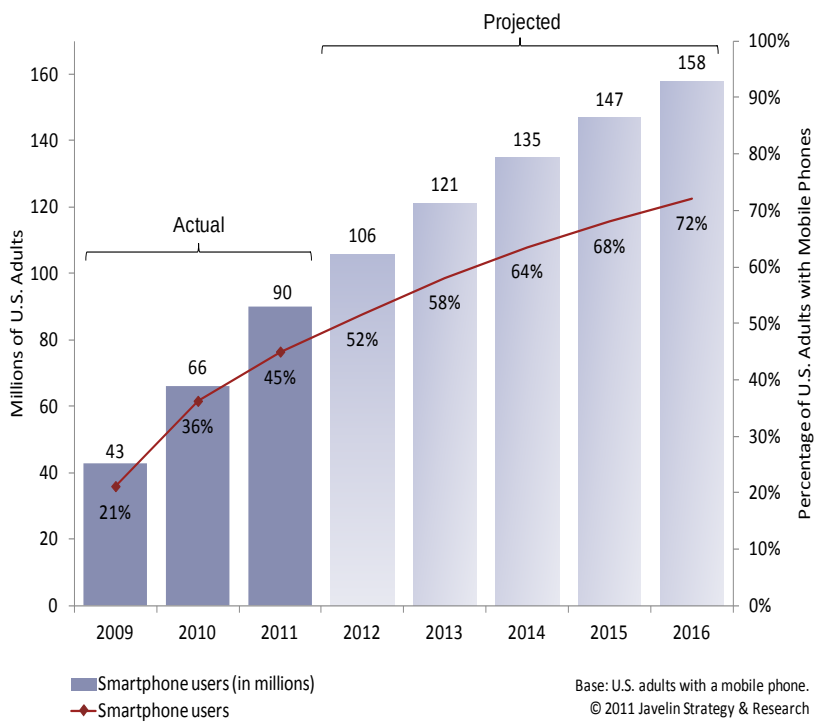
	U.S. adults who own smartphones
❑ Yes	46%
❑ No	54%

Source: Pew Internet & American Life Project, Feb 2012

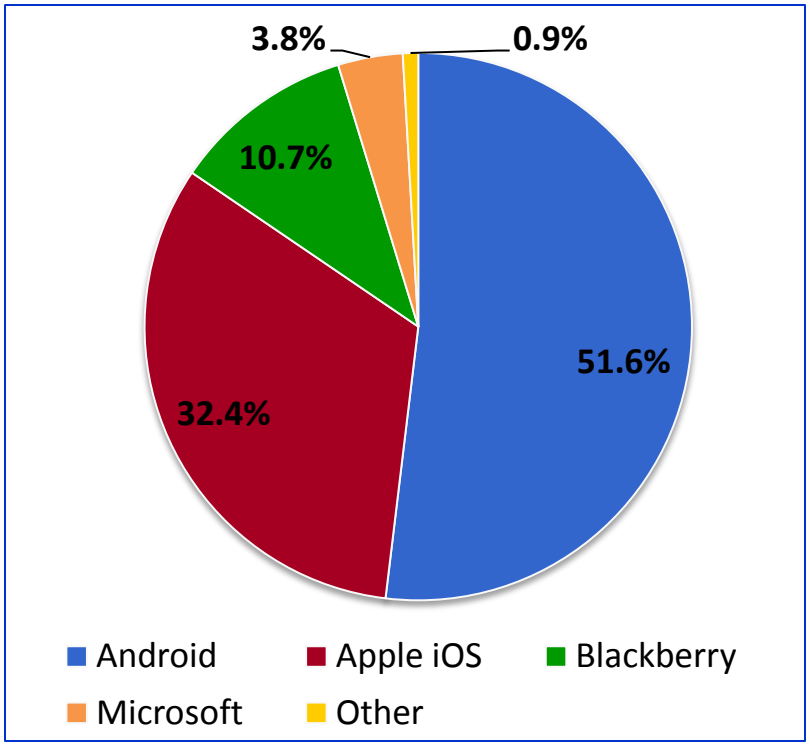
Smartphone Adoption Driving Mobile

- Need smartphone to make contactless mobile payments, download apps and access web, and receive mobile coupons, discounts
- Smartphone adoption by feature phone owners grew 9.5% in past year*

