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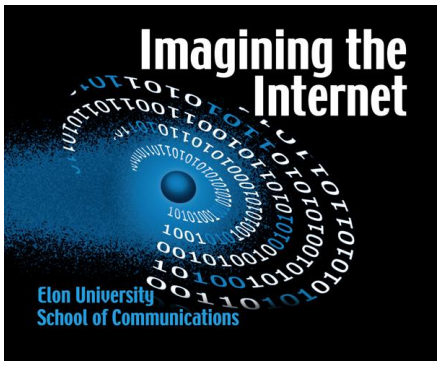


# The future of money: Smartphone swiping in the mobile age

Tech experts believe that by 2020 many consumers will have embraced smart-device swiping for purchases, but some suspect financial companies will slow down the trend. The experts also think credit cards and cash will survive for use by some types of consumers and because of security concerns and a desire for anonymity

Aaron Smith, Pew Research Center's Internet & American Life Project
Janna Quitney Anderson, Elon University
Lee Rainie, Pew Research Center's Internet & American Life Project
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Pew Research Center's Internet & American Life Project
An initiative of the Pew Research Center
1615 L St., NW – Suite 700
Washington, D.C. 20036
202-419-4500 | pewInternet.org

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THE FUTURE OF THE INTERNET

**This publication is part of a Pew Research Center series that captures people's expectations for the future of the Internet, in the process presenting a snapshot of current attitudes. Find out more at: http://www.pewInternet.org/topics/Future-of-the-Internet.aspx and http://www.imaginingtheInternet.org.**

## Overview

As adoption of advanced mobile devices such as smartphones has exploded in recent years,[1] consumers have grown increasingly comfortable using their phones to transfer money, purchase goods, and engage in other types of financial transactions.

Recent Pew Internet surveys find that one in ten Americans have used their cell phone to make a charitable contribution by text message, that more than one-third of smartphone owners have used their phones to do online banking services like paying bills or checking a balance, and that 46% of apps users have purchased an app using a mobile device.[2] Research from comScore has found that 38% of smartphone owners have used their cell phone to make a purchase of some kind, with digital goods (such as music, e-books or movies), clothing and accessories, tickets and daily deals leading the way as the most popular mobile retail categories.[3]

Similarly, a March 2012 Federal Reserve report found that 21% of mobile phone owners had used mobile banking services in the past year and that another 11% of mobile owners plan to use such services in the next 12 months.[4] Using one's phone to check account balances and recent transactions ranked as the most commonly-used service (90% of mobile banking users engage in this activity), followed by transferring funds between accounts (42% of mobile banking users). The study also found that some 12% of mobile phone owners have made payments—such as paying bills online or transferring money directly to another person's account—via their phones.

Mobile phones play an even more prominent role in the financial system in parts of the developing world—users of Kenya's M-Pesa system now send money totaling 20% of that country's GDP to each other each year via text message, for example.[5]

In light of these trends, a number of financial services and technology firms have set their sights on integrating mobile devices into the broader, multi-trillion-dollar retail economy. As a result, the infrastructure and tools for safe, reliable mobile purchasing has been advancing rapidly in recent years.

These mobile payment and transaction solutions currently take a number of forms. Some allow merchants and businesses to accept "on the go" credit card payments from customers using a special card reader that plugs into a smartphone or tablet computer.[6] Others facilitate direct person-to-person financial transfers using mobile devices—either by physically touching phones or exchanging electronic credentials such as a phone number or email address.[7]

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[1] Recent Pew Internet surveys find that nearly half of all American adults now own a smartphone of some kind, and one in five own a tablet computer.

[2] See http://pewInternet.org/Reports/2012/MobileGiving.aspx and http://pewInternet.org/Reports/2011/Cell-Phones.aspx

[3] See http://www.comscore.com/Press_Events/Press_Releases/2011/12/Mobile_Shopping_Goes_Mainstream

[4] See http://www.federalreserve.gov/econresdata/mobile-device-report-201203.pdf

[5] See http://www.time.com/time/magazine/article/0,9171,2103289,00.html

[6] Examples include the Square (https://squareup.com/) and GoPayment (http://gopayment.com/) readers

[7] Examples include services from Venmo (https://venmo.com/), Bump (http://bu.mp/), Serve (http://www.serve.com/), ClearXchange (http://clearxchange.com/) and PayPal

Other solutions go even further, placing mobile phones at the center of users' financial lives as an all-in-one payment device, identification system, coupon book and financial planner. In late 2011, Google launched Google Wallet in partnership with Citibank and MasterCard. Based on a technology known as near-field communication (NFC), Google Wallet allows users to store payment information in the cloud and pay for goods at participating retailers by tapping their phone at the point of purchase.[8] Another consortium (including Verizon, AT&T, T-Mobile, Visa, American Express, Discover and MasterCard) will be piloting a similar NFC-based mobile payment system known as ISIS starting in select cities in mid-2012.[9] PayPal and Visa have also announced plans for mobile wallet systems, and many analysts predict that Apple will announce its own virtual wallet service in the near future.[10]

Proponents argue that these "mobile wallet" systems hold a number of advantages over the use of cash and credit cards for payment. They argue that these systems are simpler and more convenient for consumers, since users need only carry a single all-purpose device rather than multiple forms of paper and plastic. And because they are location-aware and can track users' shopping and purchasing behavior in real time, mobile wallet systems can offer advanced "personal shopper" services (such as recommendations and special deals based on one's location and past purchasing history) as well as improved loyalty programs and more targeted promotions from vendors (a modern take on the "buy ten get one free" card, but with the card stored digitally in the cloud).

At the same time, critics have pointed towards a number of factors that might limit the widespread adoption of mobile payments. For starters, not everyone will use a smartphone. Other analysts raised questions about whether credit card companies will move away from the current profitable system in the developed world. Other concerns include the potential susceptibility of NFC to hackers, market fragmentation, and lack of interoperability of mobile finance systems due to the many different platforms being developed and implemented, and questions about whether consumers will feel comfortable storing the intimate details of their financial lives in the cloud.

In light of this ongoing debate, The Pew Internet Project and Elon University's Imagining the Internet Center invited experts and other Internet stakeholders to offer their predictions on the future of mobile payments, and what people's "wallets" might look like in 2020.

Overall, a majority of these respondents supported the scenario that by 2020 most people will have embraced and fully adopted the use of smart-device swiping for purchases they make, nearly eliminating the need for cash or credit cards. These experts feel that the explosive growth in the use of smartphones and other mobile devices, combined with the convenience, security, and other affordances of mobile payments systems, makes these systems an obvious choice to replace established modes of payment in day-to-day commerce.

At the same time, the expert respondents are divided on how quickly this technology will displace established transaction methods. In elaborating on their predictions, a number of respondents indicated that they expect this process to develop generationally, with younger

[8] See http://www.google.com/wallet/how-it-works-security.html
[9] See http://www.paywithisis.com/
[10] See http://www.pcworld.com/article/247052/mobile_payments_to_make_slow_progress_in_2012.html

users jumping to abandon cash and credit cards while their parents and grandparents make the move to mobile payments slowly, if at all.

Some 65% agreed with the statement:

> *By 2020, most people will have embraced and fully adopted the use of smart-device swiping for purchases they make, nearly eliminating the need for cash or credit cards. People will come to trust and rely on personal hardware and software for handling monetary transactions over the Internet and in stores. Cash and credit cards will have mostly disappeared from many of the transactions that occur in advanced countries.*

Some 33% agreed with the opposite statement, which posited:

> *People will not trust the use of near-field communications devices and there will not be major conversion of money to an all-digital-all-the-time format. By 2020, payments through the use of mobile devices will not have gained a lot of traction as a method for transactions. The security implications raise too many concerns among consumers about the safety of their money. And people are resistant to letting technology companies learn even more about their personal purchasing habits. Cash and credit cards will still be the dominant method of carrying out transactions in advanced countries.*

While 65% agreed with the statement that most people will trust and rely upon conducting monetary transactions over the Internet and in stores with their mobile devices, a number of people said the true outcome will be a little bit of both scenarios. Respondents were asked to select the positive or the negative, with no middle-ground choice, in order to encourage a spirited and deeply considered written elaboration about the potential future of hyperconnected people.

Here is a sampling of their predictions and arguments:

*Mobile money is the next logical step in the evolution of consumer finance. Mobile payments offer the potential for greater security than cash or physical cards.*

- **Susan Crawford**, Harvard professor and formerly a special assistant for technology policy for President Barack Obama, points out that, "There is nothing more imaginary than a monetary system. The idea that we solemnly hand around printed slips of paper in exchange for food and water shows just how trusting and fond of patterned behavior we human beings are. So why not take the next step? Of course we'll move to even more abstract representations of value."

- Google chief economist **Hal Varian** noted that, "…two-factor authentication (secret + physical device) is better than one-factor authentication, and smart phones seem to have a natural role here."

- **Paul Jones**, an internet expert who works at the University of North Carolina-Chapel Hill, "…welcome[s] my beast-marked future financial transactions. Just look into my eye—biometrically of course—and add to my e-wallet." And Futurewei Technologies senior engineer **Peter J. McCann** finds much to improve about our current purchasing infrastructure when it comes to security: "The use of a simple string of digits that must be

shared with any vendor with whom you transact is really a ludicrously insecure system that can and must change."

*Since a significant portion of our financial lives are already conducted electronically, mobile payments are not as significant a leap as they might appear.*

- Microsoft distinguished engineer **Christian Huitema** points out that, "We have already witnessed the transition from cash to debit/credit cards. The electronic wallet is not much more than a 'virtual card,' in which near-field wireless communication replaces the reading of a magnetic stripe."

- **Peter Pinch**, director of technology at WGBH in Boston, makes a similar argument: "I see 'credit cards' as already virtualized, electronic currency. The form factor and functionality of the card doesn't really matter: I'm already making an electronic transaction and I expect all the affordances of such." And GlobalSecurity.org director **John Pike** says that, "So many people are already accustomed to buying a cup of coffee with a credit card that smart-device swiping is only a very small next step."

