The Ultimate Guide to Site Speed

How site speed impacts conversion on your website.

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Introduction

Speed determines whether customers can find your brand, trust your store, and ultimately buy from you. No matter what you prioritize in 2021—whether it's sales growth, customer retention, or scaling internationally—it all hinges on how your site performs.

Executive summary

The deadline to speed up is here. Google will update its search rankings to prioritize page experience signals in May 2021, penalizing brands with slower sites. The consequences of poor-performing sites—like lower conversions and lost sales—will now include a drop in organic search rankings.

But the more successful your brand is, the harder it is to improve or maintain site performance. Unless you're vigilant about site speed, small problems can easily go unnoticed, accumulate over time, and result in bloated sites that bleed sales.

Let the data guide you: Link site performance to financial performance. Test the impact a 1-second change in load time has on revenue.

The site speed killers we identify, as well as the fixes, are grouped in sections related to the customer journey: discovery, browsing, and conversion. Though a particular site speed problem can have an outsized impact on its category, the impact isn't limited to that group.

Site performance gets worse as you scale

The more success you have in ecommerce, the harder it is to maintain optimal site performance. Code, apps, and scripts accumulate. Customizations, new features, and infrastructure decisions that once worked now become roadblocks.

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This is a problem that grows with complexity. As brands grow and become more sophisticated, their websites become richer. This richness usually comes with a price; unless you are actively paying attention to speed, changes will slow down your site.
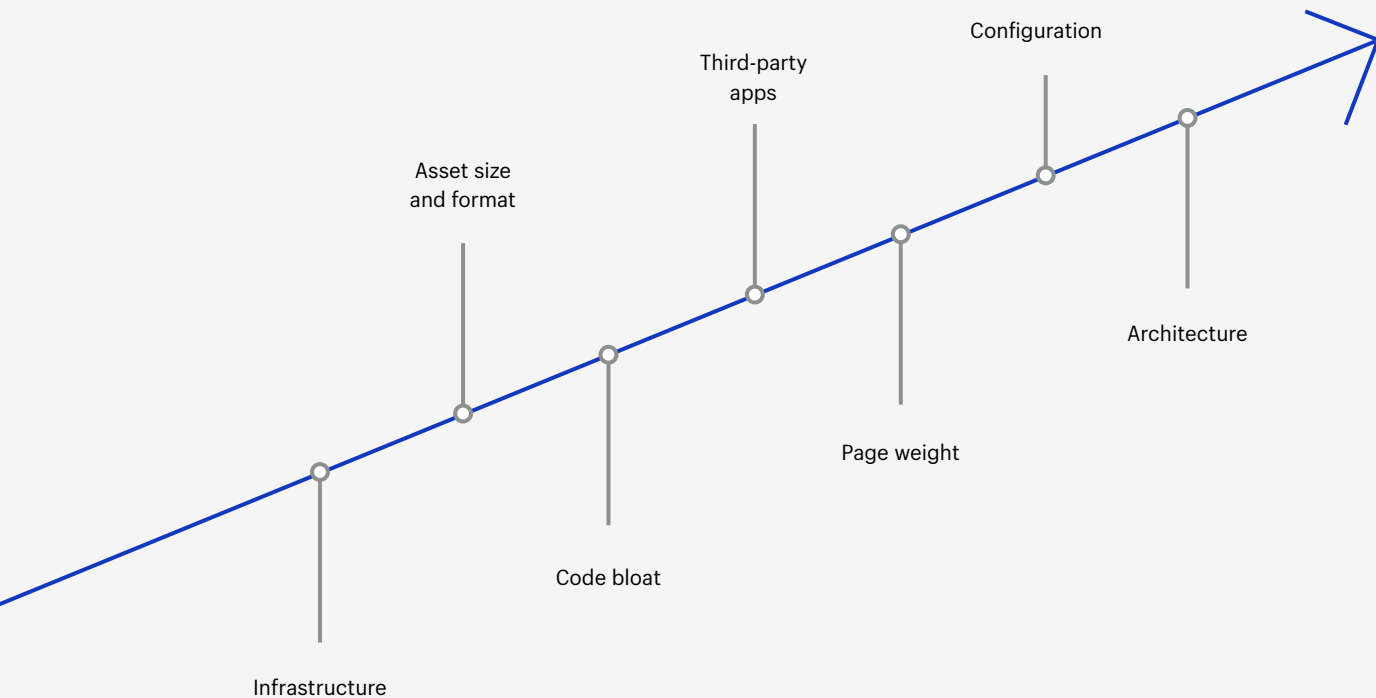
Javier Moreno
Data Science Manager, Shopify

Site performance gets worse as you scale

You'll likely outgrow your infrastructure as you scale. What worked with a hundred staff members and a hundred thousand monthly site visitors falls apart when you experience 10X growth. For example, brands hosting flash sales need a holistic platform, including hosted storefront, checkout, and payment methods that scale on demand to accommodate mega traffic spikes. Here we outline some of the performance killers—and their fixes—on your journey to scale.