U.S. Adult Smartphone Adoption, 2009-2016

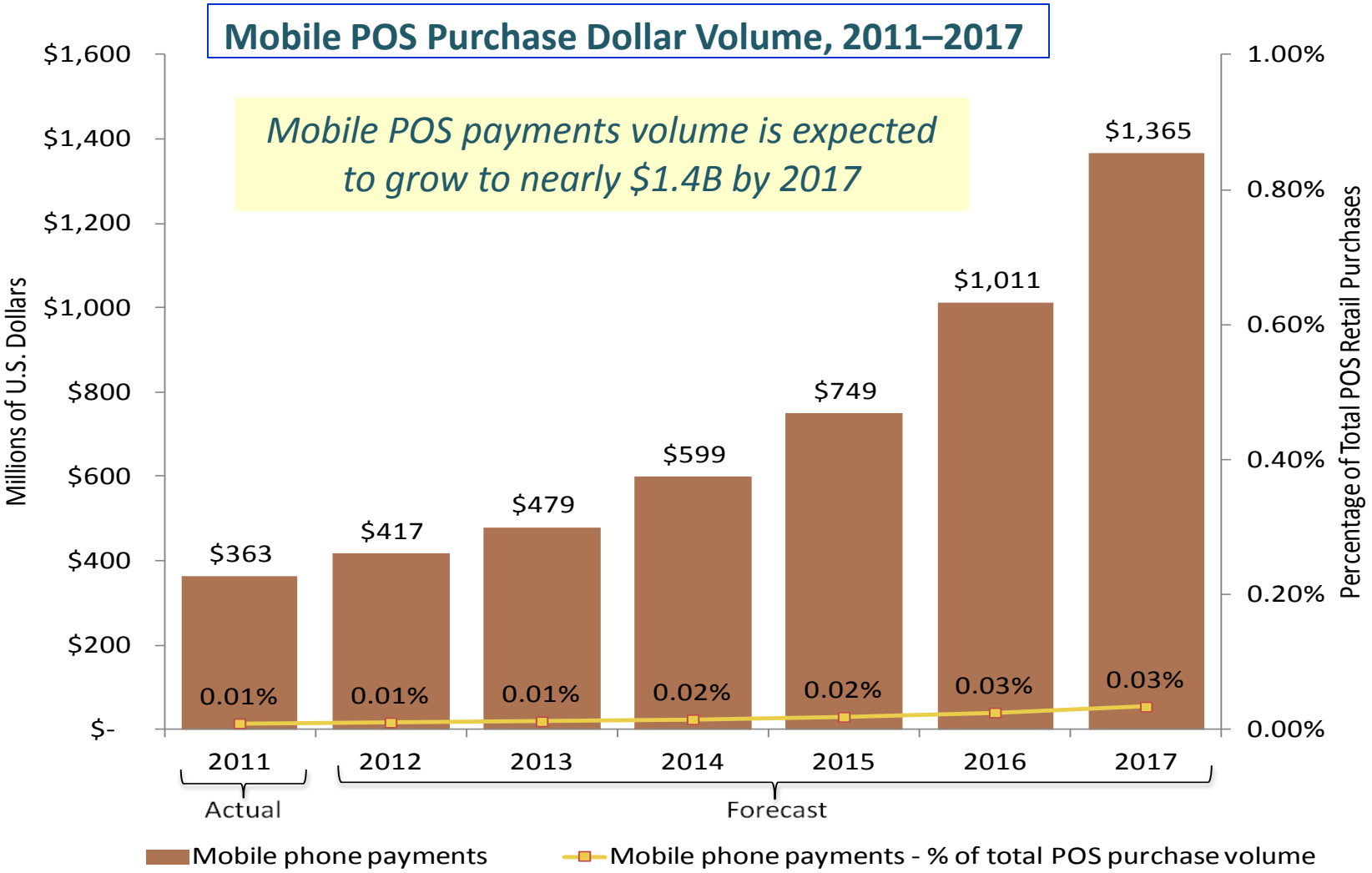


U.S. Smartphone Market Share*, 2Q 2012



*By operating systems .
Source: comScore, Jul-Aug 2012

Mobile POS Payments Volume is Growing



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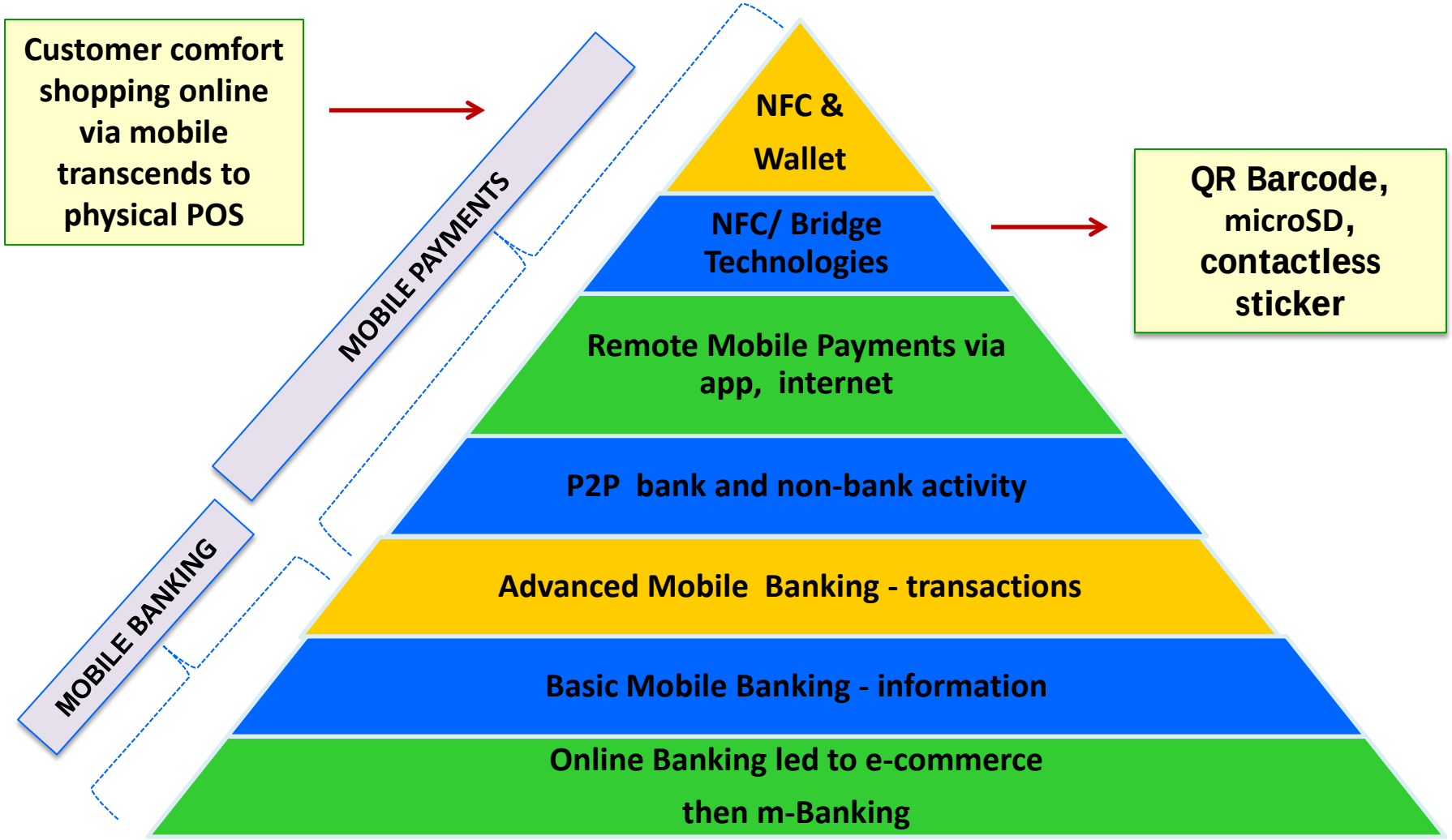
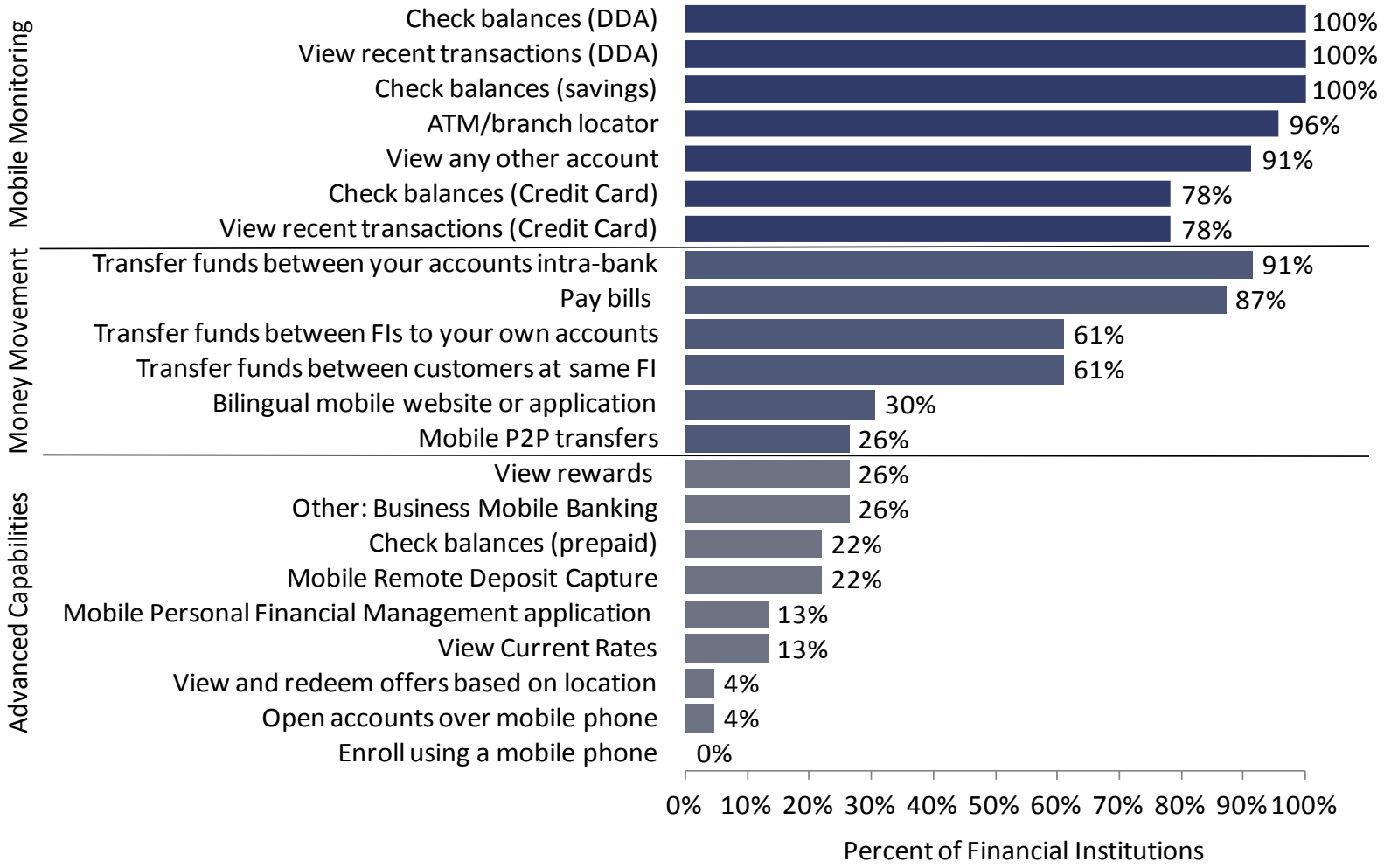
U.S. Mobile Banking and Payments Evolution



Mobile Banking Functions Offered by Banks



August 2011, n = 23

Base: All financial institutions reviewed.