*Consumers cannot implement mobile payments unilaterally, so their adoption and usage will depend on the willingness of incumbent players (banks, retailers, etc) to build out the infrastructure to accept those payments.*

- University of Illinois-Chicago professor **Steve Jones** sees infrastructure as the key limiting factor: "I don't think it will be security concerns that will stall the adoption of NFC so much as the effort involved with getting the infrastructure for its use in place on a national scale in the United States." Carnegie Mellon postdoctoral fellow **Fred Stutzman** makes the case even more succinctly: "Two words: legacy infrastructure. Maybe in 2030."

- **John Smart,** president and founder of the Acceleration Studies Foundation, said, "Corporations will be happy to milk oldsters for exorbitant check and credit card handling rates—as they do today—and to keep all these systems unsecure as long as possible, as that allows insurance companies to make a lot of cash off of ensuring against identity theft, etc." Added **Jonathan Grudin**, principal researcher at Microsoft: "The driver here will virtually 100% be whether or not the credit card industry decides it can make more money through changing technologies."

- Several respondents echoed the prediction of internet architect and activist **Bill St. Arnaud** that mobile payments will take off "in the third world first, where there is no well-established banking system" that will seek to delay implementation.

*The future has already arrived in many parts of the world outside of the United States.*

- New York University professor **Suzanne England** points out that "These systems are already the norm in other countries such as Japan," and a number of respondents pointed towards the widespread use of mobile payments in places such as Canada, Europe and Kenya as evidence that this trend is here to stay.

*The current moment offers an opportunity to reinvent economic processes.*

- Author **Jeff Jarvis** envisions "new currencies measuring new value"—such as tradable points awarded for responsible purchasing behavior. **Cyprien Lomas** at the University of British

Columbia sees a rise in financial life-hacking, as consumers engage in "personal auditing of spending/consuming habits aided by software that can track and observe trends."

*At the same time, consumers may be hesitant to place their entire financial lives in one basket in the cloud.*

- Law expert **Henry Judy** notes that "the monetary incentives for cyber-criminals to attack payment systems are so great that people will not migrate en masse to any new systems that are perceived as insecure." And things that are merely annoying when cell phones are used mainly for communication can take on greater relevance when they contain your wallet. As one anonymous respondent noted, in a world of mobile payments, "…if you run out of batteries, you temporarily run out of money."

*Many respondents predicted that mobile payments will be adopted quickly by some demographic cohorts, but will make more measured progress among others.*

- Author **Morley Winograd** was one of several experts who expect mobile money to evolve along generational lines, with older adults continuing to use cash and credit cards even as younger generations have gone almost entirely mobile.

- Microsoft Researcher **danah boyd** expects adoption of these technologies to break along socio-economic lines as well as generationally: "The majority of working class and lower-middle class people in advanced countries will not be passionate about the issue in either way but will still be extremely slow to adopt any of these systems."

*A desire for anonymity will prevent the demise of cash.*

- In addition to potential concerns about the security and privacy of mobile payments and cloud storage of financial information, wide-scale usage of mobile payments may be slowed by the simple desire for anonymity. San Jose State lecturer **Ted M. Coopman** argues that "This is especially true in the United States where fear of the government has always been part of our political culture."

- And **Robert Ellis** at Peterson, Ellis, Fergus & Peer LLP argues that, "Cash will never disappear because there will always be a demand for it—for anonymous transactions, illegal transactions, and transactions in far-flung areas where the non-cash technologies haven't been implemented."

*Ultimately, many survey participants expect the most likely scenario to be a mixture of the old and the new.*

- **Amber Case**, CEO of Geoloqi, argues for this version of the future as follows: "When credit cards arrived, checks did not disappear, and neither did money. Although in some places either cash or cards are accepted, there are three main methods of payment. If another method of payment is added, we will likely have four methods of payment and retailers and businesses must accept another form of payment. Some systems may emerge that use completely smart payments, but there will still be other forms of payment available."

- **Jeff Eisenach** of Navigant Economics LLC places this debate in historical perspective: "Cash—tangible, hold it in your hand dollars—has been around for millennia. It won't go away in a decade."

## Survey Method:
## 'Tension pairs' were designed to provoke detailed elaborations

This material was gathered in the fifth "Future of the Internet" survey conducted by the Pew Research Center's Internet & American Life Project and Elon University's Imagining the Internet Center. The surveys are conducted through an online questionnaire sent to selected experts who are encouraged to share the link with informed friends, thus also involving the highly engaged Internet public. The surveys present potential-future scenarios to which respondents react with their expectations based on current knowledge and attitudes. You can view detailed results from the 2004, 2006, 2008 and 2010 surveys here: http://www.pewInternet.org/topics/Future-of-the-Internet.aspx and http://www.elon.edu/e-web/predictions/expertsurveys/default.xhtml. Expanded results are also published in the "Future of the Internet" book series published by Cambria Press.

The surveys are conducted to help accurately identify current attitudes about the potential future for networked communications and are not meant to imply any type of futures forecast.

Respondents to the Future of the Internet V survey, fielded from August 28 to Oct. 31, 2011, were asked to consider the future of the Internet-connected world between now and 2020. They were asked to assess eight different "tension pairs" – each pair offering two different 2020 scenarios with the same overall theme and opposite outcomes – and they were asked to select the one most likely choice of two statements. The tension pairs and their alternative outcomes were constructed to reflect previous statements about the likely evolution of the Internet. They were reviewed and edited by the Pew Internet Advisory Board. Results are being released in eight separate reports over the course of 2012. This is the third of the reports.

**About the survey and the participants**

Please note that this survey is primarily aimed at eliciting focused observations on the likely impact and influence of the Internet – not on the respondents' choices from the pairs of predictive statements. Many times when respondents "voted" for one scenario over another, they responded in their elaboration that both outcomes are likely to a degree or that an outcome not offered would be their true choice. Survey participants were informed that "it is likely you will struggle with most or all of the choices and some may be impossible to decide; we hope that will inspire you to write responses that will explain your answer and illuminate important issues."

Experts were located in three ways. First, several thousand were identified in an extensive canvassing of scholarly, government, and business documents from the period 1990-1995 to see who had ventured predictions about the future impact of the Internet. Second several hundred of them have participated in the first four surveys conducted by Pew Internet and Elon University, and they were recontacted for this survey. Third, expert participants were selected due to their positions as stakeholders in the development of the Internet. The experts were invited to encourage people they know to also participate. Participants were allowed to remain anonymous; 57% shared their name in response to at least one question

Here are some of the respondents: danah boyd, Clay Shirky, Bob Frankston, Glenn Edens, Charlie Firestone, Amber Case, Paul Jones, Dave Crocker, Susan Crawford, Jonathan Grudin, Danny Sullivan, Patrick Tucker, Rob Atkinson, Raimundo Beca, Hal Varian, Richard Forno, Jeff Jarvis, David Weinberger, Geoff Livingstone, Stowe Boyd, Link Hoewing, Christian Huitema, Steve Jones, Rebecca MacKinnon, Mike Leibhold, Sandra Braman, Ian Peter, Mack Reed, Seth Finkelstein, Jim Warren, Tiffany Shlain, Robert Cannon and Bill Woodcock.

The respondents' remarks reflect their personal positions on the issues and are not the positions of their employers, however their leadership roles in key organizations help identify them as experts. Following is a representative list of some of the institutions at which respondents work or have affiliations or previous work experience: Google, the World Bank, Microsoft. Cisco Systems, Yahoo!, Intel, IBM, Hewlett-Packard, Ericsson Research, Nokia, O'Reilly Media, Verizon Communications, Institute for the Future, Federal Communications Commission, British OfCom, World Wide Web Consortium, National Geographic Society, Benton Foundation, Linux Foundation, Association of Internet Researchers, Internet2, Internet Society, Institute for the Future, Santa Fe Institute, Yankee Group, Harvard University, MIT, Yale University, Georgetown University, Oxford Internet Institute, Princeton University, Carnegie-Mellon University, University of Pennsylvania, University of California-Berkeley, Columbia University, University of Southern California, Cornell University, University of North Carolina, Purdue University, Duke University , Syracuse University, New York University, Northwestern University, Ohio University, Georgia Institute of Technology, Florida State University, University of Kentucky, University of Texas, University of Maryland, University of Kansas, University of Illinois, Boston College.

While many respondents are at the pinnacle of Internet leadership, some of the survey respondents are "working in the trenches" of building the web. Most of the people in this latter segment of responders came to the survey by invitation because they are on the email list of the Pew Internet & American Life Project, they responded to notices about the survey on social media sites or they were invited by the expert invitees. They are not necessarily opinion leaders for their industries or well-known futurists, but it is striking how much their views are distributed in ways that parallel those who are celebrated in the technology field.

While a wide range of opinion from experts, organizations, and interested institutions was sought, this survey should not be taken as a representative canvassing of Internet experts. By design, this survey was an "opt in," self-selecting effort. That process does not yield a random, representative sample. The quantitative results are based on a non-random online sample of 1,021 Internet experts and other Internet users, recruited by email invitation, Twitter, Google+ or Facebook. Since the data are based on a non-random sample, a margin of error cannot be computed, and results are not projectable to any population other than the respondents in this sample.

When asked about their primary workplace, 40% of the survey participants identified themselves as a research scientist or as employed by a college or university; 12% said they were employed by a company whose focus is on information technology; 11% said they work at a non-profit organization; 8% said they work at a consulting business, 10% said they work at a company that uses information technology extensively; 5 percent noted they work for a government agency; 2% said they work for a publication or media company.

When asked about their "primary area of Internet interest," 15% identified themselves as research scientists; 11% said they were futurists or consultants; 11% said they were entrepreneurs or business

leaders; 11% as authors, editors or journalists; 10% as technology developers or administrators; 6% as advocates or activist users; 5% as legislators, politicians or lawyers; 3% as pioneers or originators; and 28% specified their primary area of interest as “other.”

