m·commerce

a networking perspective on the growing mobile commerce landscape

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on planet earth

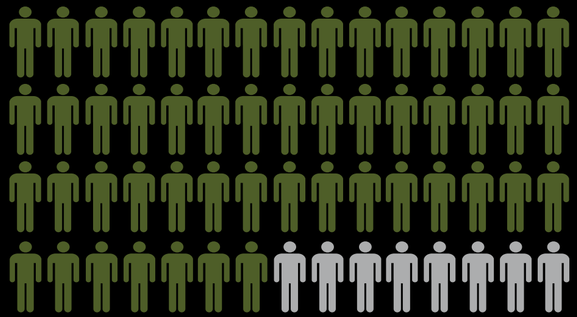
THERE ARE OVER

6 billion

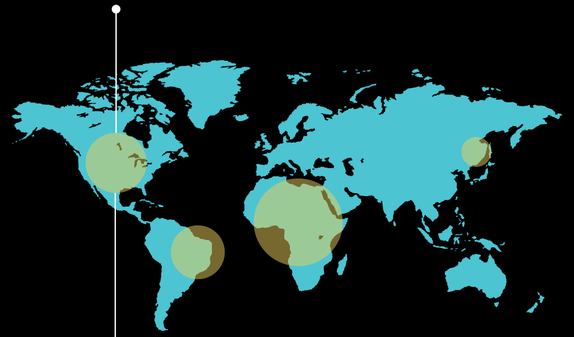
mobile subscriptions.

that's almost one

mobile per human.



88% of American adults own a cell phone and **46%** report owning a smartphone.



2013

$37.44 billion

15% of U.S. retail sales in 2013 are projected to come from mobile commerce, with tablet driving the large share of those transactions.

mobiThinking 2012; World Bank 2011; Smith, 2012; Mobify, 2012; eMarketer, 2013; Boris, 2013;

In 2006, 73 percent of Americans reported cell phone ownership (Madden, 2006) By 2012 there were some six billion mobile subscriptions globally (mobiThinking, 2012) — nearly as many cell phones as there are people on Earth (World Bank). This dramatic increase in just a half decade is predicted to continue with the expansion of mobile networks in developing regions such as the African continent, Brazil and rural China.

Mobile commerce accounted for 11 percent of retail sales in the U.S. in 2012, and that share is expected to reach 15 percent in 2013 with tablet driving a large portion of those m-commerce transactions (eMarketer, 2013). eMarketer (2013) also predicts that U.S. consumers will spend $24 billion via tablets, and this is forecasted to double by 2015, while smartphone m-commerce will have slower growth with total sales reaching $13.44 billion in 2013, and $24.32 billion by 2016.

WiFi and Cellular Networks

Fueling the m-commerce trend is access to the Internet through a variety of mobile data services. The more recent generations provide increased data throughput with less congestion for the mobile carrier. Cellular infrastructure continues to expand and innovate, but is still challenged by the strong growth in device ownership. WiFi is a viable option for shifting traffic and easing cellular bandwidth utilization. Free public WiFi is an attractive selling point to bring in new residents, increase occupancy rates for underutilized commercial real estate and drive greater revenues for retailers and local tax authorities. Additionally, local governments offering citywide public WiFi perceive it as a means to providing firefighters, law enforcement and public safety officials with easy, cost effective access to data services.