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Q: Have you used mobile banking?

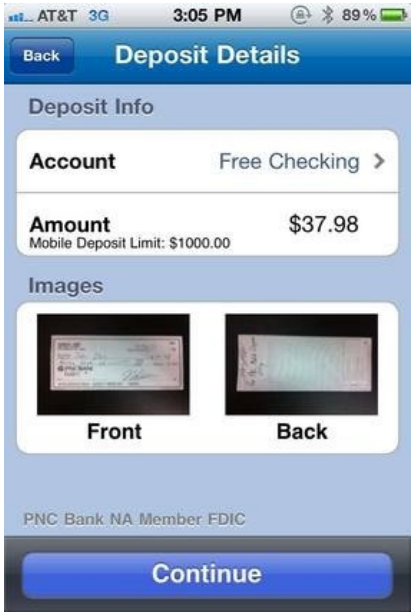
21% of mobile phone owners used mobile banking in the past 12 months

	FRB Survey
Checked account balance/recent transactions	**90%**
Received a text alert from bank	**48%**
Transferred money between 2 accounts	**42%**
Made bill payment via bank's mobile website/app	**26%**
Deposited a check using phone's camera	**11%**

Source: Federal Reserve Board Mobile Financial Services Survey 2012

Mobile Remote Deposit Capture

- Mobile app uses camera to send check image to FI for deposit
- Usually immediate availability
- Consumers & small businesses
- Offered by banks & non-banks
  - 22% of top 25 U.S. banks offer mRDC *(Javelin, Nov 2011)*
  - 109 FIs use Mitek's *Mobile Deposit* mRDC solution
  - *(Mitek, May 2012)*



Fraud Controls

- Multi-factor authentication
- Secure (encrypted) transmission
- Limit on daily customer deposit amounts
- KYC, customer due diligence
- Monitor frequency of use
- Detection of duplicates, double posting

Mobile P2P

- Replaces checks, cash, money orders
- Small dollar money transfers via ACH
  - Less costly than wire
- Bank/card networks
  - MC MoneySend, Amex Serve, ClearExchange, Fiserv PopMoney
- Non-banks
  - PayPal, Western Union, Dwolla

21% of active mobile bankers made a mobile P2P transfer in the past month

Risks

- More cross-border remittances
- Money laundering
- Need for more KYC

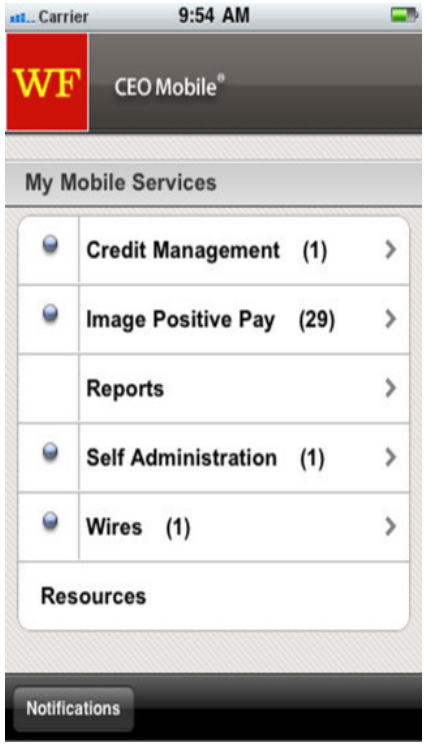
Source: Javelin Strategy & Research, August 2012

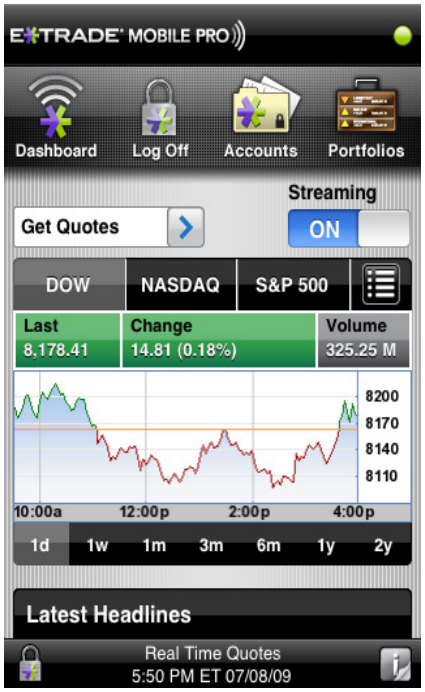
Mobile Financial Apps for Corporate and Brokerage Accounts

- Businesses can monitor and conduct financial transactions remotely
- Corporate treasury/cash management functions:
  - Monitor transactions
  - Monitor cash flows
  - View balances
  - Initiate, approve wires
  - Transfer funds
  - Receive alerts on account activity

  FIs offering services:
  - Wells Fargo
  - Wall Street Systems
  - Chase
  - CIBC
  - BB&T

- Mobile brokerage and financial trading apps include:
  - e-Trade, Merrill Lynch, Charles Schwab





Mobile Payment Opportunities

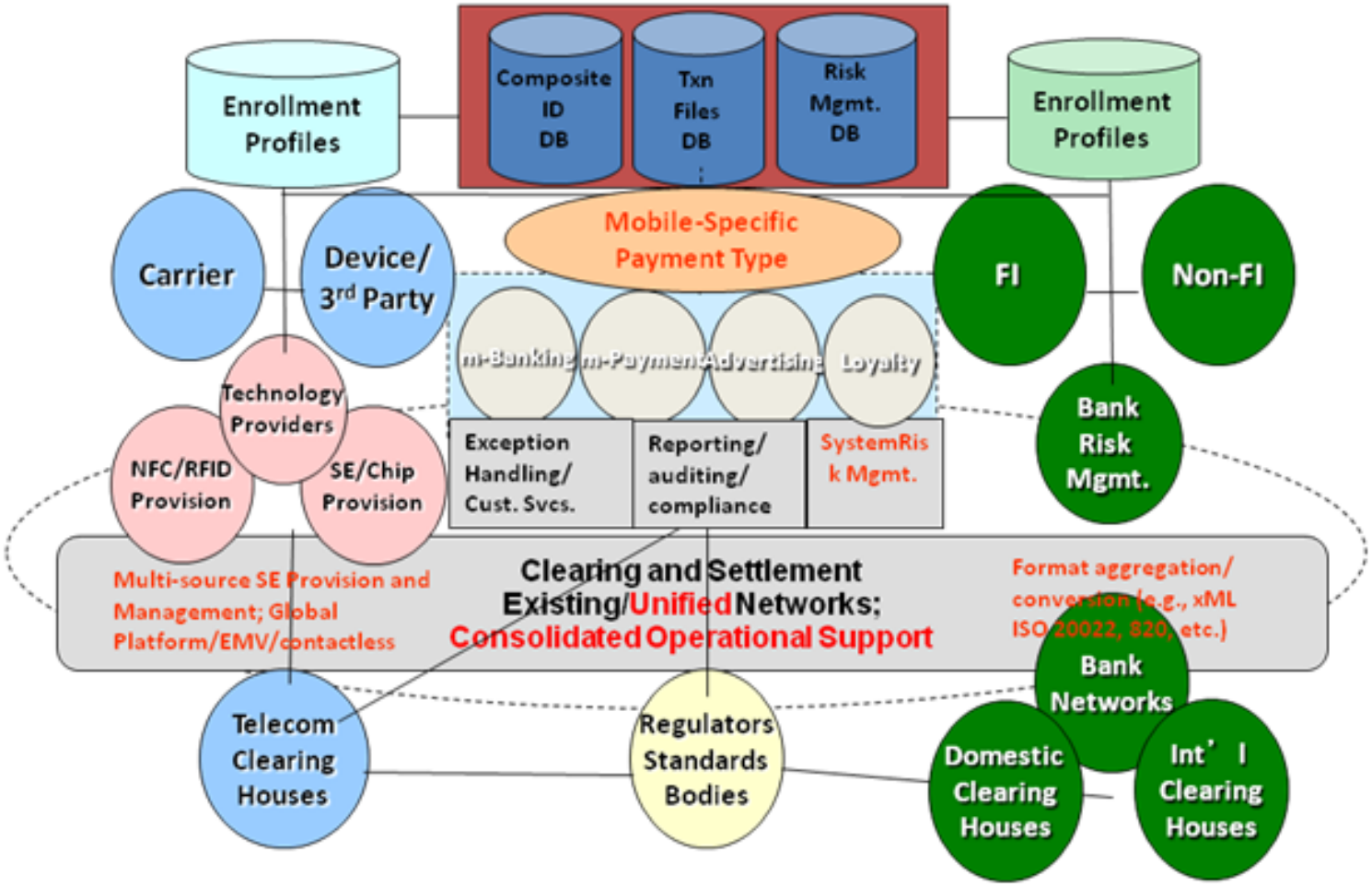
Many New Players Introduced to the Payment System