## Main findings: The future of money: What *IS* your "wallet?"

| TOTAL RESPONSES | Tension pair on smart-device use for purchasing |
|---|---|
| 65 | By 2020, most people will have embraced and fully adopted the use of smart-device swiping for purchases they make, nearly eliminating the need for cash or credit cards. People will come to trust and rely on personal hardware and software for handling monetary transactions over the Internet and in stores. Cash and credit cards will have mostly disappeared from many of the transactions that occur in advanced countries. |
| 33 | People will not trust the use of near-field communications devices and there will not be major conversion of money to an all-digital-all-the-time format. By 2020, payments through the use of mobile devices will not have gained a lot of traction as a method for transactions. The security implications raise too many concerns among consumers about the safety of their money. And people are resistant to letting technology companies learn even more about their personal purchasing habits. Cash and credit cards will still be the dominant method of carrying out transactions in advanced countries. |
| 2 | Did not respond |

**PLEASE ELABORATE:** What is the future of money? Explain your choice and share your view of any implications for the future. What are the positives, negatives, and shades of grey in the likely future you anticipate? *(If you want your answer cited to you, please begin your elaboration by typing your name and professional identity. Otherwise your comment will be anonymous.)*

***Note:*** The survey results are based on a non-random online sample of 1,021 Internet experts and other Internet users, recruited via email invitation, conference invitation, or link shared on Twitter, Google Plus or Facebook from the Pew Research Center's Internet & American Life Project and Elon University. Since the data are based on a non-random sample, a margin of error cannot be computed, and the results are not projectable to any population other than the people participating in this sample. The "predictive" scenarios used in this tension pair were composed based on current popular speculation. They were created to elicit thoughtful responses to commonly found speculative futures thinking on this topic in 2011; this is not a formal forecast.

## Respondents' thoughts

In this survey about the likely future of the Internet, a majority of technology experts and stakeholders expressed confidence that by 2020 most people will have embraced and fully adopted the use of smart-device swiping for purchases they make, nearly eliminating the need for cash or credit cards. These experts feel that the explosive growth in the use of smartphones and other mobile devices, combined with the convenience, security, and other affordances of mobile payments systems, makes these systems an obvious choice to replace established modes of payment in day-to-day commerce.

Although many respondents feel that smart-swiping represents the future of money, they are divided on how quickly this technology will actually be allowed to displace established and highly monetized transaction methods.

Also, in elaborating on their predictions, a number of respondents indicated that they expect this process to develop generationally, with younger users jumping to abandon cash and credit cards while their parents and grandparents may make the move to mobile payments slowly, if at all.

Indeed, many of those who chose the "optimistic" scenario still envision cash and credit cards maintaining an important presence in our economy for the foreseeable future. Whether this is due to ingrained consumer habits, a lack of infrastructure for making payments, foot-dragging by incumbent merchants and other providers, concerns about the security of mobile payments, or a desire for the anonymity that cash provides, a number of the experts surveyed used their comments to stake out a middle ground in which they predict that by 2020 mobile wallets will co-exist with a wide range of payment options.

The highly engaged, diverse set of respondents to an online, opt-in survey involved 1,021 technology stakeholders and critics. The study was fielded by the Pew Research Center's Internet & American Life Project and Elon University's Imagining the Internet Center. When asked to choose one of the two 2020 scenarios presented in this survey question, respondents were asked to, "Explain your choice and share your view of any implications for the future. What are the positives, negatives, and shades of grey in the likely future you anticipate?"

**Following is a selection from the hundreds of written responses survey participants shared when answering this question. The selected statements are grouped under headings that indicate the major themes emerging from these responses. The varied and conflicting headings indicate the wide range of opinions found in respondents' reflective replies**.

## Many are confident in the rapid adoption of payment by devices

Since this survey targeted tech-savvy respondents, it comes as no surprise that most of them believe the public will embrace using mobile devices as digital wallets. "Credit and debit cards will almost be dead by 2020," predicted consultant and research business owner **Stowe Boyd**, "because of the convenience and lower costs of directing payments through mobile devices, either by swiping, near-field techniques, or other services offered by cell carriers or platform companies (like Apple)."

**Jerry Michalski**, founder and guide of Relationship Economy Expedition, noted, "Cash and credit cards as we know them are on their way out. Automation is here and will keep rushing in."

**John Pike**, director of GlobalSecurity.org, responded, "So many people are already accustomed to buying a cup of coffee with a credit card that smart-device swiping is only a very small next step."

**Ross Rader,** a board member of the Canadian Internet Registration Authority, noted, "Cash has already disappeared and plastic is just an intermediate device waiting to be replaced. The security, reliability, and costs associated with maintaining plastic will drive issuers and merchants to adopt hardware and software solutions, while consumers will be motivated by convenience and functionality."

**David Morris,** managing director of research for the Michigan Economic Development Corporation, echoed the voices of many survey respondents when he noted that early adopters are paying by mobile device right now. "Smart-swiping devices will be prevalent by 2020, in fact

it already is. This way of spending in retail establishments, online purchasing, etc., is already a dominant mode of financial interaction. I can only see it becoming even more widely adopted by 2020."

**Susan Crawford**, a professor at Harvard's Kennedy School of Government and formerly a special assistant for technology policy for President Barack Obama, added, "There is nothing more imaginary than a monetary system. The idea that we solemnly hand around printed slips of paper in exchange for food and water shows just how trusting and fond of patterned behavior we human beings are. So why not take the next step? Of course we'll move to even more abstract representations of value. Other countries are already content to use their phones; we'll catch up eventually."

**Vili Lehdonvitra**, a researcher at the University of Tokyo and visiting scholar at the Helsinki (Finland) Institute for Technology, predicted that by 2020 "merchants will be offering completely automatic context-aware micro-payments that require no action on part of the consumer: simply grab a can of soda or hop on a tram, and you will be charged automatically. Virtual currencies will continue to be used as complementary money in closed-loop systems."

Anonymous respondents added:

> "The train has left the station. The only people who will need cash are those that are trying to hide something. Biometric identification technologies will be standard, so fraud will be reduced substantially."
>
> "My formerly Luddite husband, age 58, has become a big fan of his smart phone and its capabilities, as well as the convenience offered by services like online banking. Put them together, and you have a happy guy with less stuff in his pocket."
>
> "I never carry cash with me and have almost made the switch to all digital. I think paper money will still exist in 2020, but most people will have embraced smart-device swiping."
>
> "As with credit and debit cards now, whatever security concerns people may have will be overridden by the convenience of smart-device swiping."
>
> "People already view their phone as the most important item to take with them when they leave the house. I believe they will love being able to leave a bulky wallet behind when they leave, too."
>
> "Smart-device swiping for purchases is a huge convenience. Just like credit cards before them they are a big time saver and use of ease. I think they will be easily adopted by all people and the security for them will advance to point that there will be no more worry than there is with credit cards today."
>
> "This is a no-brainer. Cash is already disappearing and people are not wedded to credit cards. Whatever is fastest (given sufficient security) will work."
>
> "The security fears of using smart devices for payment mirror the early fear of making purchases over the Internet. Ultimately, the ease of making purchases will win over the public—just as they have been won over to the idea of constantly carrying their cell phones."

## Mobile payments are not so different; they are becoming more common today in many parts of the world

Several respondents noted that this shift from paper and plastic to mobile devices is already underway in many parts of the world. As **Alexandra Samuel**, director of the Social + Interactive Media Centre at Emily Carr University of Art + Design Vancouver, Canada noted, "Step outside the United States and you will see that the cashless economy is already here. In a country like Canada, where the relative centralization of the banking industry made it relatively easy to develop point-of-purchase payment mechanisms, the use of cash is already in decline. As private mechanisms for payment acceptance become easier and more widespread (think PayPal, Square) the relevance of cash will dwindle."

**David A.H. Brown**, executive director at Brown Governance Inc. in Toronto, Canada echoed this sentiment: "This trend is already overwhelmingly clear in many parts of the world—virtually all purchases will be made by handhelds and it probably won't take ten years to get there." And **Suzanne England**, a professor of social work at New York University in New York City noted that "I expect this transition to happen even more quickly that by 2020. These systems are already the norm in other countries such as Japan."

Others argued that to a large extent our financial lives are already conducted electronically, and that mobile payments will not be a significant leap. **Christian Huitema**, a distinguished engineer at Microsoft Corporation noted that, "We have already witnessed the transition from cash to debit/credit cards. The electronic wallet is not much more than a 'virtual card,' in which near-field wireless communication replaces the reading of a magnetic stripe." **Peter Pinch**, director of technology at WGBH in Boston, Massachusetts argued that, "I see 'credit cards' as already virtualized, electronic currency. The form factor and functionality of the card doesn't really matter: I'm already making an electronic transaction and I expect all the affordances of such."

**Stephen Schur**, director of online communication at Ramapo College of New Jersey echoed this sentiment that the future is just the present in a new form factor: "Online bill paying, the use of smart-devices to swipe and pay will become the norm. Most Americans use credit or debit cards to pay bills at retailers, restaurants, and in other venues. There is little difference in 2020 by using your smart device that is directly tied to your funds. The plus is a centralized resource of funds while the negative is the need for someone, hopefully the consumer, to keep track of the activity. We can't really express concern about loss of privacy since most of our activity in 2011 is already tracked and readily available for analysis."

Several anonymous respondents echoed the assertion that the future is now:

> "The future of money is the easiest thing to see. It is becoming more and more a function of numbers on a computer. I see a time when money itself becomes more of a concept of 'credit'—the one science fiction concept that seems to be realistic. People are inherently lazy—anything that makes daily life go more smoothly they will accept unless there is a clear and obviously presented threat."
>
> "What cash? Already, myself and peers in the NYC area rarely use cash. We write less than five paper checks per year. Virtually everything we spend is done electronically."

