

2014 STATE OF THE UNION Mobile Ecommerce Performance

With mobile usage overtaking desktop usage, mcommerce is booming. Delivering a fast mobile experience has never been more crucial. Two out of three mobile users expect pages to load in 4 seconds or less. We tested mobile load times for the top 100 ecommerce sites — both the m-dot and full site — and found that the average site does not meet user expectations.



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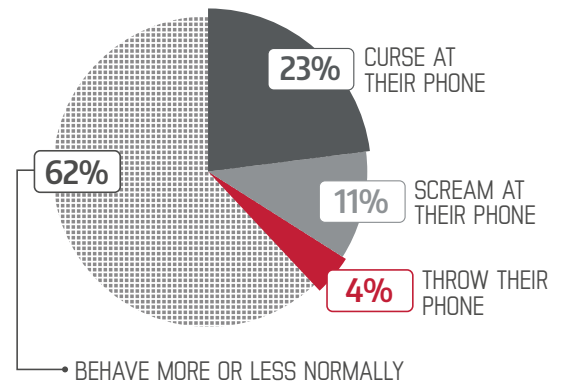
Introduction

In a world where one out of four people own a smartphone,¹ and 55% of all time spent on retail sites takes place on a mobile device,² serving the best possible mobile experience has never been more crucial.

Mobile Users Are Demanding

Two out of three smartphone users say they expect pages to load in 4 seconds or less. 85% of mobile users expect pages to load as fast or faster than they load on the desktop.³ Slow pages are the number one issue that mobile users complain about – ranking even higher than site crashes. 38% of smartphone users have screamed at, cursed at, or thrown their phones when pages take too long to load.⁴

Mobile users are affected at a neurological level by even small changes in a site's speed. An electroencephalography (EEG) study commissioned by Radware in 2013 found that a mere 500ms delay in connection speed resulted in up to a 26% increase in peak frustration, and up to an 8% decrease in user engagement.⁵



[source: Tealeaf/Harris Interactive]

Slow Mobile Pages Have a Serious Impact on the Bottom Line

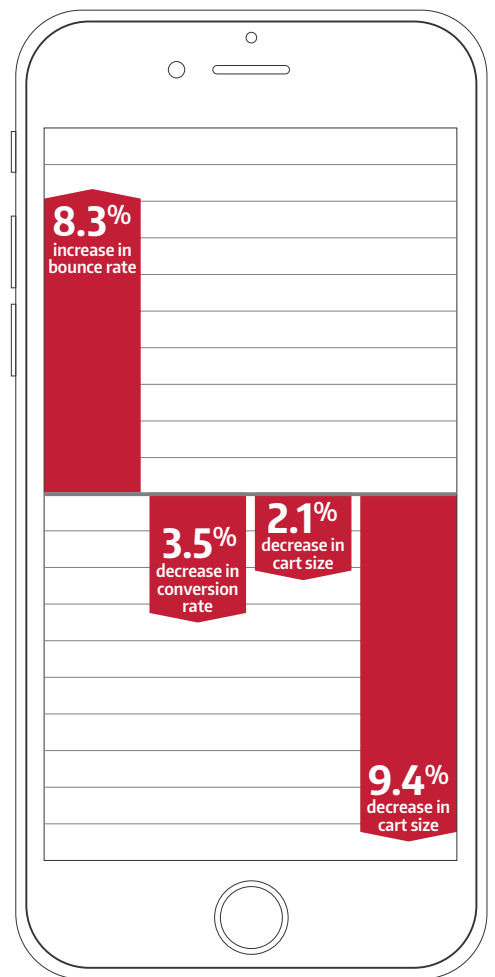
Slow performance affects every business metric site owners care about, from shopping cart abandonment to brand perception. Even seemingly minor performance problems can have a major impact on mobile business metrics.

In a case study⁶ by Radware, in which a segment of an ecommerce site's mobile traffic was served pages with a one-second HTML delay, the slower pages suffered across four key performance indicators, compared with the regular traffic.

Slow pages also drive mobile shoppers to competing websites. When faced with a negative mobile shopping experience, up to 33% of mobile shoppers will go to a competitor's site next, and 30% will never return to the offending website.⁷ 65% of customers say their opinion of a brand was affected by the online experience.⁸



30% WILL NEVER RETURN TO THE SITE



Showrooming and Other Mobile Practices Mean It Is Critical to Ensure a Fast, Consistent Experience Across All Platforms

Using conversion rate as the sole determination of the value of your site for mobile users is an extremely narrow perspective on the value of mobile browsing. While consumers typically convert at a higher rate when using their desktop computers than they do with their smartphones or tablets, mobile devices are an integral part of the purchasing process.