Traditional Payment Participants	New Mobile Technology Participants

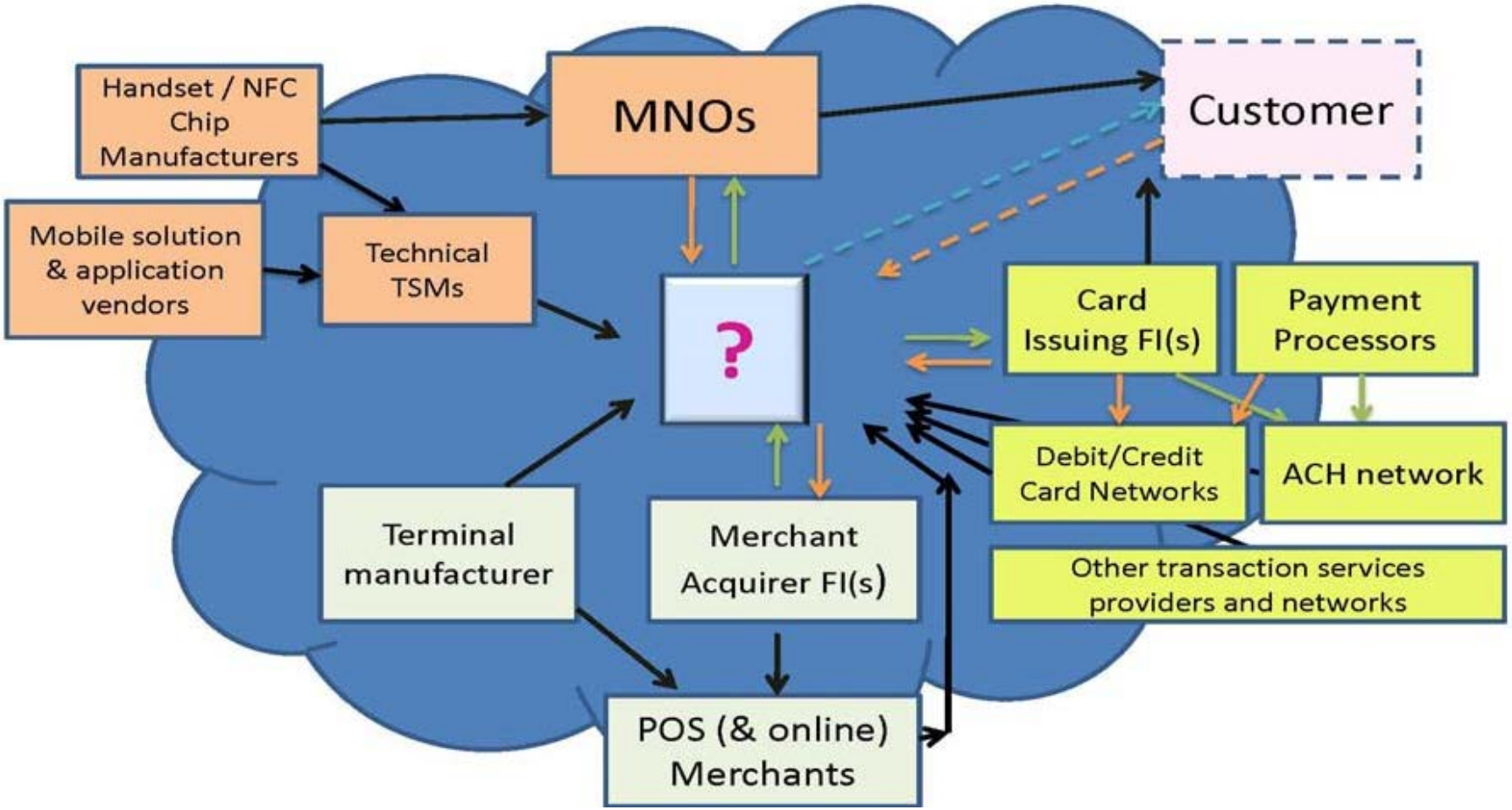
• Financial institutions
• Customers & merchants
• Payment card networks
• Clearing/settlement organizations
• Third party processors
  ◦ Fiserv, FDC, FIS
• Online payment providers & social networks
  ◦ PayPal, Amazon, Google, Facebook
	• Mobile carriers
	  ◦ AT&T, Sprint, T-Mobile, Verizon
	• Handset/OS manufacturers
	  ◦ Apple (iPhone), Nokia, Samsung, Motorola, RIM (Blackberry), Google (Android)
	• Chip makers
	  ◦ Gemalto, Device Fidelity
	• Mobile solution providers
	  ◦ Monitise, Intuit, Square
	• Bill-to-mobile vendors
	  ◦ Boku, Zong

Creating a Crowded Landscape

And a Confusing Mobile Payments Ecosystem



A More Structured View of the Mobile Payment Ecosystem



Combination of Proximity, Size and Technology Create Multiple Mobile Payment Opportunities

Payment Location	Remote	Proximity
Payment Technology	• SMS text • WAP browser • Mobile apps • Cloud • Direct Carrier Billing	• NFC • QR/2D Barcode app • Cloud
Services		
Macro > $10	• Remittances, P2P • Donations • Mobile top-up • m-Ticketing (airline) • m-Commerce • Bill Payments	• Retail POS purchases • ATM • Smart tags • Quick Service Restaurant • Convenience/drug store
Micro < $10	• Digital content • m-Ticketing (event, parking)	• Public transit • Taxis & Parking • Vending

BENEFITS

- Better security
- Merchant efficiencies
- Convenience
- Demographic & lifestyle changes
- Loyalty & rewards
- Location-based services (LBS)
- Value-added services
- Financial Inclusion

Have you ever made a purchase or payment using a mobile phone?