Each issue has a tangible impact on the customer journey, from discovery to browsing to conversion.

Performance issues scale as you grow

Configuration

Third-party
apps

Asset size
and format

Architecture

Page weight

Code bloat
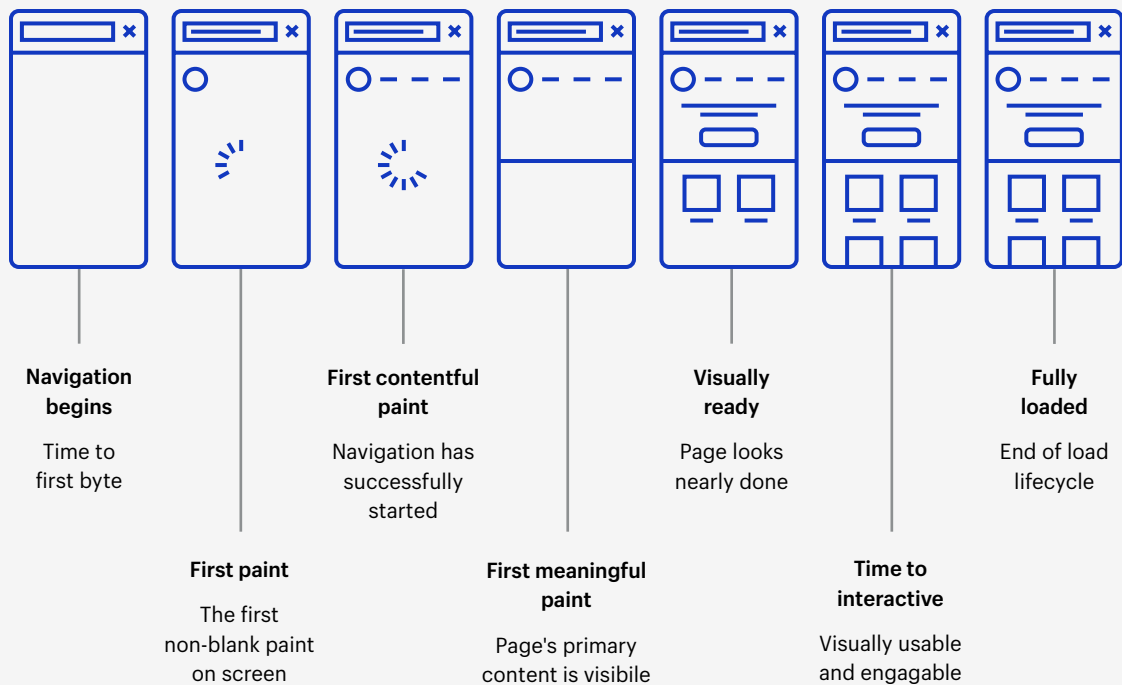
Infrastructure

Site performance gets worse as you scale

The impact of speed on discovery

Eighty-two percent of websites analyzed are plagued by issues that significantly affect performance, and 44% have critical issues. The deadline to fix these issues is approaching quickly. Google announced they would begin scoring sites in May 2021 based on Core Web Vitals like speed, among other factors, to rank and recommend sites.

Sluggish performance will negatively impact organic search rankings.

Calculated by Core Web Vitals, your score will be a number out of 100 and will measure a variety of performance metrics to determine how fast your website feels to real visitors. You can also use Google Lighthouse: Instead of using data from real users, it measures your website in a simulated lab setting to get a sense of how your site performs and to track your progress as you work to speed up. Here are the grading metrics:

"How a page loads"

Navigation begins

Time to first byte

First paint

The first non-blank paint on screen

First contentful paint

Navigation has successfully started

First meaningful paint

Page's primary content is visibile

Visually ready

Page looks nearly done

Time to interactive

Visually usable and engagable

Fully loaded

End of load lifecycle

Sourced from Onely

According to an annual report card by Retail Systems Research, brands just outside the uppermost tiers of the Internet Retailer 500 have improved mobile page load time scores from 9.25 to 7 seconds, but it's still a far cry from the 3-second mark that shoppers expect. Your site will be measured in milliseconds, and relatively minor speed oversights can significantly impact how high you rank.