"Many people are already comfortable with similar forms of purchase such as Amazon one-click from phone, downloads from iTunes, and purchasing apps."

"The future of money is increasingly wired into the machine and further away from the wallet. Society is already moving to electronic money. Go to any Starbucks and watch people swipe their cards for a $4 latte. In other countries, smartphone-enabled purchasing is already taking hold, particularly in Japan and Europe."

"In Australia we are already there. Electronic file transfer at point of sale is 'normal,' cash and cheques are the anomaly. Security is a technical issue which continuously improves."

## It's up to the people involved in the process to move it forward

Participants in the survey often noted it is up to those who now control transaction systems to set the agenda.

**Jonathan Grudin**, principal researcher at Microsoft, said the financial industry will decide this. "The driver here will virtually 100% be whether or not the credit card industry decides it can make more money through changing technologies," he responded. "They can then put in the guarantees and other incentives to bring people around. People will do what seems to work for them and the financial community knows how to manage perceptions. So, what do I think will benefit the financial companies? I think 2020 is too early for them to find ways to make this work better than the highly profitable money machine they have in place."

**Mark Watson,** senior engineer for Netflix, doubts a quick move to the new system is likely. "Since there is far less money to be made from offering useful retail banking services than in other forms of banking there seems no incentive for banks to focus on improving that aspect of their business any more than they have for the past 20 years," he wrote. "I believe people would welcome the improved services in the second scenario and will not be distrustful of NFC, mobile payments, or security, provided they are not asked to assume financial responsibility for any security risks that exist (i.e. it's the banks responsibility to make new systems secure and pick up the tab for fraud that occurs as a result of problems with those secure systems)."

**Rob Scott** of Nokia noted, "The primary impediments to adoption have been, and will continue to be, the participants (and wanna-be participants) in the payment value chain. Operators will continue to attempt to insinuate themselves into the process at a premium rather than simply accepting their long-term fate of being minimum-margin bit pipes for the masses. Transaction processors will continue to assert they are adding value when, in fact, they add none. Banks, if we are lucky, will be once again tightly hamstrung into serving their original intended purpose, leaving opaque and exotic financial instruments to the likes of Goldman Sachs and Morgan Stanley who have long since shed the term 'bank' specifically for this reason."

**John Smart,** president and founder of the Acceleration Studies Foundation, said, "Corporations will be happy to milk oldsters for exorbitant check and credit card handling rates—as they do today—and to keep all these systems unsecure as long as possible, as that allows insurance companies to make a lot of cash off of ensuring against identity theft, etc. Financial companies make the most money of any business class, and they have incentives to keep things nontransparent and changing the least slowly. Expect rapid adoption of these 'leapfrogging technologies' in less-advanced countries (eg. M-PESA mobile banking in Kenya/Africa) and by

youth everywhere, but that will remain a minority of total global commerce. Eventually these platforms will create a competitive advantage, but when they do, credit card companies will (finally) drop their rates to remain competitive, or buy up and consolidate the largest of these mobile platforms."

**Morley Winograd,** a co-author of *Millennial Momentum: How a New Generation is Remaking America*, also sees the financial industry standing in its own way, commenting, "In Europe the ability to protect existing financial institutional arrangements is likely to slow if not deter adoption of such behavior."

**Bill St. Arnaud**, an Internet architect and activist who is investigating next networks in Canada and The Netherlands, agreed that the most rapid adoption most likely to take place, "in the third world first, where there is no well-established banking system." **Pete Cranston,** an Oxford, UK-based information and communication technologies for development consultant, commented, "Seeing the impact of M-PESA in Kenya, across all social classes and age bands, convinces me that people will adapt to the new m- or e-transaction systems. They will also be pressured relentlessly by commercial interests to do so."

**Paul Gardner-Stephen**, rural, remote, and humanitarian telecommunications fellow at Flinders University, said near-field communications "introduces costs for retailers that will slow its adoption, especially in light of the lack of a compelling problem for NFC to solve." He added, "What I do anticipate is a more general use of mobile-device-based currency in developing countries, and to some extent in developed countries where the mobile minute functions as a representative currency redeemable on demand and thus, according to monetary theory, is preferable to the purely fiat currencies of countries where that currency experiences instability. Political shocks that demonstrate the ability of corporate and/or government interests to freeze, seize, or otherwise interfere with people's ability to control their own financial resources and transactions (consider 'net neutrality' becoming 'cash neutrality' under NFC) will push people towards even fiat currencies because of their physical nature even though their value may be manipulated by government as the scope to do so is much less than with a fully-digital currency."

**Sivasubramanian Muthusamy**, president of the Internet Society-India Chennai, said he expects financial institutions to push the mobile-wallet agenda forward. "Electronic payments and near-field communication devices could become ubiquitous," he wrote, "by a combination of choice a) by a significant proportion of population who are swayed more by superficial comfort rather than by more subtle concerns (such as the concern for privacy) and b) by coordinated 'impetus' by the Banking and Business sectors together with c) a strong Government agenda to move the financial system more and more towards a system that is more easily monitored. These forces have traditionally been very, very powerful and it is unlikely that the balance will shift so easily towards the will of the population in such a short time as ten years. So, even if there are vocal opinions expressed against the increasing adoption of electronic payments, the Banking sector may have its way."

Other respondents argued that banks and other players will need to take a leading role in developing infrastructure to allow the technology to take root. **Steve Jones**, a professor of communication at the University of Illinois-Chicago noted that, "I don't think it will be security concerns that will stall the adoption of NFC so much as the effort involved with getting the infrastructure for its use in place on a national scale in the United States." **Michel Menou**, a visiting professor at University College London argued that widespread adoption by 2020

"…depends on the willingness of financial institutions to enter generalized systems, which will seriously transform the competition scene. This may be a far more powerful limiting factor than people's concern for control and privacy."

Others predicted that the financial industry and technology companies will need to help allay security concerns among users. As **Veronica Longenecker**, assistant vice president of information technologies at Millersville University in Millersville, PA put it, "The deciding factor to this question is security. If we can develop security methods to ensure monetary transactions are safe, people and companies will migrate to this technology...if we don't develop strong fail-safe security methods, people will not embrace smart-device swiping."

Some survey respondents expressed frustration with the forces guiding the global economy today. "Financial institutions have lost most of their credibility and will continue to do so as they have failed to manage the age-old challenge of greed," remarked **Fernando Botelho** of F124 Consulting, an international consultant on technology and development. "As technology requires of institutions an even greater sense of responsibility, caution, and integrity, they will fail to implement new ways to transact business. Technology is no substitute for ethics, reputation, or morality; quite the contrary, it magnifies any deficiencies in the above."

**Tapio Varis**, principal research associate with the UN Educational, Scientific, and Cultural Organization (UNESCO), said, "The irresponsible and greedy behaviour of major global financial institutions will undermine the trust and confidence in the international climate of behaviour. This will slow the expected progress towards digital e-money."

Concerns about people's spending habits were also expressed. **Tom Rule**, an educator and technology consultant, predicted, "We *will* see even more people having financial difficulties because of overspending."

A number of anonymous respondents argued that the evolution of this technology will depend on incumbent players:

> "The forces of the market will sweep people along, despite distrust, or even actual instances of fraud or theft. Convenience, marketing, (including the opportunities for data mining and personalized ads) will make it difficult for individuals to have any real say in this. What makes money for the existing power structure will determine what techniques/technologies are used."
>
> "These choices will be made by the corporations who will increase their profits by eliminating all cash."
>
> "The barriers to using near-field data transfer for financial exchange will have more to do with the monopoly power of the current transaction processors and financial institutions. They have a vested interested in the current closed-source infrastructure, which enables their continued monopoly and the significant revenue stream that it generates."
>
> "In 2020, this will be true in many societies. The challenge, however, is which companies will deliver the technology. Will it be an anonymous consortium, such as Visa, that sets standards and allows a variety of banks to participate to whom individuals have existing

trust relationships, or will it be a single company that lacks transparency or has broad access to other types of individual information."

"It is essential to establish norms and practices around privacy that build consumer trust, and I believe the affected industries will have every incentive to do so. The key question is whether governments will work to facilitate the development of norms through multi-stakeholder organizations, and whether the industries can succeed in building widespread acceptance of those norms. The final hurdle will be getting financial intermediaries, providers of wireless operating systems, wireless network operators, retailers, and other key stakeholders to make the compromises and concessions necessary to fully implement an interoperable system for handling such transactions."

"What's standing in the way of both aspects is the incentives to both the large credit cabals (I hesitate to call them 'companies' as that would give their business some form of legitimacy) and retailers; in the former case, they're heavily invested in the current technology stack and the control it gives them over transactions (as well as the visibility it gives them into our data), and in the latter, changing every retail outlet around the world is an expensive and time-consuming thing to do."

"Actually I think the real issue is the resistance of the financial sector. Look at the tremendous challenge in getting chipped credit cards in the United States and the problems that cause folks who travel abroad (and the flip side in the United States—European travelers being asked to type in their zip code at a gas machine). Things just move slowly in the financial sector and these changes will take far more than eight years."

"Credit cards are already pretty convenient. I don't think most consumers want to put their financial data at risk by connecting it directly to a communication device. Additionally, what's the financial incentive for retailers to participate? They already hate paying credit card fees. Why would they pay to convert their entire revenue system again after just getting set up for credit cards?

"This question depends not on the technology but on the banking policies toward these services. Banks can drive customers in this direction by the kinds of fees and services they offer."

"The cost of transactions will be a big deciding factor. The current move to increase fees for debit transactions could cool that area of growth."

"For the majority of SMOs, smalls neighborhood shops and the like, money will keep reigning; paying for the e-banking service still will be too expensive, too weird, or just not-existent (no network available). I cannot imagine paying with PayPal after bargaining in a market at El Cairo."

"Banking fees will significantly affect the speed of this conversion. If banking fees are reduced or eliminated by using smart swipe technology consumers will move to it faster. If fees remain the same or cost more, consumers will use whichever method is easiest and cheapest for them individually."