12% of mobile phone users made a mobile payment in the past 12 months

	FRB Survey
Using mobile web browser (remote)	23%
Using downloaded app (remote/proximity)	21%
Using SMS/text message (remote/proximity)	16%
Using NFC/contactless at cash register (proximity)	1%
Scanning barcode (proximity)	1%
None of the above	45%

Source: Federal Reserve Board Mobile Financial Services Survey 2012

Mobile Wallets Enable Mobile Payments and m-Commerce

TSM manages platform to provision & secure account credentials

TSM

Bank Account/ ACH

Credit/ Debit Card

Cash

Other

(PayPal, DCB, iTunes/cloud, merchant app/barcode)

Prepaid account/access

Loyalty, rewards, coupons

Mobile Wallet & Secure Element

Google NFC Mobile Wallet

- Embedded SE
- Open platform – no charge to lease wallet
- Links ads & promotions to fulfillment of sale & payment settlement
- Partners: Sprint, Citi & MC
- 30 merchants plus transit
- Coupons, merchant deals, loyalty programs
- *Google virtual prepaid account funded with major credit cards*

  Being DISCONTINUED 9-12

- Issues:
  - NFC lacks support of largest MNOs and multiple card issuers
  - Growth dependent on NFC enabled POS terminals
  - Control of access to secure element
- *New model*: CLOUD + NFC
  - NFC initiates payment; credentials stored in cloud

Isis NFC Mobile Wallet

- Strong, well-established partners:
  - AT&T, Verizon, T-Mobile
  - Chase, Capital One, Barclaycard
  - Discover, Visa, MC, Amex
- September 2012 trial planned in Austin, TX and Salt Lake City, UT, including UTAH Transit

- NFC SIM card model focused on increased wireless subscriptions (carrier) and transaction fees (card issuer)
- Issues
  - Growth dependent on NFC-enabled POS terminals
  - Control of access to secure element

Cloud Digital Wallet

PayPal™

113M+ active PayPal accounts, 190 countries,
25 currencies; 50M+ active U.S. customers (2012)

- Mobile services
  - View PayPal balances and transactions
  - P2P to banks, Discover, PayPal account
- *PayPal In-store* payment – Phone # & PIN at POS terminal access PayPal account stored in cloud to make purchase
  - User ID converts to token authenticated in cloud
  - Trial with Home Depot & 15 other retailers
  - Discover network connection planned 2013
- *PayPal Here* plug-in card reader

2D (QR) Barcode App

- Mobile app to access and read barcode
- Merchant driven, open standard
- Low cost, low barrier to entry

Starbucks

- Closed-loop prepaid account
- Reload funds, track rewards
- 55M+ mobile transactions

LevelUp

- 200K+ users; 3K merchants
- Location-based offers & services
- 10 major cities
- Loyalty program
- PIN-lock QR code & phone

Alternative Mobile Payment Networks

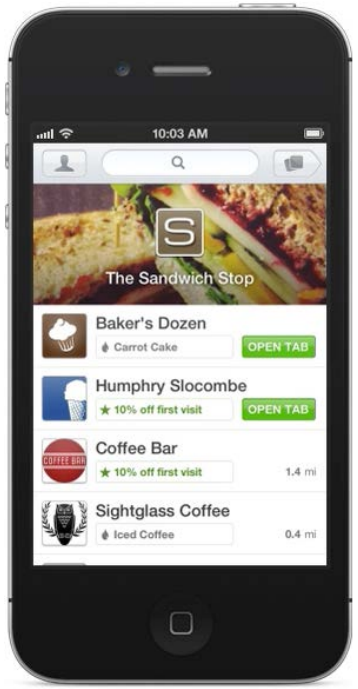
Square Mobile Payment Solutions

Mobile Credit Card Acceptance

- Enables small/micro POS merchants to accept credit/sig debit cards with plug-in device and app
- Payment provider is merchant acquirer, assumes liability, handles charge-backs
- Merchant incentive: lower fees, cash/check replacement
- Competitors: Intuit GoPay, ROAM Data, PayPal Here

Pay with Square app

- Link credit card and open tab manually or automatically when customer walks in door
  - At checkout, name & photo appear on register; cashier confirms customer photo to complete sale
  - Mobile phone not needed



Apple Digital Wallet

- iTunes
  - One of the biggest online credit card subscribers
  - 400M+ active accounts
  - Credit card/billing info stored in cloud digital wallet
  - Mobile payments app
- *Passbook* mobile app *(with new iPhone 9/12/12)*
  - Aggregates QR codes from retailer loyalty cards, gift cards & coupons, boarding passes, movie tickets
  - More efficient tracking of loyalty cards, rewards
  - Not a payment wallet

Direct Carrier Billing

- Intermediary between internet merchant and mobile carrier to handle payment to merchant and bill to mobile carrier
- Payment charged to consumer's monthly mobile phone bill
- Small value, low risk digital content, online donations in U.S.
- Potential Issues
  - Bypasses traditional payment process and settlement
  - Mobile carrier is extending credit
  - If purchase value increases or shifts to physical POS
- Controls
  - Dollar limits on purchases to protect against unauthorized use
  - User parameters to control how, when and by whom they are charged
  - Fraud management and monitoring

ZONG

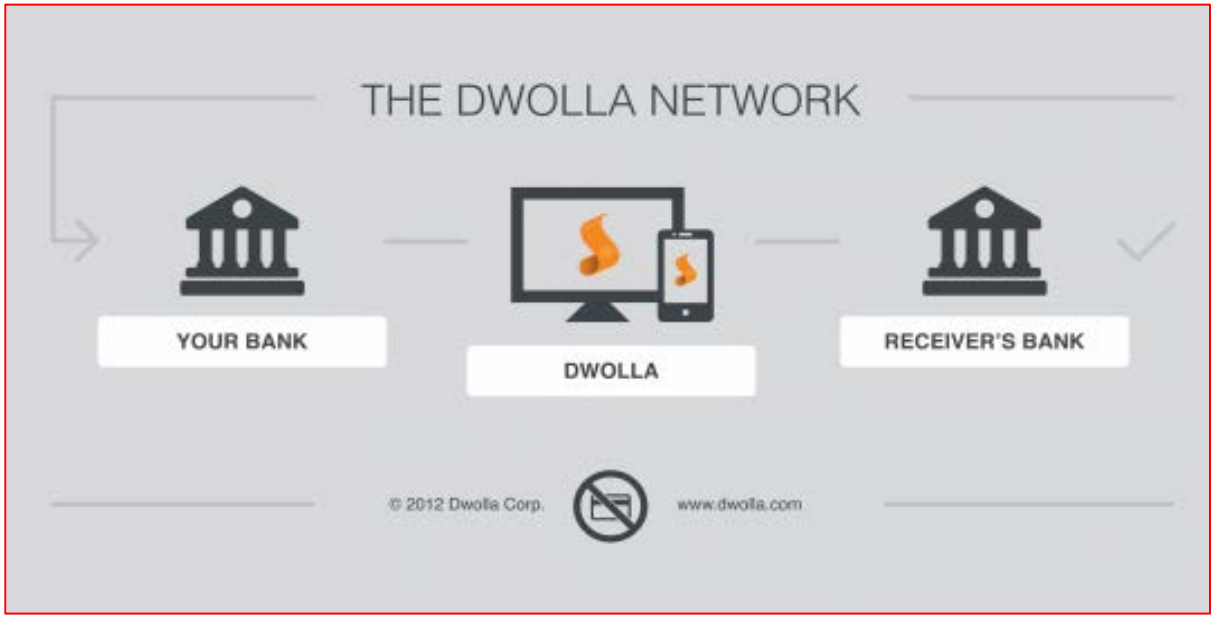
boku Pay by Mobile™

PayOne Mobile Payments. Mobile Life.