Page loading time

3-second load
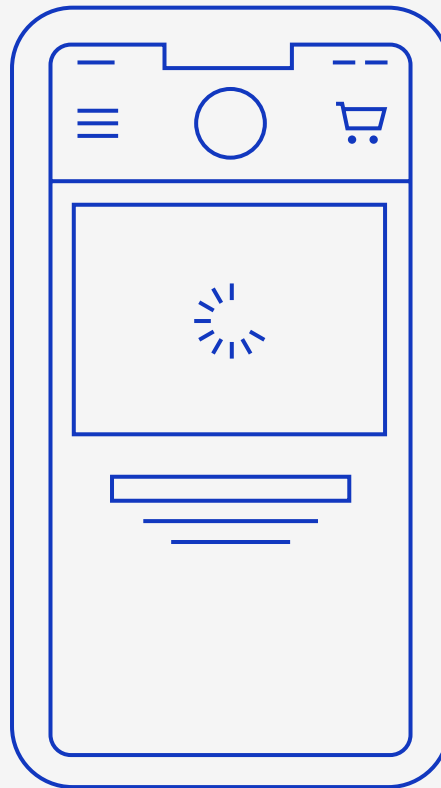
7-second load

The impact of speed on discovery

Performance issues related to discoverability

The code and third-party apps you add to your site weigh down your pages, slow load time, and will soon result in search engine optimization (SEO) penalties. Even brands with relatively sophisticated development teams can unknowingly harm site performance by trying to improve the customer experience.

Code bloat issues

- Brands often prioritize images (both quality and quantity) to improve site speed, when in fact there are higher impact ways to optimize while still creating room for high-quality images and media. One large offender is with JavaScript issues, whose execution accounts for 40% of the Lighthouse score. And as features pile up, so does the amount of JavaScript on your page. JavaScript takes additional time to download, parse, and then execute. The more JavaScript accumulates, the more your site slows downs.

- Poor-performing sites can also be using parser-blocking JavaScript (using <script> instead using <script async> or <script defer>). These are often tags added by stack overflow snippets, poorly designed apps, or sites that depend on jQuery in inline JavaScript parts of a theme.

⍰ How Shopify can help

Shopify automatically minifies SCSS.liquid, which reduces the CSS file sizes for a faster download. We also offer whitespace control tags to help theme developers remove bloat in the rendered HTML. Shopify makes it easy to optimize for page titles, meta descriptions, SEO-friendly URLs, and a solid internal linking structure to improve organic search rankings.

The impact of speed on discovery

Third-party integration issues

- Third-party solutions can slow down your site with synchronous scripts, stylesheets, or fonts loaded from third parties within your <head> tag. Parser-blocking scripts added directly into the <head> often have an immediate impact on performance.

- Even integrations (e.g. apps) you've uninstalled can leave behind snippets of code that bog down your site, making you less discoverable as a result.

- A/B testing tools like Google Optimize can cause pages to go blank between transitions by using an anti-flicker snippet, which hides the initial page until the experiment container is ready. In fact, Google Optimize can even slow down your site when you aren't running experiments at all.

Page weight issues

- Pages come in all shapes and sizes. As certain pages become heavier over time, they can load at varying speeds in different geographic locations or on different devices, negatively impacting international expansion efforts. You can see a list of oversized or unused files in your Lighthouse audit recommendations.

- Heavier pages load more slowly and might not immediately render what's above the fold, a page's most valuable real estate.

The impact of speed on discovery
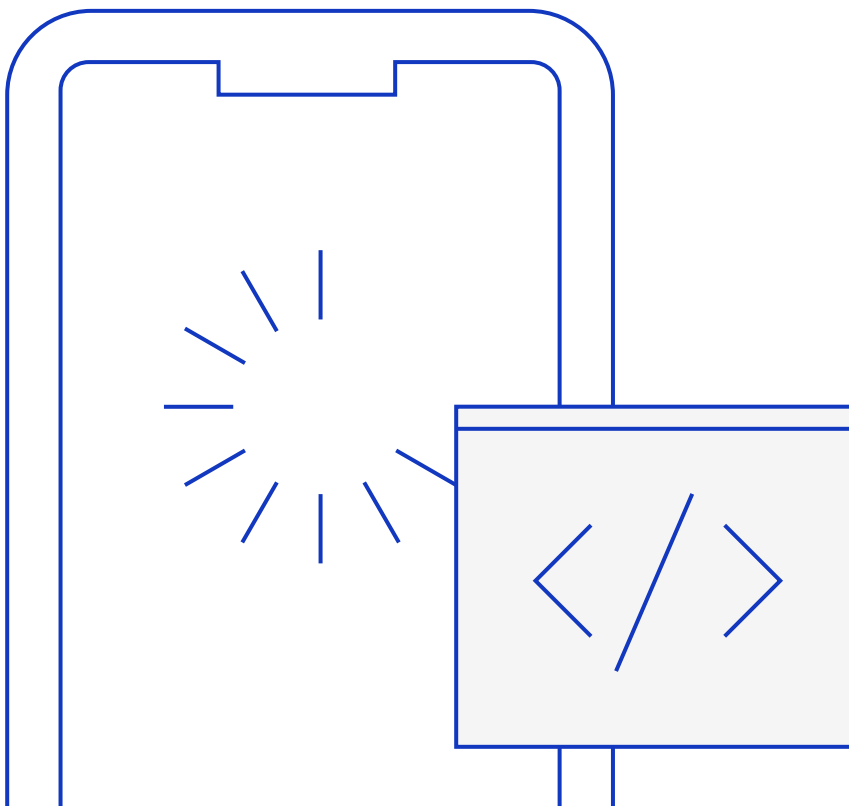
How to improve performance and discoverability