The average shopper jumps across platforms throughout the purchasing process. 90% of mobile users use multiple screens sequentially to accomplish a task over time.⁹ On average, shoppers use 2.6 different devices to convert online and make 6.2 visits to a company's website before they purchase.¹⁰

What's more, 81% of consumers use mobile devices in-store¹¹ to perform other vital tasks on the journey from browsing to buying: locating a store, researching in-store product availability, comparing product features, in-store price checking, and calculating shipping versus in-store pickup costs.

This puts a great deal of pressure on ecommerce site owners to ensure a consistent user experience across all platforms.

There are Numerous Technical Roadblocks to Delivering Optimal Mobile Performance

Before mobile, web developers could rely on steady improvements in hardware and bandwidth to help deliver an optimal user experience to desktop users. In recent years, however, the explosion of mobile web browsing has developers struggling to keep up with mobile performance on many fronts. In addition to addressing the inherent limitations of mobile devices – lower bandwidth, smaller memory, greater latency, and less processing power – they must also consider several other constantly moving targets in the changing mobile landscape:

- Browser/device fragmentation (No single screen size owns more than 20% of the market share.)
- Website versus app
- M-dot/t-dot (i.e., separate sites customized for smartphones and tablets) versus full site
- Responsive web design

This report provides a snapshot of the current mobile performance landscape, as well as best practices that site owners should consider to optimize the mobile experience for their customers.

Summary

In July and August of 2014, we engaged in a four-week study of the real-world performance of the top 100 retail websites, as ranked by Alexa.com. We subjected the home page of each site – both the full-site version and the m-dot version – to a series of page speed tests over 4G/LTE and Wifi networks, and calculated the median results for metrics such as load time and number of resources.

The goal of this research was to gain an understanding of how leading websites perform for real users in real-world settings, outside of development and testing environments.

Key Findings

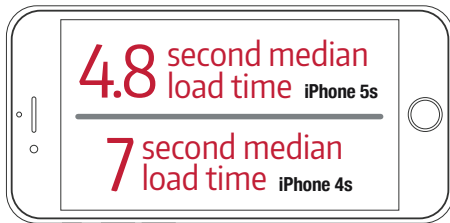
Our key findings are summarized below and described in detail in this report. The report concludes with best practices that site owners should consider when developing their sites for today's multi-screen universe.

Except where specifically noted, results discussed throughout this report are for the iPhone 4s and iPhone 5s over a 4G/LTE connection, as these represent the most frequently used devices (in terms of total hours spent online)¹² and the most widely adopted connection speed¹³ currently in use.

- Among the top 100 retail websites, the median m-dot page took 4.8 seconds to load on the iPhone 5s and 7 seconds to load on the iPhone 4s.
- Only 2% of full-site pages loaded in the ideal time of 4 seconds or less on the iPhone 4s. 15% of full-site pages loaded in fewer than 4 seconds on the iPhone 5s.
- Median load times varied across tablets, ranging from 5.7 seconds for the Galaxy Note to 8.1 seconds for the Nexus 7.
- While the median m-dot page contains only 34 resources (such as images, CSS, and JavaScript files), 5% of the m-dot pages we tested contained 100+ resource requests. Each of these requests incurs latency, which adds up to slower load times.
- The median full-site page contained 106 resource requests, amplifying the latency issue discussed in the point above.
- 81% of sites automatically serve an m-dot version of the home page to smartphones.
- 20% of m-dot sites do not allow shoppers to access the full site.
- 8% of the top 100 retailers serve a tablet-optimized version of their site to tablets.
- Despite the fact that most tablet users expect a full-site experience, many sites still serve the pared-down m-dot site to tablet shoppers. Android tablets were much more likely than iOS tablets to be served the m-dot site (e.g. 30% for the Nexus 7, compared to 5% for the iPad 2).

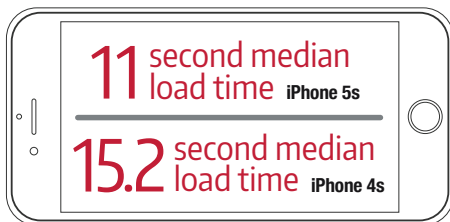
Finding 1: Both M-Dot and Full Sites Fail to Meet User Expectations

Regardless of the type of site, device, or connection, the median site in each set of tests failed to meet user expectations for load times of 4 seconds or less.