BilltoMobile™ Powered by Danal

Dwolla Mobile Cash Network

- P2P, C2B and B2B transactions using email, text, Dwolla accounts, Facebook, Twitter
- ACH-based, funded through bank accounts
- 70K+ users, 5K merchants *(Jan 2012)*
- *FiSync* – new real-time money transfer system *(June 2012)*
  - Veridian Credit Union (Iowa)



Merchant Customer Exchange

- Started by group of retailers & merchants
- Mobile payment network that will let customers pay by mobile app at participating retail stores, supermarkets, restaurants, and gas stations
- Focus on offering merchants a m-commerce solution
  - Will integrate offers, promotions, and retail programs
  - Merchant funding for promotions to build retailer customer loyalty vs. interchange to card issuers
- Developing MCX system and mobile wallet app

Security Issues

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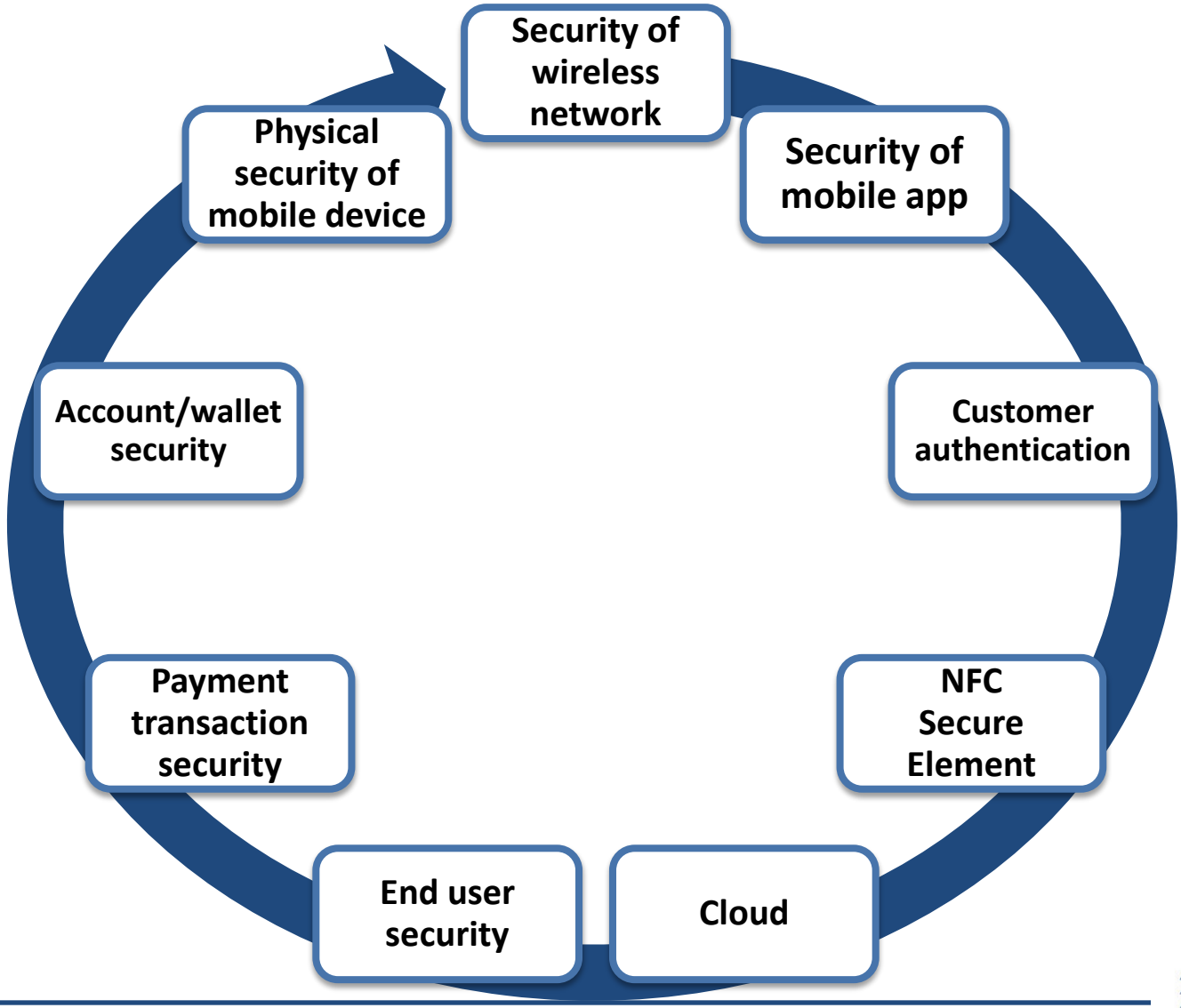
Q. What are the main reasons you have decided not to use mobile payments?

	FRB Survey
I am concerned about security	42%
I don't see any benefits from using mobile payments	37%
It is easier to pay with cash or credit/debit card	36%
I don't have the necessary feature on my phone	31%
I don't trust the technology to properly process my payments	20%
Cost of data access on my plan is too high	15%
I don't know of any stores that accept mobile payments	9%

Source: Federal Reserve Board Mobile Financial Services Survey 2012

Mobile Payment Security must be addressed holistically



RISK - Mobile Device Lost or Stolen

Mitigation Tools

- Strong password to access phone
- Multi-factor authentication to access wallet/financial accounts
- Remote device deactivation
- Remote wipe and lock
- Auto device log-out
- Auto time-out

RISK - Download Virus, Malware, or Bad Application to Mobile

Mitigation Tools

- Install ID theft protection features (e.g. mobile anti-virus software)
- Test and certify applications and mobile vendors
- Develop customer guidelines to avoid downloading malicious, unsecure, or phony apps
- Implement ongoing mobile risk and control assessments