Keep your site lean and nimble

Use minification to shrink the code you need. Remove poorly coded HTML, CSS, and JavaScript on your site to reduce the amount of data you send to users without impacting functionality.

Conduct a forensic audit of your third-party integrations

Take a look at your existing integrations (e.g. apps) and quantify the value they add to your business. Some apps power product recommendations and social image feeds that unnecessarily request massive images. Compare the value with possible performance reductions, and remove unnecessary or value-destroying integrations.

Even after you've uninstalled an app, search your site for traces of leftover code and manually remove it to be sure it won't impact performance long after it's gone.

To guide your app cleanup efforts, create speed benchmarks to confirm whether the work you're doing improves performance at all.

The impact of speed on discovery

? How Shopify can help

If you sell on Shopify and want to install an app to improve your site's functionality, the Shopify App Store surfaces apps with the lowest speed impact at the top of the search results page.

We're also continuously improving our mechanism for removing leftover code from uninstalled third-party apps so you don't have to go digging for it.

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Seriously consider the trade-off between features and performance. Shopify provides some tools that allow brands to detect performance damage, and we plan to continue improving them to support their app choices in the future.

Javier Moreno
Data Science Manager, Shopify

Prioritize loading above the fold

Instead of forcing users to download every image on your site, lazy loading only initially shows shoppers images at the top part of your site. Only after users begin scrolling down will the page fetch the images for that section of the page. Lazy load your site with JavaScript libraries like lazysizes, lazyload, and yall.js. If most of your visitors use Chrome, lazy load selected images by adding the loading="lazy" property to the <img> tag, though be aware that your images won't lazy load in other browsers.

Calculate the trade-off between speed and page weight

Record page weight as well as load time when benchmarking site performance. Use these inputs to direct your optimization efforts. For example, say your average page weighs 15 MB and loads in 2 seconds. If you want to reduce load time by 0.7 seconds—and your infrastructure is able to deliver on average 7.5 MB to the user—you need a page weight of no more than 9.75 MB per page to meet your 1.3-second load goal.

The impact of speed on discovery

Case study: Emazing Group

The Emazing Group, the parent company of a trio of leading lifestyle brands, worked with their internal tech team and outside agency partner to improve site performance. Specifically, The Emazing Group improved its lazy loading times to ensure the tops of its pages loaded instantly. Besides laying a foundation for a better Lighthouse score, The Emazing Group reports:

- Sites now load under 3 seconds, down from 4.5 seconds the previous year
- Conversions increased to 4.08% from 2.45% the previous year, with mobile conversions up 4.13% from 2.45%

Case study: Emazing Group

EMAZING GROUP

The biggest gain for us has been controlling loading priorities for different elements on each page. We would prioritize anything above the fold to give the illusion that the site is very fast.

Bran Lim
CEO and Founder, The Emazing Group

The impact of speed on browsing

Enriching the browsing experience is a necessity when you consider that just 10% of shoppers visiting your site will add an item to their shopping cart. But the very tools, information, and nudges that prompt shoppers to buy can significantly slow down your site:

- Bounce rates can go from 9% to 38% in the extra seconds it takes a product page to load
- 57% of shoppers have left a slow-loading site and purchased from a competitor
- Poor browsing experiences cost large brands up to $100,000 an hour in lost sales

Nearly a quarter of all customer journeys begin on a product detail page (PDP), which is notoriously image and text heavy. PDPs usually contain code or third-party apps that:

- Use 3D product modeling or immersive augmented reality (AR) to bring collections to life
- Embed social feeds to highlight user-generated content for engagement and authenticity
- Showcase customer reviews to increase purchase decision confidence
- Nudge customers by instilling urgency with fear-of-missing-out promotions, inventory counters, or countdown clocks

According to a study by Retail Systems Research in 2019, when asked to identify the two online features that make shopping online most enjoyable, product ratings or reviews and the ability to compare similar products topped the list.