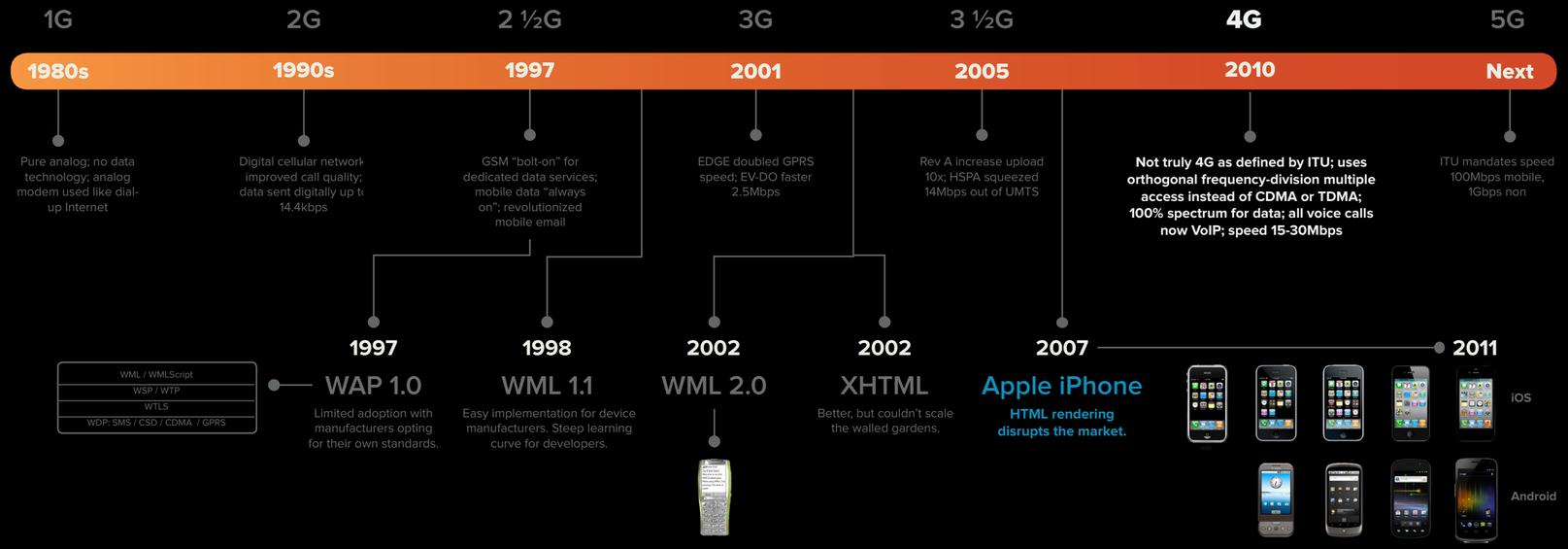
The city of Mountain View, California, for example, provides free public WiFi to mobile subscribers within the city limits (City of Mountain View). The initiative was sponsored by Google, which also pays the city an annual rental fee for the use of city streetlight poles to mount wireless transmitters. Resident response has been quite favorable and, in addition to a 10 fold increase in data throughput, Google is able to gather valuable marketing data about how subscribers use the network. Additionally, the homepage for the wireless network is set to the Google homepage, thus increasing opportunities for online advertising income for Google to offset the significant investment in deploying the public WiFi network.

Responsive Design

Since Apple released iOS for iPhone in 2007, Google has subsequently released its own competing operating system, Android. The resulting plethora of device specifications has made it challenging to design for mobile Internet. While mobile apps still provide a richer experience due to their ability to directly access operating system functions and resources, mobile web allows businesses to reach a broader range of consumers.

Continuing some of the core paradigms of XHTML, the responsive design framework uses a combination of CSS media queries, JavaScript and HTML to render slightly

The Evolution of Mobile Web. Early attempts to provide a mobile Internet experience in the 1990s were hampered by low processing power of feature phones. In 1997, the Wireless Application Protocol (WAP) Forum released WAP 1.0 — a specification outlining standard information access directives for mobile devices. However, instead of uniting mobile carriers worldwide as intended, WAP 1.0 served as a poorly implemented standard with limited adopted. In one deviation from the standard, Japan's NTT DoCoMo disabled WAP across their subscribers in favor of their own in-house transmission protocol, i-mode (EuroTechnology, 2012). From WAP 1.0, a subset of HTML was created to address the extreme constraints of early mobile devices. While there were some similarities to HTML, Wireless Markup Language (WML) represented a steep learning curve for developers, even though it was relatively easy for device manufacturers to implement. The result was manual content duplication across HTML and WML servers. Because of strict language syntax, manufacturers could design simple WML browsers that would default to a failed render rather than insinuate the web page's intended design. This implementation is diametrically opposed to the way in which most HTML browsers operate where partial display of data is preferred to the lack of data. Finally, in 2002 the WAP Forum relaxed its use of WML and introduced XHTML as the markup language of choice for mobile devices. In conjunction with the improved 2.5G networks, the XHTML standards were more liberating for web developers. Conversely, mobile carriers still insisted on curated content behind a *walled garden* rather than allowing subscribers to access any web server on the Internet. It would not be until the introduction of the Apple iPhone in 2007 when full-fledged HTML rendering that could rival desktop web browsers was introduced to market. Part of what fueled the high adoption of the iPhone was that it provided the *real* view of websites, rather than the stripped-down experience available on competing devices such as the RIM Blackberry Pearl. The latter interpolated HTML pages into a reduced function set of XHTML to allow for rapid rendering on grayscale, or limited-color liquid-crystal display screens. In contrast, the iPhone used vibrant color touchscreen and a web browser rendering subsystem borrowed directly from the desktop web browser equivalent, WebKit. iPhone's desktop-grade rendering engine empowered web teams to use the full power of HTML. JavaScript and CSS render the same underlying content for smaller displays by inspection of the device capabilities such as manufacturer, screen size or geolocation.