M-Dot Site on Smartphone Over 4G/LTE

Among the top 100 retail websites, the median m-dot page took 4.8 seconds to load on the iPhone 5s and 7 seconds to load on the iPhone 4s.



Full Site on Smartphone Over 4G/LTE

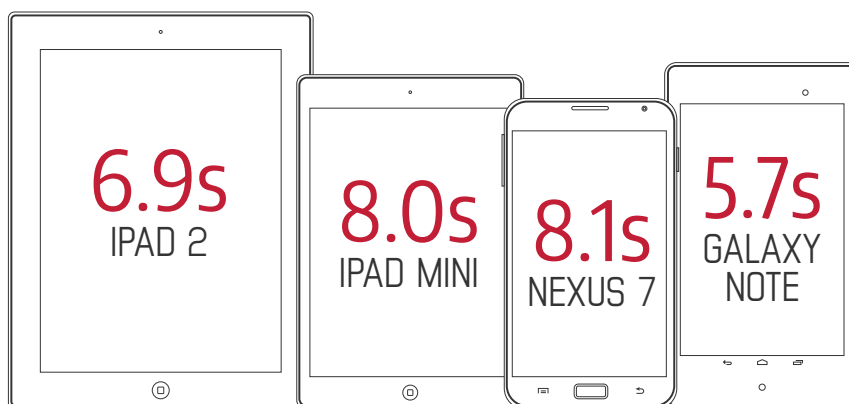
Many shoppers will choose to view the full-site version of a website, so we tested those pages as well. The median full-site page performed much worse than the median m-dot page, taking 11 seconds to load on the iPhone 5s and 15.2 seconds on the iPhone 4s.

Only 2% of full-site pages loaded in the ideal time of 4 seconds or less on the iPhone 4s. 15% of full-site pages loaded in fewer than 4 seconds on the iPhone 5s.

Full Site on Tablet Over Wifi

Median load times varied across tablets, ranging from 5.7 seconds for the Galaxy Note to 8.1 seconds for the Nexus 7. The takeaway is that performance is somewhat dependent on the user's device type. Site owners should test across a range of devices to get a clear snapshot of their site's performance.

The primary performance culprits are page size, redirects, user-agent sniffing, and page complexity (e.g. third-party scripts, other blocking JavaScript and CSS files). These factors are discussed in more detail in the next section of this report.



Note on Interpreting These Results

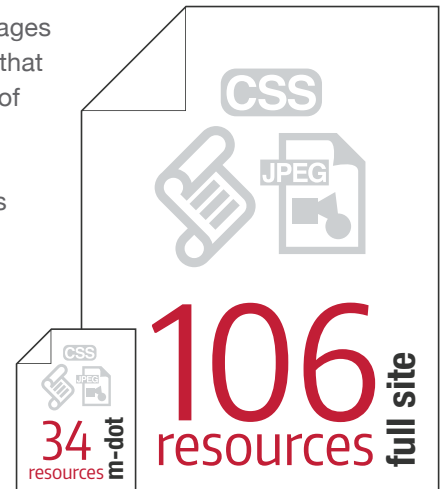
These tests are not intended to serve as a performance review of the devices tested, and the results should not be interpreted as such. Rather, they demonstrate how broadly performance can vary across mobile devices, with **the slowest device performing three times more slowly than the fastest device**. Site owners should be aware that this degree of variance exists among their users. This should serve as a reminder of the importance of testing performance across a range of devices.

Finding 2: Page Size and Composition Is a Serious Performance Issue for Mobile

The median m-dot page contains only 34 resources (such as images, CSS, and JavaScript files). This number may give a falsely misleading sense that m-dot pages are relatively small and lightweight, and therefore responsive. It is worth noting that 5% of the top 100 retail pages contained 100 or more resource requests. Each of these requests incurs latency, which adds up to slower load times.

Latency is the amount of time it takes for the host server to receive and process a request for a page resource. The amount of latency depends largely on how far away the user is from the server. It can range from 150 milliseconds to 350+ milliseconds per resource. If you're designing for mobile, it's safest to assume you're going to incur a total of 2 seconds of 3G latency.

The median full-site page is three times larger than the median m-dot page, containing 106 resource requests and is 1492 KB in size. Page size is one of the single greatest indicators of performance. As a general rule of thumb, faster pages are almost always less than 1 MB in size.