Creating rich PDPs that are also fast often requires difficult trade-offs between performance and functionality. Optimizing your PDP's Largest Contentful Paint, or the shopper's perception that your PDP is useful, is vital to improving the browsing experience.

The impact of speed on browsing
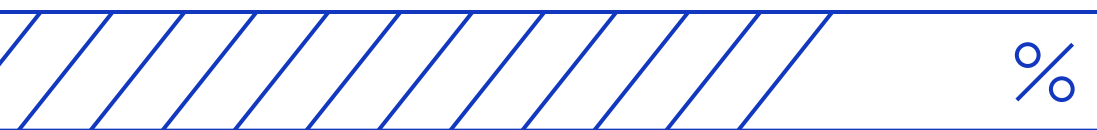
Performance issues related to browsing

Fast PDPs and landing pages are structured to balance speed with a feature-rich browsing experience. High-growth brands that routinely run user experience experiments must minimize the negative speed impact of third-party scripts and apps while architecting product pages optimally.

Configuration issues

- Third-party synchronous scripts, stylesheets, or external fonts loaded within your <head> tag can negatively impact the browsing experience. Scripts added directly into the <head> often have an immediate impact on performance.

- Third-party scripts, domains, and resources—think Google Analytics, Tag Manager, or Facebook—are not always immediately discovered by browsers. They can cause TCP (transmission control protocol) and TLS (transport layer security) delays and compete for bandwidth. This particularly degrades mobile browsing experiences, which is critical in a time when mobile shopping is growing: 67% of sales were made on mobile devices versus 33% on desktop during Black Friday Cyber Monday in 2020.

- Unsupported external web fonts will not always render immediately, which can cause load delays.

Architecture issues

- Reliance on an application layer running PHP or a server environment—and an SQL database that must be referenced—to compute data and return results before a site or page can render

- Faulty mobile design or architecture—one with too much data powered by a server with limited memory—that might not render completely or quickly if making excessive HTTP requests, especially on older devices connected to cellular networks

- Infrastructure concentration that creates distance between distribution buckets and end users

- Unreliable and unpredictable third-party integrations that add friction to the customer journey, which increases bounce rate

The impact ofspeed on browsing

How to improve performance and browsing

Shave hundreds of milliseconds with preconnects

Preconnect to key third-party domains to help browsers download faster. Google engineers recommend rel=preload as a hint resource that allows early fetches of critical resources before the browser would otherwise discover them. A domain name system (DNS) prefetch rule will instruct the browser to look up and cache the DNS information for an external domain and potentially shave hundreds of milliseconds from load times.

Guarantee blazing-fast product page loads with web fonts

Ensure well-crafted product descriptions on high-converting product pages render fast by swapping external fonts that load immediately. Add a font-display: swap property in your @font-face declaration, or, if you're using Google Fonts, a & display=swap URL parameter (e.g. <link href="https://fonts.googleapis.com/css?family=Roboto&display=swap" rel="stylesheet">).

Conduct an audit of your third-party integrations

Take a look at your existing third-party integrations (e.g. apps) and try to remove as much "jankiness" as possible from the browsing experience. Jankiness is something that Google is trying to capture with Cumulative Layout Shift in Core Web Vitals. Consider the possible performance reductions of any integrations, and remove the ones that don't add value.

The impact of speed on browsing

Case study: Rebecca Minkoff

[Rebecca Minkoff](#) is a couture high-fashion brand that has leaned into retail technology like smart mirrors, self-checkout, and radio-frequency identification chips in handbags. The company has adopted 3D modeling and AR on its product pages, connecting shoppers to its catalog in newer and more effective ways than ever before. Shopify lazy loads 3D models to minimize the image's impact on performance. Since implementing 3D and AR, Rebecca Minkoff has seen:

• Shoppers are 44% more likely to add an item to their cart after interacting with it in 3D

• Customers are 27% more likely to place an order after interacting with a product in 3D

• Visitors are 65% more likely to place an order after interacting with a product in AR

? How Shopify can help

Extra features come out of the box: On PDP's, 3D product modeling and AR capabilities let shoppers see how your products look inside their home. But even with feature-rich sites, Shopify-powered brands load [2.97 times faster than other SaaS platforms.](#)

Case study: Rebecca Minkoff

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REBECCA
MINKOFF

3D media makes for a much more interactive shopping experience. Customers can examine our products from every angle, including the option to view products in augmented reality, which helps them get a better sense of quality, size, and other details that matter.