World Wide Web Foundation; Manno, 2004; Zieber, 2011;

altered versions of a website based on defined interaction points coded in CSS as declarations.

There are two implementations that businesses can pursue for responsive design. The first implementation builds a separate site that has been fully optimized for mobile by removing extraneous scripting and other code, and reducing image sizes (Grigsby, 2010). However, reducing files sizes being sent over cellular networks, and thus providing faster page downloads to consumers, comes at a cost for businesses as they now have multiple code bases to manage. This can also slow down implementation of mobile web as budget constraints necessitate phased rollouts of functionality.

The second implementation of responsive design uses the same code base and content as the desktop site. For mobile, images may be suppressed and scripting ignored, while also realigning a horizontal layout optimized for 1024 pixel display to a layout where all elements are now vertically stacked to accommodate the scrolling form factor of a mobile display. Technology teams manage just a single code base, and the mobile commerce experience is greatly improved versus a site that has not incorporated any responsive design.

The challenge with using a single code base is that mobile devices must download and process all the code from the site, even if it will be skipped over during rendering (Grigsby, 2010). Businesses can mediate this issue by setting media queries to recognize mobile devices as the default in CSS instead of desktops. This ensures that the code base has been built for mobile, and desktop code is only loaded on demand if the queries determine the display size is large enough to render a desktop version.

Since the ubiquity and maturity of responsive design implementation and management are still in their early stages, it is recommended that organizations implement the second option and use media queries to define how the site experience should adapt to match mobile form factors. For the near-term, networking teams will need to find solutions for accommodating this growth in mobile web traffic until responsive design and *mobile first* become more mature aspects of site management within technology and marketing organizations.

Securing Mobile Devices

With both responsive design and improved network access increasing mobile browsing capabilities, the issue of how to secure network traffic must be considered. This is especially the case as we determine how to build the level of trust needed to persuade consumers to enter payment information such as credit cards.

The primary mechanism for delivering secure transactions in mobile browsers is the Secure Sockets Layer (SSL) (IETF, 1995). Operating within the transport layer of the OSI Reference Model, SSL/TLS provides for the negotiation, setup and teardown of a security envelope, or tunnel, within which regular TCP/IP communication can be transmitted. The benefit of this layered approach is that the underlying communicating devices need not concern themselves about the security of the connection. This allows for improvements to the security (e.g., encryption style, bit length, entropy, etc.) without restructuring the entire end-to-end communications.

Of the remaining percentage of mobile transactions not delivered using HTTPS, specialized applications are developed to perform the purchase. These apps will likely utilize SSL/TLS as a transport layer to communicate with backend databases and credit card payment processing systems.

Despite subscribers having the same security protections on mobile devices as they do on desktop computers, 60 percent of study respondents mentioned a greater fear of using their mobile Internet device for m-commerce than their desktop device (Mashable, 2011). In line with the trend towards biometrics as a viable solution to mobile web security, Apple is rumored to be incorporating a fingerprint sensor in its next iPhone model. This speculation arises from their recent acquisition of biometric manufacturer AuthenTec for $356 million, and also from Apple's refusal to sell any future technology to other companies (Biometrics Institute, 2013). Additionally, Apple holds a patent for unlocking smartphones using a visual photograph of the owner's hand.

Combined with NFC (near field communication) chips, biometric sensors could enhance smartphone security to the point where mobile devices become the most secure and most convenient form of payment moving forward. Traditional physical wallets can be stolen or lost, and any person who finds a physical wallet is immediately able to use the cash contained within, along with the credit cards for some period of time. In comparison, a biometric-protected virtual wallet would be nearly impossible to unlock, and would immediately be traceable using GPS beacons. For businesses to fully capitalize on the growing mobile ownership and engagement trends, consumers will need simple and secure options for making payments as they shop via mobile web and mobile apps. The easier and more secure the payment process, the more likely users will be to complete a sale.