While the median full-site page was three times larger (in terms of resource requests) than the median m-dot page, it was only two times slower. This is because the number of page resources is not the only factor that affects load times. Other factors include:

- **Redirects** – When a user types in the full-site URL, he or she is redirected from the full site to the m-dot site. Redirecting takes time, and even a few hundred milliseconds are significant within the context of everything else required for a page to render. (As Google performance guru Ilya Grigorik has stated, “The optimal number of redirects for mobile is exactly zero.”)
- **User agent sniffing** – This refers to the practice of websites displaying content customized to suit specific browsers and platforms. For mobile, this customization can range from the relatively small (e.g. resizing images to fit smaller screens) to extensive (e.g. rendering the page in a completely different markup language).
- **Download speeds** – Download speeds experience significant variance, ranging from a mere 1 Mbps over 3G to as much as 31 Mbps over LTE.
- **Page complexity** – A web page can be small, yet still contain a significant degree of complexity. This complexity can come in the form of third-party scripts, custom fonts, and CSS and JavaScript. Each of these elements has the power to slow down or completely block a page from rendering.

The takeaway is that site owners need to be aware that simply stripping down their sites into pages with fewer resources is not a performance cure-all.

Finding 3: As Device Fragmentation Continues to Accelerate, Website Fragmentation Also Continues

When considering mobile devices, most people think in simple terms: Android versus iOS. But the fragmentation picture becomes much more complex when one considers the sheer volume of devices and form factors currently in use. According to a recent study, there are 18,796 distinct Android devices.¹⁴

It is no surprise, then, that site owners are making a brave attempt to serve optimized versions of their pages across high-level device categories:

- 81% of sites automatically serve an m-dot version of the home page to smartphones.
- 8% of the top 100 retailers serve a tablet-optimized version of their site to tablets.

While serving mobile-and tablet-optimized pages to users addresses some issues, this strategy is not a usability cure-all.

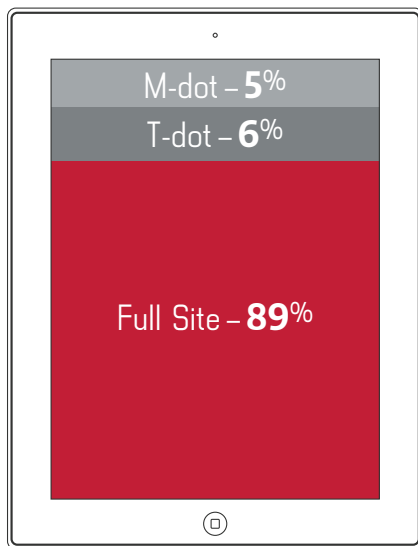
Many Smartphone Users Want a Full-Site Experience, Which 1 out of 5 Sites Fail to Offer

While mobile-optimized sites have evolved beyond stripped-down menu-based designs, many m-dot pages still cannot serve the rich, dynamic experience — not to mention the depth and breadth of content — which most users expect. This is why many mobile users will choose to view the full site when given the option.¹⁵

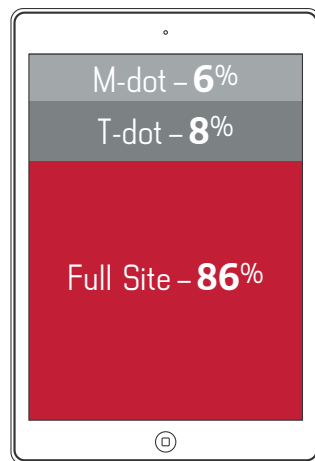
However, we found that 20% of m-dot sites do not allow shoppers to access the full site.

Tablet Users Expect a Desktop Experience, Yet Many Site Still Serve M-Dot Pages to Tablets

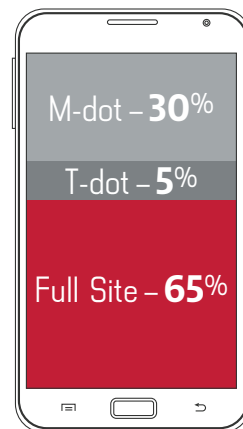
Consumers shopping via tablets expect content and ease of browsing/purchasing to be consistent with what they experience on the desktop. Yet, among the top 100 retailers, many sites still serve the pared-down m-dot site to tablet shoppers. Android devices were much more likely than iOS users to be served the m-dot site (e.g. 30% for the Nexus 7, compared to 5% for the iPad 2).