Uri Minkoff
Co-founder and CEO, Rebecca Minkoff

Case study: Rebecca Minkoff
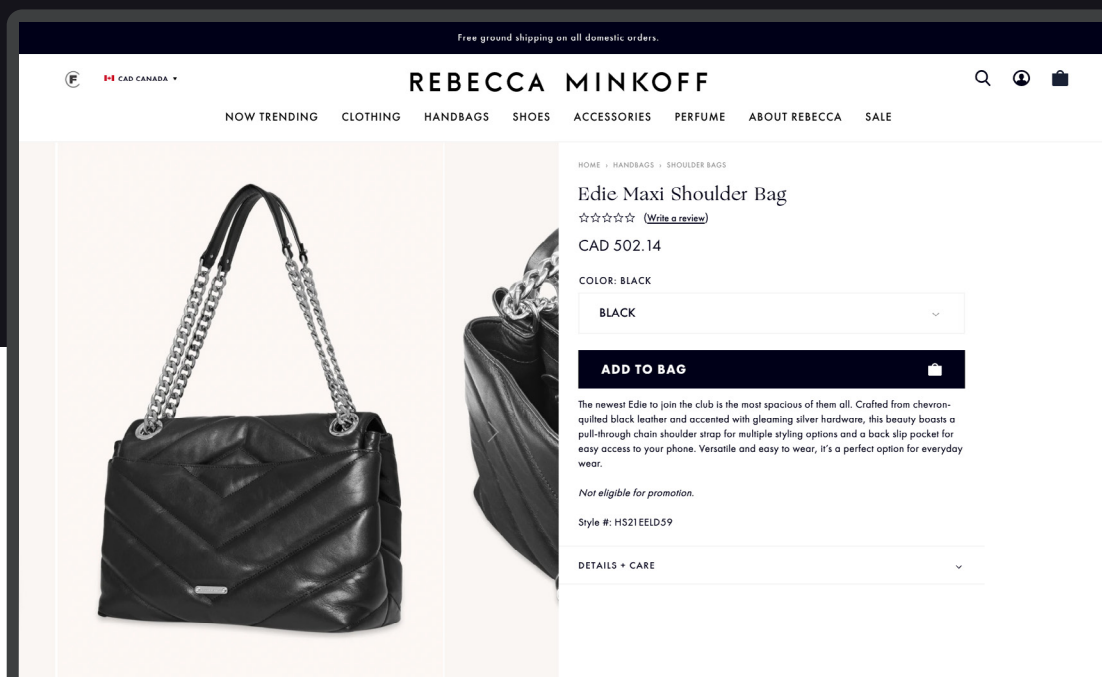
The impact of speed on checkouts and conversions

Slower sites negatively impact conversions. The widely cited statistic—a 1-second delay in page load time results in a 7% decline in conversions—understates the true impact since the pandemic's acceleration of ecommerce by 10 years. A 1-second speed improvement could mean up to a 27% increase in conversions. Even the smallest improvement—we're talking milliseconds—can generate millions of dollars in additional sales.

Research suggests that improving mobile site speed by just 0.1 second can lift conversions by 8% and spending by 10%.

Consumer surveys reveal customer expectations are high:

- 79% of customers who are dissatisfied with a site are less likely to return
- 64% of smartphone users expect a website to load in 4 seconds or less
- 47% of online shoppers expect web pages to load in 2 seconds or less
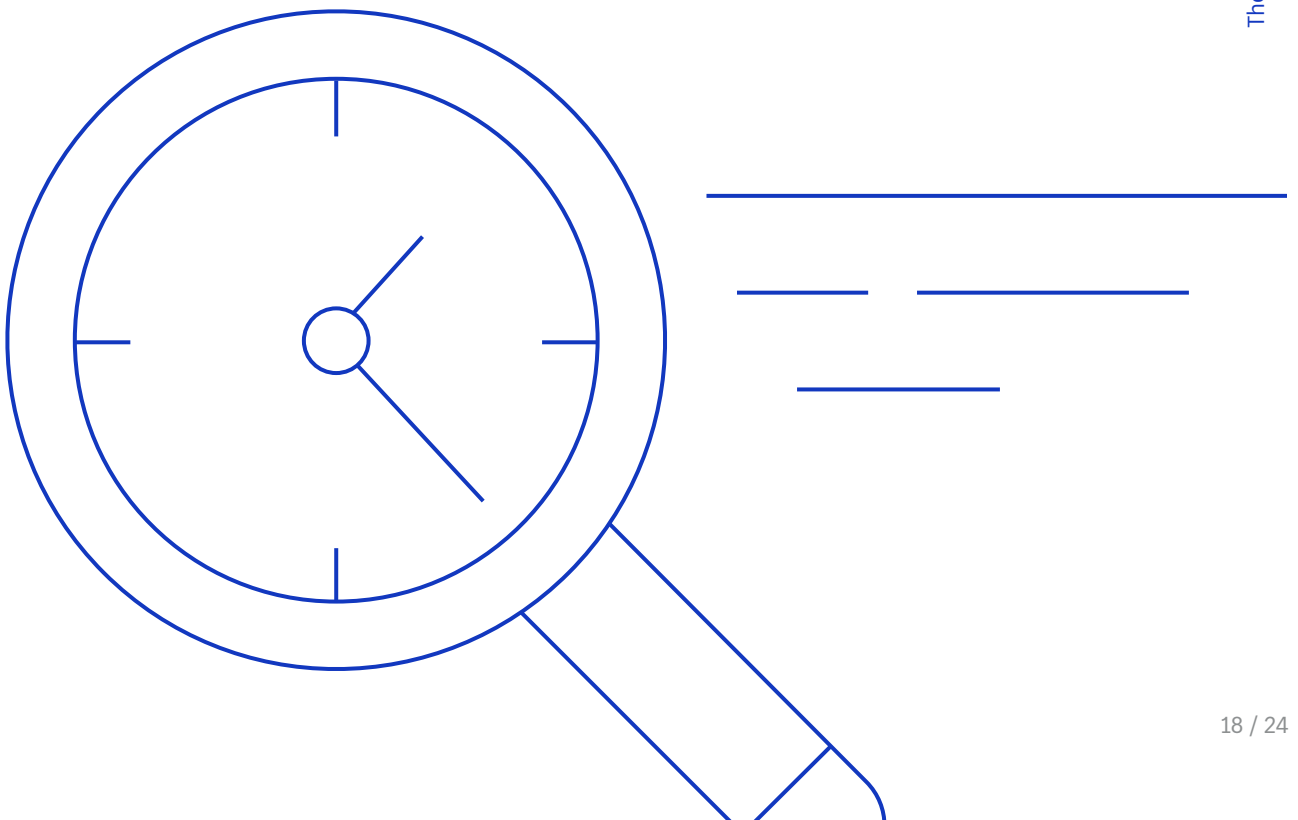
Performance issues related to conversions

It's not uncommon to outgrow the foundation on which you build your business. Likewise, brands often lack the technical expertise necessary to optimize infrastructure and marketing assets as they scale.

Infrastructure issues

- Self-hosted ecommerce sites that lack bandwidth are prone to crashes during high-traffic times like holiday promotions and flash sales, or periods of rapid growth.

How Shopify can help

As the premier flash sale platform, Shopify was built to perform under pressure, with top brands routinely executing record-breaking flash sales that generate tens of millions of dollars, hundreds of thousands of orders, and millions of unique visitors. When high-volume events occur, Shopify's infrastructure is designed to meet traffic demands by employing scale and traffic-control mechanisms developed through years of experience hosting flash sales.

- Inexpensive DNS hosting is often "free" with your registrar fee, but can lack the high availability and low latency necessary to scale and expand internationally.

- A single content delivery network (CDN) that is hosted in one geographic region can bog down your site for visitors in other regions or markets.

- Inflexible checkouts don't benefit from cache loading, so it can take up to 20 seconds for a simple page to load, execute, and render hundreds of JavaScript and API requests, resulting in a slow checkout.

How Shopify can help

With Shopify, a better browsing experience combined with an accelerated checkout allows customers to speed through the browsing process to the checkout securely. Shop Pay is four times faster than other ecommerce checkouts and can increase conversions by 18%.

The impact of speed on checkouts and conversions

Asset size and format issues

Conventional wisdom says high-resolution (hi-res) images are better—and they are, in the right context. What's problematic on a site or app is using a large image when a smaller one would do.

Format matters, too. Images in the wrong format (PNG versus JPEG) can weigh down a site. Images should account for 50–75% of the page weight. As a general rule, your photographs should be saved as JPEG and your graphics (and screenshots) as PNG.

How to improve performance and conversions

Speed up with a trusted global infrastructure

Build your business on a CDN that automatically scales with you, with data centers around the world. Be sure the CDN you select has servers in the regions you plan to target in the future.

How Shopify can help

Our global CDN scales with you, providing optimal performance by ensuring your brand's content is always delivered from a server closest to the user.