Payment Options on Mobile

The promising m-commerce domain has prompted established firms and startups alike to implement their own mobile payment options. In Europe, several firms including Payleven and iZettle have launched successful mobile payment applications, and, to increase their credibility in the market, have secured certifications and partnerships from entities such as the Financial Services Authority and MasterCard (Lunden, 2013). Incorporating other secure options like chip-and-pin as

Mobile optimized sites reduce image sizes and unneeded scripting resulting in smaller file sizes transmitted over cellular and WiFi. But multiple code versions create overhead for development teams.

The solution: **A single code base with media queries and mobile as the default CSS style ensures a consistent site experience.**

Offline mobile payment processing now available at

250,000

retailers across the U.S.

25% of smartphone owners have used a virtual wallet service like Google Wallet. Collaborations such as the PayPal and Discover venture can extend the reach of mobile payment processing, and create additional opportunities for retail and distribution incentives and consumer loyalty rewards.

Lunden, 2013; Johnson, 2013;

Payleven has done, helps to further accelerate consumer confidence and ubiquity of their mobile payment services (Lunden, 2013).

Additionally, mobile payment processors are going beyond the standard SSL/TLS to provide additional security provisions within their mobile payment offerings. Amazon has announced a patent that will limit the data two parties transmit during a payment transaction, effectively rendering the transaction anonymous (Etherington, 2013). Once consumers have registered for the service, identifying information such as phone number, name and email address would be encrypted within a series of unique identifiers that serve to both secure the information during transmission, and provide a handshake procedure to verify that the intended payee is in fact the one who should be credited funds from the payor (Etherington, 2013).

Mobile payment options are especially valuable given the rise of *showrooming*, where consumers browse online for better prices and options while present in a physical store. Combining unique products not found online and customer rewards with simplified payment processing, retailers can increase conversion in store and ensure customers are not leaving empty handed after finding a better price online through mobile search, or barcode scanning.

Recently, PayPal and Discover have collaborated to extend the reach of PayPal services to in-store point of sale (Mobile Payments Today, 2013). This partnership creates additional opportunities for rewards-based incentives targeted towards consumers as well as retailers. In the near term, online retailers stand to gain the most from the higher engagement rates on mobile. For networking professionals, these trends not only increase the need for cellular and WiFi bandwidth, but also increase utilization of geolocation satellite services as more devices from parking meters and RFIDs underlying the *Internet of things*, and activities from geocaching to social sharing add to increases in Internet traffic.

Looking Forward

Overall, consumers are expected to use their smartphones and tablets to complete $37.44 billion in retail purchases in 2013, which is a 37 percent increase from the 2012 total of $23.72 billion (Boris, 2013). The travel industry alone estimates $26 billion in travel and leisure bookings will happen on smartphone and tablet devices in 2014, which will account for one in five travel dollars — three times more than in 2012 (Onbile, 2013).

Bypassing the mobile app marketplace means firms can opt to reduce their development efforts on apps without sacrificing their ability to reach highly engaged mobile consumers. But more mobile adoption, especially smartphones, brings with it more rich content transmission over already challenged cellular networks. Consumers want fast speeds, but they also want to know their information is secure. Responsive design, 4G networks, biometrics and virtual wallets offer viable solutions to address these competing objectives. Retail firms and cellular service providers alike must be ready to address these needs with cutting edge data speeds, full-service mobile Internet engagement and secure platforms that build trust and persuade consumers to complete m-commerce transactions.

There is still much work to be done in both the technology and user experience design domains. Even though 30 percent of mobile web users in 2012 booked or bought travel products in 2012, for example, 54 percent of smartphone users and 61 percent of tablet users overall said they find mobile websites ineffective and difficult to use (Mashable, 2011). In fact, 63 percent of users would be unlikely to buy from a company again, even through non-mobile channels, if they had a negative m-commerce experience including, but not limited to, long forms to complete, lack of zoom functionality and designs that are esoteric and hard to decipher (Nodes, 2012).

Even with these challenges, whether the engagement metric is making a purchase, sharing content or watching a video, users are more likely to engage with sites on mobile compared to desktop. For retailers, this increases the need to ensure they are optimizing their sites and e-commerce options for mobile devices. As responsive design, mobile security and virtual wallet options innovate and mature, this will increase trust with a population that continues to respond well to mobile web experiences, and thus increase opportunities for businesses to convert more mobile Internet visitors to m-commerce customers.

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strategize for mobile + social

OFFER FULL SERVICE

be responsive

BE SECURE

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