"It won't happen this quickly less because of security fears but more because of the cost of mass adoption of these technologies. It needs to reach a tipping point where most vendors run this way, and I just think it will be cost prohibitive for a while."

"The consumer cannot drive the move to NFC payments. The cost to build the infrastructure to support NFC is too large. Additionally, the security issues related to passing data using NFC outweigh the benefit of adopting this new technology. If NFC was able to be used by 85% of the population, and could displace a more costly form of payment it may have a chance to succeed, but the reality is that cash will always be in the economy, and bank-issued cards (debit and credit) provide too much profit for them to be displaced."

"If it is universally available, people will adopt the technology. A classic case was the New York Subway installing the MetroCard. Until it was available at stations that people frequented every day, few used it. As the technology rolled out and it was priced to 'sell' there were high levels of adoption."

## Multifactor authentication is the next step in payment systems—assuming security concerns are addressed thoughtfully

Many of the survey participants who see a positive future for payment by mobile devices said it should generally be more trustable and secure.

**Mike Liebhold**, senior researcher at the Institute for The Future, noted, "Widespread adoption of point-of-sale capabilities like NFC [near-field communication] seems inevitable, along with the creation of robust and secure personal digital wallets. The parallel rise of reliable multi-factor biometric authentication will help secure electronic transactions."

"I for one welcome my beast-marked future financial transactions. Just look into my eye–biometrically of course—and add to my e-wallet," responded **Paul Jones**, an associate professor and Internet expert who works at the University of North Carolina-Chapel Hill. "E-wallets aren't a giant leap from credit and debit cards."

**Hal Varian,** chief economist at Google, said the process is in development. "The 2020 date might be a bit optimistic, but I'm sure that this will happen," he responded. "What is in your wallet now? Identification, payment, and personal items. All this will easily fit in your mobile device and will inevitably do so. But it may take a while. It is generally thought that two-factor authentication (secret + physical device) is better than one-factor authentication, and smart phones seem to have a natural role here."

**Peter J. McCann**, senior staff engineer for Futurewei Technologies, agreed it should be more secure than present-day systems. "Money is already a largely digital process," he said. "The modern fractional reserve banking system is backed by digital account balances at the Federal Reserve. The introduction of cryptographic protection to the instruments such as credit cards that we carry around with us is necessary and inevitable. The use of a simple string of digits that must be shared with any vendor with whom you transact is really a ludicrously insecure system that can and must change."

**Rob Scott**, chief technology officer and liaison at Nokia, said exchanges using mobile devices will be safe. "The consumer is far more comfortable and protected in financial dealings than in the

days of plastic and magnetic strips," he wrote. "If they wish, every transaction that could be attributed to them is routed to their personal, secure grid for approval or denial. The more trusting of consumers will allow their personal persistent agent (virtual machine in the cloud) to make most of these decisions as it has constant access to their location, history (online through captured speech), and of course the ability to reach them."

**Mack Reed**, principal at Factoid Labs—a consultancy on content, social engineering, design, and business analysis—said trust in a new system will not be a problem. "Improved technologies for privacy and security have eroded the general distrust of technology and powered the advance of online commerce to the point where we think nothing of ordering songs, trips, and $1,000+ computing devices online," he pointed out. "This trend will continue as the market determines the best way to do business at both the personal and enterprise levels."

Futurist **Marcel Bullinga** predicted that by 2020, "Paper money will be gone, provided the safety of virtual money is addressed properly—all virtual money and value papers will have embedded features for privacy and trust. All tokens will be wrapped with an unbreakable 'Cloud Seal' (the updated version of the old notary seal). All transactions and all claims will be checked in real time by mobile phone *before* they are executed, thus preventing fraud. Lying becomes very difficult—we will use all sorts of local money, like the Totnes Pound, that is 'non-speculative' by nature. Local money will prevent a global financial meltdown."

Despite these potential security benefits, a number of respondents cautioned that major security lapses along the way would delay—if not prevent—widespread adoption of mobile payments. **Tom Hood**, CEO of the Maryland Association of CPAs, said, "The positive scenario you propose can only happen with an evolution of identity protection and data security. Otherwise, the public trust will not be adequate to support the trend."

**Wesley George**, principal engineer for the Advanced Technology Group at Time Warner Cable, agreed, saying, "Already, many people have all but abandoned carrying cash and using checks in favor of things like PayPal, credit cards, etc. Ultimately, convenience wins, often at the expense of security. The key will be to find ways to secure the system while not losing too much of the convenience inherent in it."

**Perry Hewitt,** director of digital communications and communications services at Harvard University, also said security issues will be a problem but convenience will win the day, noting, "A smart phone that can swipe me into the subway, buy my latte and bagel, and serve as an ID to get me into my building may well be a privacy nightmare, but it's also a harried urban commuter's dream."

A selection of anonymous responses on this topic:

> "Today's NFC requires a smart phone, but future NFC devices will be the size of a credit card with e-ink touch screen, and non-volatile memory. Future NFC devices will overtake credit cards when they match the card form factor, robustness, and cost."
>
> "This is already happening with the advent of automatic toll payments for cars on toll roads across the country. It is inevitable that similar technologies will be used by individuals. I suspect that eventually chips will be implanted so we won't have to remember to carry our wallets with us."

"I think this is almost here now for some countries and market segments. It will be driven by the business needs for trusted security for more virtual goods transactions like books, music, entertainment, etc."

"Many of my friends no longer use a check book. I happily foresee the time when we don't have to walk around with wallets of cash and credit cards—that all too often get stolen!"

"We will arrive much sooner than 2020. Money is not an object like a dollar bill, it is a 'value' assigned to a 'unit.' I can definitely see a near future where most everyone uses a code or a biometric (thumb print) to pay for purchases."

"Convenience and security are king. The e-wallet provides both. Why wouldn't we move in this direction?"

"The third world is way ahead of advanced countries. Fewer and fewer people carry cash (myself among them) and as we become more trusting of the security tied to our mobile devices and life in the cloud, not having to carry a wallet/pocketbook around will appeal to more people than those who want to continue to have to carry a purse, a wallet stuffed with credit cards and cash."

"Maybe it is because I hardly ever use bills and coins, and all my bills are paid electronically since it saves time and work, that I can see this coming. All systems are improving and the security issues will be resolved, and/or things like some form of biological recognition (the eye) will be in place."

"This is a tough one, but it seems that convenience and a guarantee of privacy and security is enough for most people. We went from holding our own money, to trusting banks, to trusting credit card companies—an even more convenient way to spend will be welcomed."

## Some predict the result by 2020 is likely to be a gradual movement rather than wholesale revolution

A number of respondents expect people to ease into the common adoption of digital devices as their mobile wallets.

"Most people will by 2020 have embraced the digitization of transaction, but a sizable infrastructure to support use of 'real money' will still be in place," noted **John Horrigan**, vice president of Tech Net. "Generally, migration to such 'new digital worlds' will be somewhat slower than expected due to: a) experts' general over-estimation of the speed at which the general public embraces new technology, and b) the long-term nature of the current economic crisis which slows investment in and uptake of tools by users in 'new digital worlds.'"

Several respondents noted that deep-seated habits seldom vanish overnight. "Cash—tangible, hold it in your hand dollars—has been around for millennia. It won't go away in a decade," said **Jeff Eisenach**, managing director and principal at Navigant Economics LLC in Washington, DC. **Dan Ness**, principal research analyst at MetaFacts in Encinitas, California echoed this statement: "Inertia is also a major factor. Consider the decades it took for ATM and debit card transactions to come into widespread use. Yes, there will be early adopters and pioneers with digital wallets.

By 2020, it's unlikely that cash will disappear among the mainstream majority." "Two words: legacy infrastructure. Maybe in 2030," said **Fred Stutzman**, postdoctoral fellow at Carnegie Mellon University in Pittsburgh, Pennsylvania.

Others predicted that widespread adoption will depend on how security risks are addressed. "As the news of identity theft, hackers, major political, economic, military, and educational electronic sites being electronically attacked proliferate, people will remain wary of abandoning money and credit cards—even though credit card-based Internet transactions are becoming increasingly vulnerable as well," said **Simon Gottschalk**, professor in the department of sociology at the University of Nevada-Las Vegas

Many anonymous respondents envision a gradual emergence of widespread mobile payments:

> "While NFC use will rise sharply, there will be a few highly publicized scares that will cause consumers to rethink adoption. My guess is that NFC transactions could be as high as one third, but I doubt it will be more than that."
>
> "As a technologist I hate my choice of selecting the second statement. The smartphone used as a credit card will only be adopted by folks that seek and embrace technology. By 2020, heck, getting people to not write checks in grocery stores would be a major accomplishment. Also, cash lets folks buy things they don't want others to know about or track."
>
> "This shift shall also take longer than expected. Other than security and privacy issues, more prosaic problems such as costs or other hindrances—e.g. if you run out of batteries, you temporarily run out of money—may arise."
>
> "2020 is far too soon to see much change. Online bill paying has been around for fifteen years, and I would be surprised if a majority of bank customers use it now. If you had made 2040 the date, I would have chosen the other scenario. 2030 would be a toss-up."
>
> "We'll get there, but in 2030 rather than 2020. It just takes time for the whole system—from hardware to habit—to shift. Look at how long checkbooks have hung around, and nobody has ever really liked them."
>
> "The format of a credit/ATM card is too ingrained in how people are used to dealing with money, and smart-devices have no chance of coming close to completely replacing that form factor by 2020. On the other hand, there will be a lot of use of near-field communications in that card factor—for example, I pay all of my transit fares with an NFC card that is the size and shape of a credit card, and that system is rapidly being adopted by most large transit systems."
>
> "It just takes time to change the culture. Charge cards have been around since the 1930s but it was only in the 1960s that they really began to take off."
>
> "Cash and coins have been in use for millennia, and are unlikely to disappear any time soon. Money is a mechanism for conveying trust, and people are extremely reluctant to abandon something that has worked well for so long."
>
> "Mobile money is coming; it is just coming slowly in developed countries (like the United States) where there are so many entrenched options to do payments and banking."