The impact ofspeed on checkoutsand conversions

Optimize your marketing assets

Compress images to improve your load time and site speed score, and consider using the srcset attribute on image HTML tags. This identifies a user's device and switches between different versions of the same image based on their browser. Identify what percentage of your traffic is from high-DPI devices or retinal displays to determine whether hi-res images are necessary. If you choose to reduce your image size by using the WebP format, with a graceful fallback to a JPEG of the same size, note that this will reduce the quality as well. There are ways you can optimize your site to create room for high-quality images and media, considered a key part of ecommerce sites.
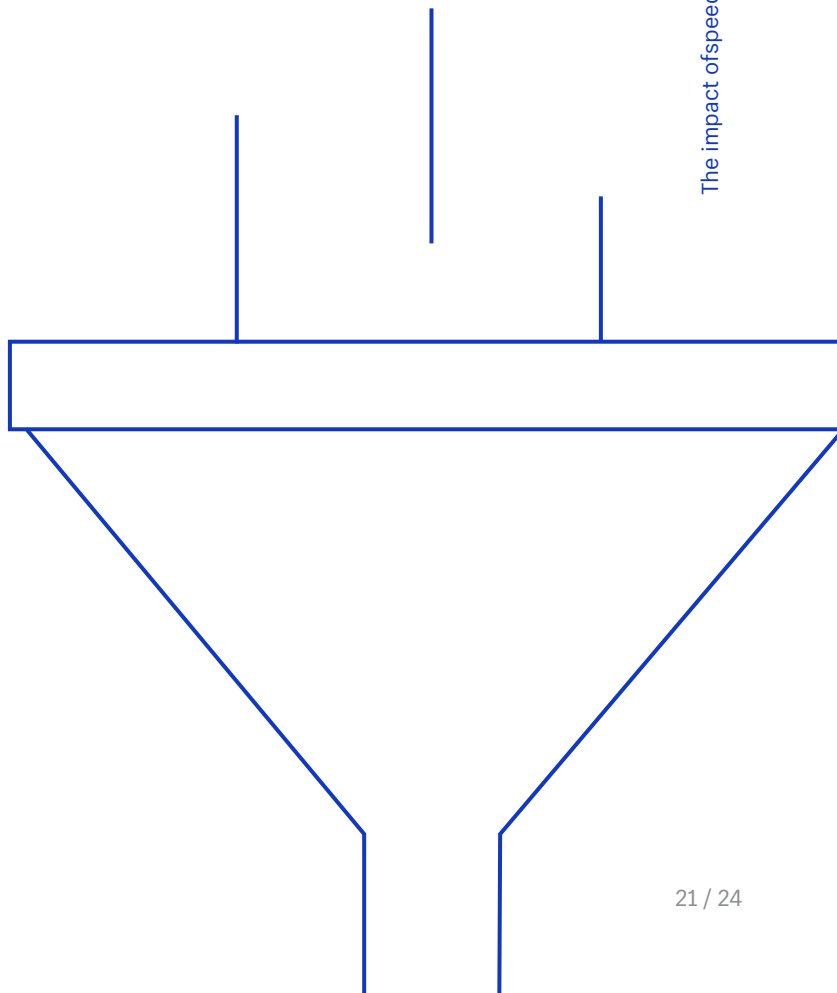
Replace GIF animations with video, and use the proper HTML5 semantic structure for embedded videos.

How Shopify can help

Shopify automatically optimizes image size and delivery based on a user's device by embedding the srcset attribute in your brand's theme.

The impact of speed on checkouts and conversions

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Case study: Rhone

Rhone, a high-performance activewear brand, listens closely to customers to improve product development. To move faster, Rhone's store was served with Shopify Storefront Renderer, a server-side app that Shopify built to serve traffic requests and provide faster page response times for customers. As a result, they saw dramatic month-over-month improvements in site performance and conversions.

Besides a 37.9% decrease in server response time and a 3% reduction in bounce rate, Rhone reports:

- A 15% increase in revenue
- A 17% increase in conversion rate
- A 12% decrease in average page load

Case study: Rhone

RHONE

We kill ourselves trying to fix things if we get negative feedback. Our customers are our lifeblood. If we can't provide value above and beyond a great product, we don't deserve your business.

Nate Checketts
Co-founder and CEO, Rhone

Conclusion

Improving site performance requires difficult trade-offs. Design sacrifices that improve speed can take away from the user experience. The reverse is true as well. What you *can* do must be balanced with what you *should do*.

Let the data guide you:

Link site performance to financial performance.
Test the impact a 1-second change in load time has on revenue.

The path to a fast website is a long game. Actionable steps you can take to get there include conducting an audit annually and tracking performance monthly. Shopify brands can access their store speed report anytime to see their site speed score, how the score has changed over time, and how it compares to other Shopify stores. The Shopify speed score is just one of many other tools shared in this guide.

It's worth noting that the Shopify score can look lower than the Google score because it's based on the Lighthouse scores from three types of pages: home, collection, and product. Collection and product pages are weighted more heavily in the final score than the home page, based on the proportions of page views to those types of pages.

We also only show the mobile score, which tends to be lower than the desktop score, to encourage our merchants to build with mobile shoppers in mind.

Conclusion

Ready to speed up your website and boost sales?

Talk to one of our site speed experts today.

Let's talk