RISK - Unauthorized Access to Device and Financial Data

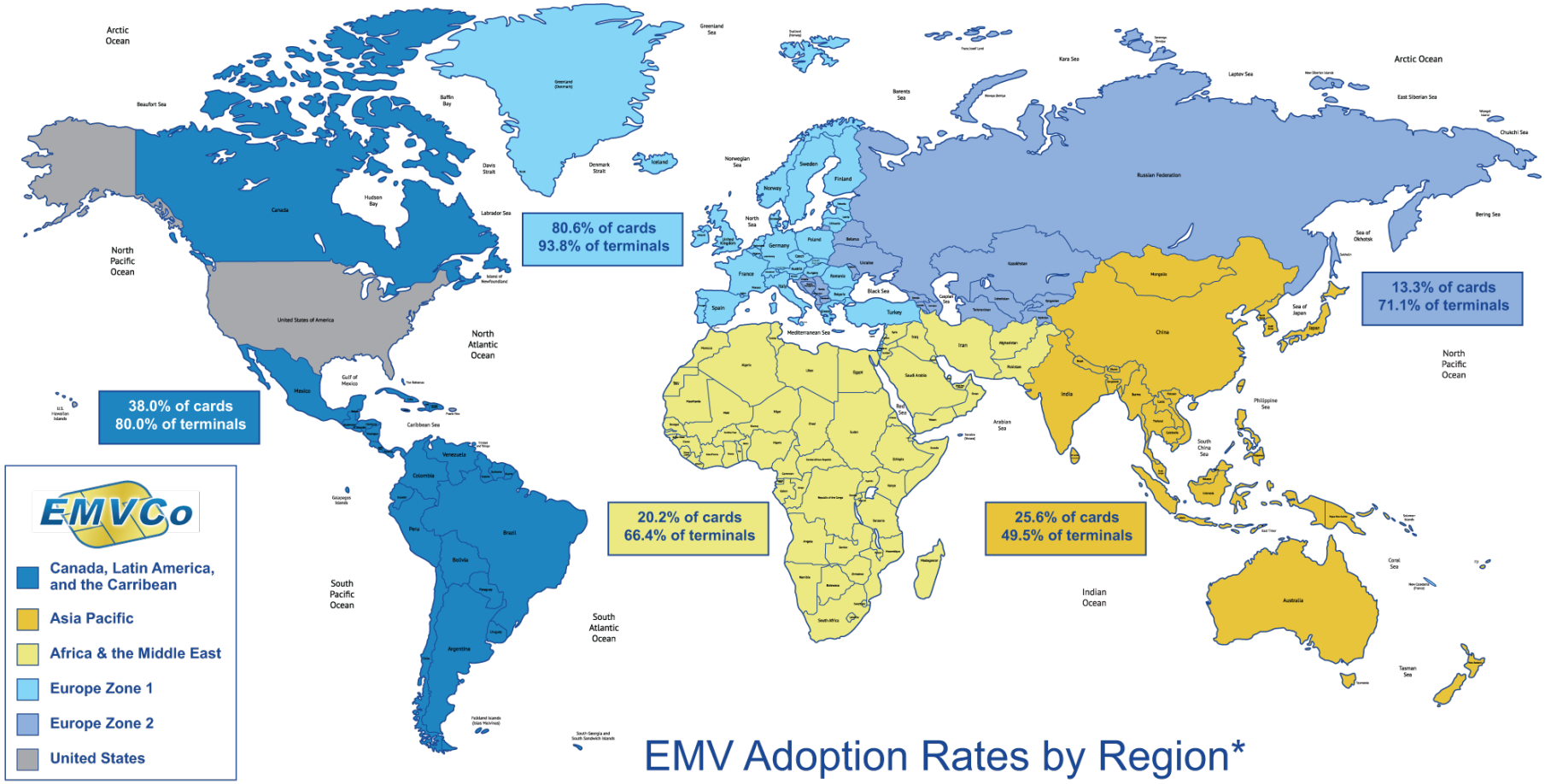
Mitigation Tools

- Limit and monitor transaction dollars
- Use alerts to notify of suspicious activity
- Encrypt sensitive data stored on mobile device
- Encrypt transmissions
- Educate consumer on mobile device and app security
- Educate consumers on need to participate in security of mobile payments

What is EMV?

- Global standard for security of credit/debit cards based on chip card technology to replace mag stripe
- EMV offers strong authentication
  - Chip+PIN combined with mobile phone increases fraud protection
  - Account credentials and PIN are stored on EMV chip in phone and remain encrypted to terminal while obtaining authorization

EMV Chip+PIN Debate



EMV Adoption Rates by Region*

*Figures reported as of Q3 2011 and represent the latest statistics from American Express, JCB, MasterCard, and Visa, as reported by their member financial institutions globally. Figures do not include data from the United States.

N. America except U.S.
Card = 38.0%
Term = 80%

W. Europe
Card = 80.6%
Term = 93.8%

U.S. EMV Migration Plan to Replace Mag Stripe with PIN (+Chip)

Liability Shifts to non-EMV merchant acquirers

April 2013 | **2014** | **October 2015** | **October 2016** | **October 2017**

Acquirers & Processors 100% EMV

Liability Shifts for ATM transactions

EMV at Gas Pumps

Security of NFC Secure Element

- SE embedded in phone/controlled by HS manufacturer
  - Data encrypted at rest and during entire data path
  - Risk: Must wipe-out credentials on old device
- SE on SIM card/controlled by mobile carrier
  - Meets security standards set by FIs
  - Risk: Requires tamper-proof hardware because of portability
- SE on microSD plug-in card/controlled by bank
  - Risks: No standard for secure communication between microSD and user interface; portability if lost
- Overall SEs embedded or on SIM cards are highly secure
  - Vulnerabilities from social engineering that gets around technology security (people and processes)
  - Mitigation should focus on strong multi-channel authentication

Security in the Cloud

- Benefits
  - No new hardware required
  - Data not tied to lost/stolen phone
  - Expanded data storage with secure back up
  - Remote wipe capability
- Risks
  - Loss of direct control if not a private cloud
  - Greater risk of security breaches since fraudsters inclined to attack large data files vs. individual phones
  - Loss of connectivity
- Mitigation Tools
  - End-to-end and at-rest encryption
  - PCI compliance
  - Back-up for connectivity

Mobile Payments Can Be Safer

- Users notice missing mobile phone 4-8 times sooner than wallet
- Users almost never leave home without mobile phone, yet 25% leave home without wallet
- Alerts and responses can be communicated anytime, anyplace
- Mobile phone has built-in protections
  - Unique numbers associated with phone number (MSISDN), SIM card/subscriber (IMSI) and physical phone (IMEI)
- Consumer has tools to protect phone
  - Consumer selected PIN
  - Remote deactivation/wipe
- Security credentials on mobile can be tokenized with encryption and dynamic data authentication (DDA)

Regulatory Landscape

Regulatory Agencies that touch Mobile

Multiple regulatory agencies touch payments and wireless transactions

Regulatory Challenges

- Regulation has not kept pace with mobile payment innovations
- Underlying payment methods covered by existing regulations and rules
- Most non-banks rely on traditional funding sources: Credit, debit, prepaid, ACH
- Mobile carriers and alternative payment providers less familiar with banking laws
  - BSA/AML, KYC, state money transmitters, risk compliance, consumer protection
- No specific guidance or legal framework for mobile payments, creating gaps where coverage and liability unclear

Current Regulatory Climate

- MPIW met with bank regulators, FTC, and FCC on April 24, 2012 to discuss regulatory clarity, not specific regulation
- Primary concerns were consumer protection, privacy, and data security
- Emphasized consumer "awareness before engagement"
- Non-banks and new companies offering mobile services must understand how to protect consumers, but for now banks still liable
- General consensus – still too early in mobile payments evolution to regulate
- Will focus on education and communication between industry and agencies
- Industry stakeholders want to be involved, in the loop, when need for mobile regulation arises

Consumer Mobile Protections Depend on Funding Payment Method

- **Pay now (debit)**
  - Electronic Funds Act (EFTA) and Reg E
  - Limit liability
    - Up to $50 if report within 2 business days, then goes up to $500; 60 Days for unauthorized transactions
  - Right of Recredit
- **Pay later (credit)**
  - Truth in Lending Act (TILA) and Regulation Z
    - Liability capped: Up to $50
    - Chargeback rights

Consumer Protections Depend on Funding Payment Method

- **Pay in advance (prepaid)**

  Gift cards
  - Federal Credit CARD Act
  - Limits on fees and expiration date
  - State laws

  General Purpose Reloadable (GPR)
  - EFTA and Reg E protections
- **Direct to Carrier Billing**

  Pay in Advance (Prepaid) and *Pay Later* (Postpay)
  - FCC Cramming Rules
  - California CPUC Rule

Consumer Financial Protection Bureau (CFPB)

- Authority to regulate non-bank providers of consumer financial products and services, including those that:
  - Extend credit or issue stored value or payment instruments
  - Provide payments or other financial data processing products to consumer by any technological means, including online banking or mobile telecomm network

Other Regulations that may impact Mobile Payments

- FinCEN
  - New Treasury rule for Prepaid Access providers (e.g. Green Dot, NetSpend) to be Money Service Businesses, subject to BSA/AML compliance
- Gramm-Leach-Bliley Act – Privacy Rule
  - Protects customer's private information since provider cannot disclose non-public PII to third parties unless customer opts-in
  - Some alternative payment providers require users to register with PIFI, establishing a customer relationship, so subject to GLBA

Mobile Payments Industry Status

Evolution of Mobile Payments Industry Workgroup (MPIW)

- 2010 – Fed convened mobile payment stakeholders to address fragmentation and encourage communication on direction of mobile payments in U.S.
- Wanted to understand industry perspectives on mobile payment developments in U.S. and expectations of Federal Reserve
- MPIW Objectives
  - Build consensus on mutual points of value, challenges, and opportunities in mobile payments
  - Discuss possible business cases for collaborative activities to help build critical mass for mobile payments

Mobile Payment Challenges

- Low consumer demand
- Unclear value proposition
- Not enough NFC-enabled phones
- Business model revenue sharing
- Customer ownership
- Security
- Collaboration between stakeholders
- Lack of global industry standards
- Unclear regulatory direction

Other Issues

- Who will control mobile wallet?
- Which new market entrants will be supported?
- What options will merchants choose?
  - EMV Chip+PIN or EMV signature
  - Contactless NFC, barcode or cloud?
- How will wallet provide end-to-end security for transaction?