"People have deep concerns about privacy and it will take time to ensure/assure people of the safety of strictly digital money."

"I have serious doubts and trust issues about exclusive all-digital applications going forward. I think we will have to look at new, more secure ways to protect individuals' financial security. I don't see an end to the use of debit/credit cards and cash."

"As much as I'd like to see a money-free world, I'm afraid the opportunities for the hackers and pirates are too great. I'm happy to buy my $2 Starbucks using my Android but I don't know that we will ever feel secure enough to make much larger purchases that way."

"Seeing as people are barely past (and sometimes not past) trusting in physical resources like gold, I find this unlikely for 'most' people in the near future. People may increasingly rely on hardware and software for financial transactions out of necessity, but I find it more unlikely that most people will trust in these transactions. Even if most people are using these systems for some transactions there will likely still be strong reliance on traditional money for specific types of transactions."

"I think that it is very possible that cash or credit card transactions be eliminated in developing or emerging economies first before it happens in the developed countries. Innovation in this sector will come from poorer countries, as transactions will be done more via mobile phone."

"However, certain aspects of technological adoption vary according to cultural influences. As an American who has lived in Europe for eight years you can see that technology is just as prevalent to society, however, the adoption of credit/debit card transactions is limited in certain 'developed' countries. Germany and Italy are heavily cash dependent still, whilst the United Kingdom is very 'Americanised' and you can use your card to purchase water, if you wanted to."

"2020 is too soon for this sort of shift. My husband works for the post office, and people still come in for money orders. There are segments of the population that do not use banks. I do think we will see more cards, debit cards, cards that carry points for social services, etc."

## Some see this change evolving along generational and socio-economic lines

Many survey participants predicted that young people will drive the change in the US, but that adoption may happen slowly (if ever) among older generations.

**Morley Winograd**, co-author of *Millennial Momentum*, predicted that, "In the United States, with the Millennial generation representing more than one out of every three adult Americans, the ability to use technology to make each moment of the day more productive will win over this giant piece of the market, and then ultimately the rest will follow. Since privacy concerns are also not a Millennial generation priority, such concerns will only cause older adults to resist the transition, but when dealing with their children they will fall in line as quickly as mothers learned to text to communicate with their kids."

Other survey participants agreed that adoption will be generational at first and then spread. “As Baby Boomers age out and are no longer the dominant consumer group, younger, tech-savvy adults might lead the charge,” wrote **Melinda Blau**, freelance journalist and the author of 13 books, including Consequential Strangers: The Power of People Who Don’t Seem to Matter But Really Do. “I just don't think we're there, yet. What I do think will become more common, thanks to the Internet, is commerce based on sharing (zip cars, house sharing, etc.), not ownership.”

**Lisa E. Phillips**, a senior research analyst at eMarketer Inc., explained, “Although mobile payment methods will be far more advanced in 2020 than they are today, they will not be trusted by most people for every type of transaction. From a demographic perspective, in 2020, the oldest baby boomers will be 74 and the youngest 56. Census projections put their numbers around 71 million, about 21% of the US population. Although they rely on the Internet for information and entertainment, it will take a lot of persuasion to get this group to use mobile devices rather than money. By contrast, young adults 18 to 34 will make up about 22.5% of the population 2020, at nearly 77 million. They will be less cautious and more open to going without physical wallets.”

**Hugh F. Cline,** adjunct professor of sociology and education at Columbia University, said, “I expect that by 2020 significant progress will have been made in eliminating cash and credit cards. Although a large number of older persons will insist on methods of exchange that they feel will be more secure, the trend is clear among young persons today.”

Microsoft Research leader **danah boyd** envisions a socio-economic component to the adoption of mobile payments. “The majority of working class and lower-middle class people in advanced countries will not be passionate about the issue in either way but will still be extremely slow to adopt any of these systems. In many of the communities that I visit, using ATMs is still a radical thing done by the young. Their failure to adopt will not be because of security fears, but because the elite will still be battling this out and most people will just slowly wait and see what will happen. Adoption will happen generationally.”

An anonymous respondent added, “A segment of the population will be comfortable with scenario one, but there is a huge segment—small-business, lower middle class, middle class of people—who may not be able to afford the technology and will always want to use cash. Concern about privacy is only one issue. Lack of trust in banks, big companies, etc. will probably keep a wide group of consumers (including me) to use smart phones, but not exclusively for financial management.” Another predicts that, “This is another scenario where the outcome will most likely be a mix between the two and divided on socio-economic lines. The way the economy is going now, I don't see the rural Midwest embracing smart phone transactions anytime soon. It could be common to see smart-device swiping in New York City in 2020, but I think it will most likely be an urban, middle to upper-class phenomenon.”

A number of other anonymous respondents expect this trend to evolve generationally:

> “The real question is related to the timing of this trend, not its eventuality. The majority of consumers in 2020 will still be from a generation bred to shop with credit cards, which will still have a strong enduring presence.”
>
> “Much like the personal check, cash, and credit cards will take much more time to be fully eliminated. The elderly and lower income groups will take more time to adopt

these new technologies, making it critical for businesses and services to maintain the cash/credit card option."

"I think that the 2020 timeline for the mass-adoption of smart cards is optimistic. There is still considerable resistance even to using debit cards for purchases in some demographic brackets. I would think that 2030 would be more realistic."

"Thinking a global level, the change of traditional behaviors will need more than one generation."

"Simply as a demographic matter, people used to using paper money and credit cards will not abandon them within the next decade. Cultural changes don't happen as quickly as forecasted in many of these scenarios. Changes in values, practices, and social institutions occur gradually over generations."

"This was one of the more difficult choices. I chose the latter because I honestly do not see the older generations being comfortable with this idea—I still know many people who refuse to pay bills online or own a bank card—something which I have never understood but I see every day."

"The rate of adoption of cashless exchanges is increasing from the bottom up—meaning from Generation Y to X to Baby Boomers, however, until smartphones become less expensive and their securities increase there it is unlikely smartphones will become the predominant vehicle for monetary exchange."

"This will be true for digital natives, but not digital immigrants. PNC reports that 17% of their non-cash transactions are paper checks. They also report that their student load business is increasing. So, young adults will use the smart transactions, while the older adults, over the age of 40, will use bank-by-phone services."

## This is a moment at which people can invent economic processes that involve new measures of value, new transaction schemes, new currencies

Several survey participants said the time is ripe for a reinvention of how we do things when it comes to global economics.

"Not only will our notion of currency change as it becomes electronic and (even more) virtual, but I see the possibility for new currencies measuring new value," predicted **Jeff Jarvis**, author of *What Would Google Do?* "We could, for example, award and trade in points for responsible environmental behavior. I also see the possibility to create new currencies that cut across national borders, independent of governments. We have already seen the first nascent attempts to do this. It won't be easy but it is theoretically possible."

**Peter McCann** of Futurewei Technologies suggested that governments should take a step back and turn the global financial system over to be operated by private intermediaries and a cryptographically protected, gold-backed system. "The involvement of the government in our money may be reduced dramatically in the future," he predicted, "especially if they continue to abuse the fiat system that is now in place by over-issuance of currency. A return to a gold-

backed system with private organizations playing the role of intermediaries is a definite possibility. The use of cryptography can help to improve the security and privacy of such a system."

**Stan Stark,** a consultant at Heuroes Consulting, based in Houston, Texas, responded, "One observation—watch for interest in gold standard to resurface in a big way."

**Jerry Michalski**, founder of Relationship Economy Expedition and Sociate, responded, "The bigger question to me is whether the dollar will still be the mainstay of civilization, and in fact whether most transactions will be denominated in fiat currencies. Two reasons are looming that could drive that change. First, the global monetary system, always fragile, is more precarious than ever. People who led good lives and worked hard are finding their retirements ruined and their assets gutted, while they watch the tiny fraction of the wealthiest make more than ever and pay no taxes. That's a bad formula. Second, it's going to get incredibly easy to set up local currencies of all kinds that may not be coupled to fiat currencies at all, thus freeing them from the inflationary and deflationary vagaries of the global financial markets. Omnipresent automation will make this possible."

**Alex Halavais**, a professor at Quinnipiac University and author of *Search Engine Society*, wrote, "The real question is whether alternative currencies (Bitcoin, etc.) will make headway or remain a geeky pastime."

**Barry Chudakov**, principal at Metalife Consulting and visiting research fellow in the McLuhan Program in Culture and Technology at the University of Toronto, observed, "As Venessa Miemis and others are now detailing, peer-to-peer networks may create mutual credit systems to challenge credit cards."

**Jon Lebkowsky**, principal at Polycot Associates LLC and president of the Electronic Frontier Foundation-Austin in Austin, Texas responded, "I already see the growing use of digital monetary transactions in my world, and increased support for them. I'm not completely sure the credit card will go away, I suspect cards will get 'smarter,' and have more data stored on them. Perhaps we'll have cards that contain a key to multiple accounts. There are some serious discussions of alternate forms of currency, growing in volume as economies seem increasingly shaky. I suspect there'll be innovation here—evolution not just of the medium of exchange but also of the value it represents."

**Kevin A. Carson**, research associate at the Center for a Stateless Society and the Foundation for Peer-to-Peer Alternatives, responded, "The paperless digital economy will exist to a considerable extent under cover of a darknet, with LETS, credit-clearing systems a la Greco, etc., using encryption technology and a lot of re-localized economic activity (like raw milk, micro-manufactured knockoffs of patented industrial designs, non-chipped livestock, etc.) that violates zoning, licensing, and spurious 'health' and 'safety' laws sucking commerce out of the official above-ground economy."

And **Cyprien Lomas**, director at The Learning Centre for Land and Food Systems of the University of British Columbia, said that use of devices for all purchases will allow individuals to track their own economics even better through "personal auditing of spending/consuming habits aided by software that can track and observe trends."