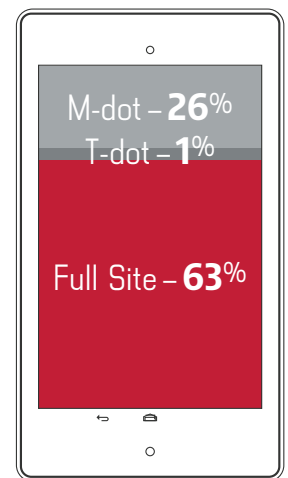
IPAD 2



IPAD MINI



NEXUS 7



GALAXY NOTE

Disadvantages of Website Fragmentation

While continued device fragmentation is inevitable, many argue that continued website fragmentation is unsustainable. These are a few of the reasons most commonly cited:

- **Unwieldy mobile-to-desktop sharing**
This is a common issue, when opening a mobile-optimized page on a desktop browser.
- **Broken links when desktop-to-mobile sharing**
Another common issue, when a user attempts to open a desktop link on a mobile browser and is served a “page not found” message.
- **Managing multiple sites, each with unique content requirements**
This practice — called “forking” — isn’t just difficult, it also makes you more susceptible to mistakes. Many content management systems aren’t cut out to handle the complexity of populating different design templates with different content, so maintaining an m-dot means that you’re managing two distinct entities.

Responsive Web Design Will Not Automatically Make Your Pages Faster

A growing number of site owners recognize that maintaining multiple websites is not a sustainable solution. In an effort to create a consistent user experience across platforms, many sites are turning to responsive web design (RWD). RWD is a design approach that aims to craft sites to provide an optimal viewing experience across a wide range of devices and screen sizes; however, responsive websites are complex, and that complexity can come with a serious performance price tag.

While it is quite possible to design a website that is both responsive and fast, these two attributes do not automatically go hand in hand. A properly optimized responsive site requires a deep understanding and knowledge of both design and front-end performance optimization.

Takeaways

Delivering a fast, consistent user experience across devices – particularly mobile – has never been more crucial than it is now.

Serving an optimal experience to all visitors is a difficult proposition, particularly given the current state of device/browser fragmentation – a state that will only become more diverse.

There is no magic bullet for mobile performance.

Building web pages that perform well across all devices, browsers, and connection types remains a significant challenge for site owners – a challenge that has been brought into the spotlight in our emerging “mobile first” world.

The best tips for designing a mobile-friendly site are universal for all platforms: keep pages clear, simple, and concise. 97% of mobile response time happens at the front end, after the HTML arrives at the browser. This means that the front end – the web page itself – is where site owners can focus their performance optimization efforts and achieve maximum results.

Among other things, developers should aim to keep pages small (well under 1 MB), optimize images, compress other page resources, limit JavaScript, and defer rendering “below-the-fold” content.

Maintaining separate m-dot and t-dot sites may not be a sustainable long-term practice.

In addition to reasons mentioned earlier in this report, Google does not like multiple URLs for a single site: “Using a single URL for a piece of content makes it easier for your users to interact with, share, and link to your content, and a single URL for the content helps Google’s algorithms assign the indexing properties for the content.”¹⁶

Don’t serve your m-dot site to tablets.

Ensure that your site recognizes when users are visiting via a tablet – any tablet, not just an iPad.

Test before, during, and after deployment on a variety of devices, browsers, and connection speeds

Testing in a development or lab setting will not give an accurate measure of how your site performs in the real world. Remember that 3G latency is typically 150-350 milliseconds, and this latency affects every resource on your pages.

Methodology

The test group included 100 leading ecommerce sites, as ranked by Alexa.com. Each site's home page (both the full site and the m-dot, when an m-dot was offered) was tested 10 times per device across the following devices:

- iPhone 4s
- iPhone 5s
- iPad 2
- iPad Mini
- Nexus 7
- Samsung Galaxy Note 10.1

The median results were used in our analysis.

The tests were conducted over a four-week period, from July 25 to August 22, 2014.

The iPhone 4s and iPhone 5s were tested over a 4G connection using their native browsers. The iPad 2, iPad Mini, Nexus 7, and Galaxy Note were tested over a Wifi connection using their native browsers.

For all tests, devices were positioned in the same location, in an attempt to mitigate the latency impact caused by location changes. For all tests, devices and radios were at full power and screens were not allowed to lock during testing.

We calculated median results across these metrics:

- load time (mobile site)
- load time (full site)
- resource requests (mobile site)
- resource requests (full site)

Sites that did not yield a result were marked as null in the test results.

About Radware

Radware (NASDAQ: RDWR), is a global leader of application delivery and application security solutions for virtual and cloud data centers. Its award-winning solutions portfolio delivers full resilience for business-critical applications, maximum IT efficiency, and complete business agility. Radware's solutions empower more than 10,000 enterprise and carrier customers worldwide to adapt to market challenges quickly, maintain business continuity, and achieve maximum productivity while keeping costs down. For more information, please visit www.radware.com.

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