Developed Principles of a Successful U.S. Mobile Payments Framework

- Open mobile wallet that supports multiple payment options
- NFC technology for contactless mobile payments at POS
- Existing clearing and settlement channels (credit, debit, ACH, prepaid and carrier billing)
- Dynamic Data Authentication for security
- Based on global standards and an industry certification process
- Regulatory clarity to avoid gaps in oversight and consumer protections between agencies
- TSMs to oversee security and account management function

Fed/MPIW Status – 2012

- Fed, MPIW and other mobile industry experts testified at House and Senate hearings in March 2012
- Published *U.S. Regulatory Landscape for Mobile Payments* report in July 2012
- In progress: *End-to-end Risk Management & Security Requirements for NFC and Cloud Mobile Payments* and update to 2011 *Mobile Payments in the U.S.* whitepaper
- Fall 2012 MPIW meeting will include session with merchants and mobile start-ups
- Continue dialogue with regulators to clarify oversight responsibilities, help create regulatory guidelines for security and privacy; and work on developing business standards and best practices

More Industry Groups Now Addressing Mobile Payments – Overlap?

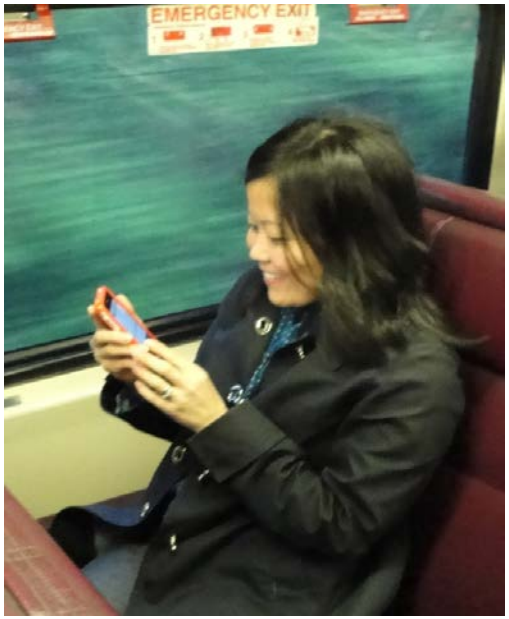
- **NACHA Internet Council** Mobile Workgroup looks at use of ACH for mobile payments and associated risks
- **ASC X9 and ISO** focus on mobile transactions data and managing mobile financial apps
- **BITS Mobile Security & Fraud Project** reviews threats and assesses mobile financial services environment
- **Mobey Forum North America** is a bank-led industry group focused on developing sustainable mobile financial services and open, secure technology standards
- **ETA Mobile Payments Committee** wants to help develop policy and business strategies to advance mobile payments industry
- **NRF Integrated Mobile Initiative (IMI)** is taking a holistic view of how mobile channel is impacting retailing and consumers
- **Smart Card Alliance EMV Migration Forum** to provide guidance on technical issues, consumer awareness and best practices for EMV adoption in U.S.

Key Take-aways

- Non-banks will continue to play strong roles in innovation and implementation of mobile services and technology
- More partnerships with mobile stakeholders likely as nonbanks and financial institutions jockey for position and wallet share
  - Banks help shape mobile market, mitigate risks, maintain customer relationships
- Security and fraud issues must be addressed collaboratively to reach full adoption of mobile payments
  - Include risk monitoring, fraud prevention, and education of banks, carriers, vendors, merchants and consumers
- Consumers will adopt mobile payments, regardless of provider, if they meet requirements for convenience, security and incremental value
- Banks should work with mobile industry groups to develop technical, business and security standards, and effective consumer education tools
  - Mobile Payments Industry Workgroup, Mobey Forum, NFC Forum, Smart Card Alliance, ANSI X9, NACHA, etc.

A Day in the Life …
Mobile Payments @ Work

Getting to work …



Parkmobile
PARKING MADE SIMPLE™

Massachusetts Bay Transportation Authority

Mobile ticketing app
(coming soon)

…Morning…

Sage Payment Solutions

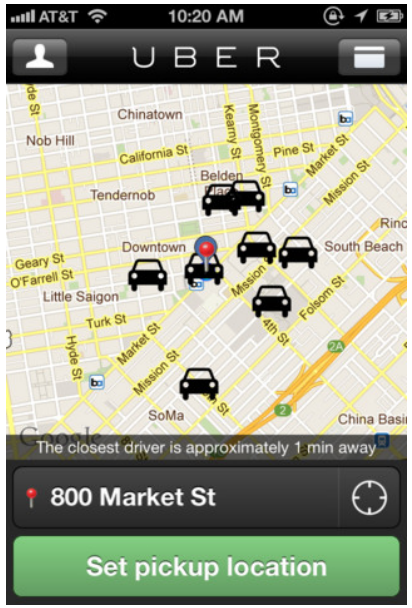
Square

LevelUp

… Afternoon…

LevelUp

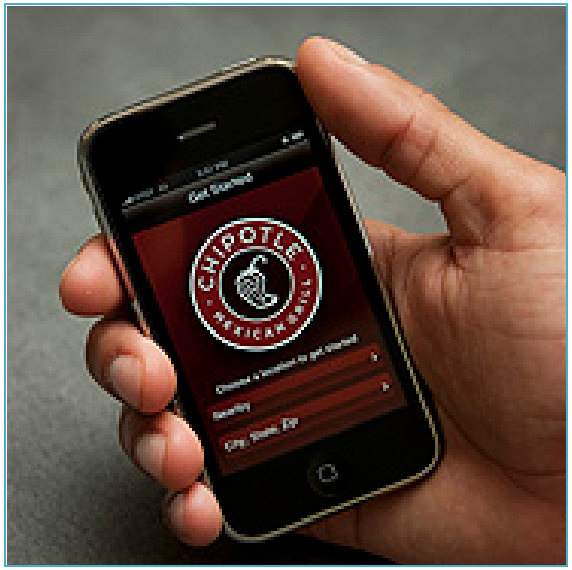
Square



UBER

… Evening

pay fast by AisleBuyer



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Questions?

Thank You

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Resources

Title	Topic	Link
The U.S. Regulatory Landscape for Mobile Payments	White paper on Mobile Payments regulatory environment in U.S. by Marianne Crowe, FRB Boston, Mary Kepler, Cindy Merrit, FRB Atlanta	http://www.bostonfed.org/bankinfo/payment-strategies/publications/2012/us-regulatory-landscape-for-mobile-payments.pdf
Opportunities and Challenges to Broad Acceptance of Mobile Payments in the United States	White paper on acceptance of mobile payments in the U.S. by Elisa Tavilla, FRB Boston	http://www.bostonfed.org/bankinfo/payment-strategies/publications/2012/opportunities-and-challanges-to-broad-acceptance-of-mobile-payments.pdf
Consumers and Mobile Financial Services Survey, March 2012	Survey examining consumers' usage of and attitudes towards mobile phones and mobile financial services, report by Matthew B. Gross, Jeanne M. Hogarth, and Maximilian D. Schmeiser, FRB's Division of Consumer and Community Affairs	http://www.federalreserve.gov/econresdata/mobile-device-report-201203.pdf
Mobile Payments in the United States Mapping Out the Road Ahead	White paper on Mobile Payments in the U.S. by Darin Contini, Marianne Crowe, FRB Boston, Cindy Merrit, Richard Oliver, FRB Atlanta, Steve Mott, BetterBuyDesign	http://www.bostonfed.org/bankinfo/firo/publications/bankingpaypers/2011/mobile-payments-mapping.pdf
CTIA	The wireless association	www.ctia.org
Javelin Research & Strategy	Market research firm focused on payments	https://www.javelinstrategy.com
SCA	Smart Card Alliance for smart card technology	www.smartcardalliance.org
Mobey Forum	Mobile White paper references on web site	www.mobeyforum.org
BITS	BITS Financial Services Roundtable for banking in the U.S. to promote best practices and a strong infrastructure in technology	www.bits.org www.fsroundtable.org