Anonymous comments:

> "We will also see sharing economies and barter and trade; all kinds of new economic models; e.g. Bitcoin—virtual currencies in-world and real world."
>
> "Many transactions, but not all. There will remain a flourishing semi-underground economy. One of the interesting implications of swipe-based transacting is the question of what currency will be used for it. It becomes much easier to handle currency conversions, or insist that all one's transactions take place (from one's own side) in a single currency or in whatever currency is at the moment the most advantageous for the transaction. And then the problem starts getting interesting— designing the software that will search among currencies and find the optimum for both parties in real-time is not necessarily easy!"

## Those who doubt widespread change focused on the safety, security, and privacy issues tied to cashless exchanges

Those who expressed doubts in the quick uptake of the use of mobile devices for financial transactions often cited safety, security, and privacy issues.

**Donald G. Barnes**, a visiting professor at Guangxi University in China and former director of the Science Advisory Board at the US Environmental Protection Agency, said global trust issues will impede progress. "Some have tied the growing lack of trust in society to the growing inequality distribution of wealth," he responded. "There is little indication that this inequality is likely to be reversed anytime soon, and there are indications that the inequalities of many important countries (cf., the Gini Index in the United States and in China) are reaching historically dangerous levels. Therefore, the chances are slim that trust and concomitant acceptance—let alone embracing, of new forms of economic and personal information transfers—will be significantly higher in 2020 than they are today."

**Laura Lee Dooley**, online engagement architect and strategist for the World Resources Institute, raised trust issues and said consumers' fears will inspire new businesses. "There will always be people who are concerned with the security of their transactions," she wrote, "so the concern of someone hacking into your financial flows will continue to grow, and personal security and device-tracking companies will become an integral and major component of the marketplace."

**Henry Judy**, an expert in corporate, commercial, technology, and financial law, responded, "The monetary incentives for cyber-criminals to attack payment systems are so great that people will not migrate en mass to any new systems that are perceived as insecure. In addition, I do not see any substantial progress being made during the time period on the problem of certain countries being used as safe havens for cybercriminals. The widespread use of new payment technologies requires that applicable security measures be readily available and relatively inexpensive. I do not see any great likelihood that that will be the case."

**Sandra Braman**, a professor, researcher and editor of MIT's Information Policy book series, said she's skeptical about a rapid public embrace of mobile payments. "The incorporation of RFID chips into credit cards and passports, with the concomitant growing acceptance of the need to actually use a shielding wallet, and the movement of 'tin foil hats' from the bizarre to the ordinary may impede this particular development," she wrote.

Some people expressed doubts about “cloud” systems and the security of mobile computing. “Coming from a highly regulated industry,” an anonymous respondent wrote, “I know that banks are currently exploring these options. Not only is cloud computing resulting in frightful consequences for protection of customer data, but every day a new discovery is being made about the lack of safety surrounding mobile devices. After being exposed to this scary information on a daily basis, I don't even want to use my credit cards anymore, let alone a mobile device to pay for my groceries.”

**Heywood Sloane**, principal at CogniPower in Wayne, Pennsylvania responded, “Unless substantial changes are made to regulations and contracts, I don't see wide adoption of ‘near field communications,’ if that means things like mobile phones. That isn't to say that these aren't very useful as mobile catalogues, for price comparisons, and as deal finders, etc. But, their utility depends on letting a lot of apps and companies share a large amount of information about a person—more than just location. The chance for identity theft, outright theft of the phone, etc., are high.”

**Nathaniel James**, a social innovation consultant based in Seattle, Washington sees opposition emerging from a range of mindsets: “Resistant individuals and groups will likely come from divergent perspectives—tech-savvy open identity advocates, a subset of economic conservatives concerned with the further virtualization and automation of the economy, liberals who oppose the expansion of corporate social control, and social justice activists representing impoverished communities lacking access to mainstream financial institutions.”

Many anonymous respondents expressed strong reservations about security or other potential issues:

> “Other than security and privacy issues, more prosaic problems—e.g. if you run out of batteries, you temporarily run out of money—may arise.”
>
> “This is my hope, not my prediction. I think it's dangerous to go down the road of a cashless society. We see what happened when a few people are in control of other people's cash—the housing market crashing, manipulation, and scandal. The first paragraph scares me because I see it being at the beginning of a road of corruption. And I see it as a system that's easily broken—not good.”
>
> “Consumers want smart-device swiping for purchases. Until they personally get burned, they are willing to believe that privacy concerns or piracy concerns don't really exist for them.”
>
> “All it will take is one (or more) catastrophic breach to chill adoption of smart-device swiping—people's bank accounts get wiped out or something else horrible.”
>
> “The level of fraud in on-line payments and devices is rising and there is little likelihood that trend will be reversed in the next eight years. Given some of the changes in the economy that make even temporary losses quite painful, the average person seems much more likely to want to keep closer control over some payments. In the United States there is also a strong undercurrent of concern about breaches and companies having too much information.”

“The legal and security regimes for consumer payments are not keeping up with technological development. Credit cards will persist not because they're good technology, but because the security flaws are understood by the public, and because the liability rests sufficiently with the banks that do their due-diligence to maintain security.”

“We haven't solved the personal data and tracking issues, and as more info comes out, the public gets more angry. Until all these issues are solved the digital wallet won't be ubiquitous.”

“People will want to retain as much control as possible over their assets. This is human nature and the entire world will not be wired at this point in time.”

“I would not feel comfortable combining my credit card and my phone. Too many eggs in one basket. I think people will increasingly feel that way as the dangers of that kind of concentration of knowledge, power, and control become clearer.”

“Most people have not thought through the security or privacy implications of digital money. They enjoy the convenience of technology-enabled financial transactions, as long as they can afford them (charges for using digital money) and nothing happens to them (identity theft or unwarranted surveillance).”

“I don't think everyone is going to go fully with smart devices. I've had my credit card number stolen three times in my life—all from online purchases at different, yet credible, online vendors. I do not trust everything going through the Internet. I am sure that for people that have had their identity stolen, they would want to use cash more than credit cards.”

“Surely, there will be some gigantic and horrible breach between now and 2020 that will affect trust.”

“As much as I believe smart devices are the future and I hope to move to a cash-less society, I believe human fears of monetary and identity theft will prohibit that future.”

“At some point, there will be a major security breach, and people's personal financial information will be open for all to see. This will make individuals wary of giving up control over their monetary transactions.”

“Unless unforeseeable technologies come into place, security issues shall linger and oblige certain process issues.”

“There are too many security concerns about RFID chips. Some digital payment will certainly occur (as it is now—RFID-embedded credit cards, barcodes on a smart phone screen to buy coffee, etc.), but it will not be extremely widespread.”

“I know my level of trust is diminishing with time. I imagine others feel the same, though I can't confirm it. I would not go all-digital, all the time with my finances considering the amount of hacking into banks and other financial sites that has been occurring.”

“At least in America, many will still want to use cash and credit/debit cards. Those who wish to disrupt online commercial activities (hackers) seem to be up to any challenge

corporations put in their way. They will continue to hamper these activities for the foreseeable future."

"Some will be happy to use smart-devices, but when even credit cards and debit cards are synonymous with serious security issues, I'm not certain that we can expect wholesale adoption of smart-device swiping."

"I don't believe people will ever trust banks, the government, and themselves enough to rely solely on digital payments. If nothing else, people lose their cell phones too often for them to be a primary payment device."

"Even with NFC becoming a more prominent form of currency, I worry about a continued lack of cybersecurity for small entities as well as advanced targeting for larger entities. Hard to say but I don't think everyone is hip to all digital, all the time."

## People will retain a variety of payment choices

A number of survey respondents said payment by mobile device will not crowd out other approaches, and that consumers will utilize a number of payment options depending on the situation.

"When credit cards arrived, checks did not disappear, and neither did money," said **Amber Case,** anthropologist and CEO of Geoloqi, a company that creates location-based software for commercial and enterprise use. "Although in some places either cash or cards are accepted, there are three main methods of payment. If another method of payment is added, we will likely have four methods of payment and retailers and businesses must accept another form of payment. Some systems may emerge that use completely smart payments, but there will still be other forms of payment available."

**Richard D. Titus**, seed funding venture capitalist at Octavian Ventures and producer of documentaries, including *Who Killed the Electric Car?* echoed this sentiment: "Each succeeding generation of technology claims it will eliminate or destroy its predecessors. Nine years is just too short a time to have this sort of impact on global consumer behavior that has arisen over literally thousands of years."

**Steven Swimmer**, a self-employed consultant in Los Angeles, California who previously worked in digital leadership roles for a major broadcast TV network and a major museum, sees mobile payments being used mostly for smaller, day-to-day expenses: "Expect bigger near-field uses in lower cost daily transactions like vending machines, coffee stores and perhaps gas stations. There may be more trust of limited exposure solutions, such as pre-paid near-field solutions. Larger transactions may continue to require a card of some kind."

**Bob Frankston**, ACM Fellow and co-developer of VisiCalc, noted, "Swipe and NFC are just means of exchanging credentials and intent, and cards are just tokens. We'll see a lot more mixes."

This theme was echoed by a number of anonymous respondents:

"I do think that our electronic modes of commerce will adapt to more smart-device usage, but I don't believe cash will disappear. I live in Brooklyn where most small-business people prefer to deal in cash, because they are charged big fees by the banks.

Consumers are also beginning to be charged for using debit cards, and if this continues, I foresee push-back against further bank greed."

"I don't think cash will disappear. There's a large movement of people away from using plastic now, championed by people such as Dave Ramsey, who see cash as something tangible."

"The future of money will really be a blend of these options. Many people will adopt various forms of mobile money (such as smart-device swiping), and rely upon them for most transactions, thus reducing the need for cash or credit/debit cards in most transactions that occur in advanced, and developing countries. There will be a hardcore population who will resist (or be unable to afford) the use of such devices."

"Just as cash, checks, and credit cards have evolved to co-exist today, personal hardware will play roles and join the other three as but one means of economic activity. The others will not 'be replaced.'"

"This question, like others in the survey, belongs in the 'the future is already here, but it's unevenly distributed' category."

"I think some of the first choice will occur, but not for most…Hey, we still use pennies and dollar bills."

"The difficulties of setting up the registers to process electronic monetary transactions are a pretty high barrier for entry and won't work in many settings (for instance, your local farmers market or a bake-sale in a school)."

"NFC will be 'embraced' for 'small' transactions. I suspect large transactions, such as purchases of home or cars, will be much more traditional, but that people will rapidly adopt NFC and its successors for coffee, fast food, and other 'small' transactions."

"Cash is going away, but debit cards will stay. The technology to support mobile devices for payment will simultaneously support swipe cards and near-field cards. In 2020, people will swipe their debit cards, use mobile devices for payment, and a little cash."

"Mobile payments will become much more prevalent, but there will still be a sizable proportion of the population who do not trust them. Cash and credit cards will remain options though paper checks may be phased out of the United States by then as they are in other countries."

"I bank and shop online routinely. It works for some things; it doesn't for others. Offline, credit cards aren't ubiquitous. Some employees still opt for printed paychecks rather than direct deposit. I do not see cash disappearing (though the penny might)."

"Electronic systems are not always reliable or transparent. If the United States cannot get people to use a dollar coin, it is unlikely that people will abandon the physical reassurances of familiar coins and currency. The future will continue as a combination of financial transaction methods, depending on the moment, the amount, the vendor/institution, and the comfort level of the consumer."

"Financial institutions and businesses will need to accommodate the whole range of 'money.' Cash and credit cards will not go away, but more people will adapt to smart-device swiping with vendors they trust."

"Cash survived checks and credit cards and I think it will also survive NFC payments. It's also unlikely that credit cards, per se, will disappear any time soon if for no other reason than many NFC payments will still be made using these very accounts. What is, perhaps, more likely, is that NFC will begin to displace credit card swipes among younger individuals for those sales made in person."

"By 2020 cash will be used in far fewer instances, but based on my knowledge of how the government works it would be at least another twenty years after the fact before they would attempt to eliminate it. When it comes to currency it also matters what other nations are doing to take payments. If a technologically advanced nation were to phase out cash and credit cards but they traveled abroad how would they be secure financially? The security aspect is also important as older generations are clearly uncomfortable with adopting certain aspects of the Web, so credit cards will likely remain in use. There will likely be an increase in near-field communication device payment systems, but due to security and potential global adoption a 2020 expectation date seems improbable."

"Not only cash and credit cards but also coupons and fidelity cards. Payment is part of the imagination of marketers and they do not tend to make it simple Diversification is the rule. The electronic wallet has been tested in France and failed to dislodge credit cards because actors (banks and shops) made it more expensive than normal cards. My advice is that many systems will cohabitate. People have just multiplied their payment tools."

"This will be one of the areas where the digital divide manifests. Some groups (most likely those who are better educated, more affluent, and likely younger) will be more familiar with and more willing to use smart-devices to pay for purchases and replenish their accounts as necessary. Others will not trust the technology—this is evident through online banking and ecommerce. While it appears that 'everyone' uses the technology, it is still more of a one-way issue (ie: I'll pay bills online although I still want a paper bill, etc.)."

"Prediction: The adoption of smart-device payment systems went exceedingly well up until the blackouts of 2015 and 2016, which lasted several days in many urban areas. This permanently impacted the progress towards any sole reliance on electronic payment systems. Now in 2020 people rely on the four major methods of payment: Smart-devices, national currencies, networked work barter points systems, and the new global 'poker chip' currency that uses interlocking machine readable plastic chips that are impregnated with gold foil."

## Any successful currency system has to consider the need for anonymity

A commonly cited advantage of retaining traditional currency systems is that—unlike mobile wallet systems—they offer individuals full privacy.

Consultant and Internet research expert **Stowe Boyd** noted there's a need for people to have the option of anonymity in their transactions, writing, "There is a wide range of use cases where anonymity is necessary, like illegal transactions (drugs, sex, bribes), gray economics (paying undocumented immigrants), or other sorts of secret activities (gift for a mistress). It's conceivable that an anonymous form of digital money could serve in place of cash, like the design thinking behind Bitcoin, but that remains to be seen."

**Stephen Hoover**, lecturer at Minghsin University of Science and Technology in Taiwan, said, "Cash hides activities that people want to keep beyond the scrutiny of the government." **Bruce Nordman,** a research scientist at Lawrence Berkeley National Laboratory in Berkeley, California agreed, noting, "There will be a need for people to have an 'anonymous' wallet that can be used for payments that are not traced to them personally."

**Ted M. Coopman**, a lecturer at San Jose State University, responded, "We are a long way from the demise of cash as a way to purchase items and pay for services. This is especially true in the United States where fear of the government has always been part of our political culture." **Robert Ellis**, a partner at Peterson, Ellis, Fergus & Peer LLP focusing on Internet law notes that, "Cash will never disappear because there will always be a demand for it—for anonymous transactions, illegal transactions, and transactions in far-flung areas where the non-cash technologies haven't been implemented."

**Erica Johnson**, assistant lecturer at the Universite Paris-Est Creteil in Creteil, France responded, "I don't think cash will ever disappear. Even when checks and credit cards were created, cash still existed. I think that some people will want to maintain a stronger control over what they spend, and that's very hard to do when using technology. Quite a few people are worried about privacy and hackers, and they work hard to 'stay off the grid' by only using cash."

And **John Laprise**, visiting assistant professor at the Doha, Qatar, campus of Northwestern University predicts that "This will result in a class of people who are unidentified and a gray cash economy that runs parallel to the established electronic economy."

Some anonymous responses:

> "Convincing people that the benefits of these devices outweigh the cons will take more than a decade. The burst of popularity for innovations such as Bitcoin indicate that, if anything, people tend to want their financial transactions to be more private. Technologies that offer a relatively small measure of additional convenience at the expense of far less privacy will struggle for adoption."
>
> "People are already highly dependent on insecure payment systems. The future systems will offer increased convenience with no loss in security. The biggest thing holding back electronic payment systems is the anonymity of cash for use in illegal purchases."
>
> "I am really in between these two answers. While I enjoy using electronic deposits, ATM cards, PayPal, and others, there are times when the anonymity of using cash is splendid."
>
> "The biggest issue will be reliability. While I do think near-field payments will increase, the need for easy (and sometimes anonymous), reliable payments will be far more in demand."

“Definitely agree with scenario one, with one glaring exception: There will be digital forms of cash. How else are we going to buy drugs and other informal economy items if we can't use anonymized forms of money (i.e., cash) to do the transaction? In Africa, a lot of people use the M-PESA system, trading phone minutes like cash. I suspect that a system like this will evolve into the cash of the future.”

“It's practically the case now; I never carry ready cash. The downsides are the security issues and platform stability issues which must be conquered by this current generation. Human rights issues associated with identity protection, such as the right to privacy, will be troublesome and difficult to resolve.”

“People will want to protect some, if not many, of their transactions from observation/tracking, and that will slow down complete adoption.”

“Like media, new forms do not ‘eliminate’ old forms, but they may overshadow them. Metal coins still exist; paper money still exists; paper checks still exist; credit cards still exist; debit cards still exist. All existing forms will play some role, with new forms (with privacy and security concerns) playing their biggest role in transactions that are a) small (coffee, parking spaces, magazines) and b) not seen as all that revealing. Transactions that are large (house purchase, car purchase, appliance purchase) or deemed sensitive (medical, disfavored—tobacco, alcohol, sexual materials) will rely more on more well-known forms.”

“There will always be the need for some cash in the economy—not everybody wants his or her transactions and earnings to be fully traceable. But I think that the people comfortable with using credit cards will be comfortable using smart-devices for the same things.”

“There will always be a place for cash; a significant part of the population will continue to distrust financial communications systems.”

## About the Pew Research Center's Internet & American Life Project

The Pew Research Center's Internet & American Life Project is one of seven projects that make up the Pew Research Center, a nonpartisan, nonprofit "fact tank" that provides information on the issues, attitudes and trends shaping America and the world. The Project produces reports exploring the impact of the Internet on families, communities, work and home, daily life, education, health care, and civic and political life. The Project aims to be an authoritative source on the evolution of the Internet through surveys that examine how Americans use the Internet and how their activities affect their lives.

The Pew Internet Project takes no positions on policy issues related to the Internet or other communications technologies. It does not endorse technologies, industry sectors, companies, nonprofit organizations, or individuals.

URL: http://www.pewInternet.org


## About the Imagining the Internet Center at Elon University

The Imagining the Internet Center's mission is to explore and provide insights into emerging network innovations, global development, dynamics, diffusion, and governance. Its research holds a mirror to humanity's use of communications technologies, informs policy development, exposes potential futures and provides a historic record. It works to illuminate issues in order to serve the greater good, making its work public, free, and open. The center is a network of Elon University faculty, students, staff, alumni, advisers, and friends working to identify, explore, and engage with the challenges and opportunities of evolving communications forms and issues. They investigate the tangible and potential pros and cons of new-media channels through active research. Among the spectrum of issues addressed are power, politics, privacy, property, augmented and virtual reality, control, and the rapid changes spurred by accelerating technology.

The Imagining the Internet Center sponsors work that brings people together to share their visions for the future of communications and the future of the world.

URL: http://www.imaginingtheInternet.org

## Methodology

The survey results are based on a non-random, opt-in, online sample of 1,021 internet experts and other internet users, recruited via email invitation, Twitter or Facebook from the Pew Research Center's Internet & American Life Project and the Imagining the Internet Center at Elon University. Since the data are based on a non-random sample, a margin of error cannot be computed, and the results are not projectable to any population other than the experts in this sample.