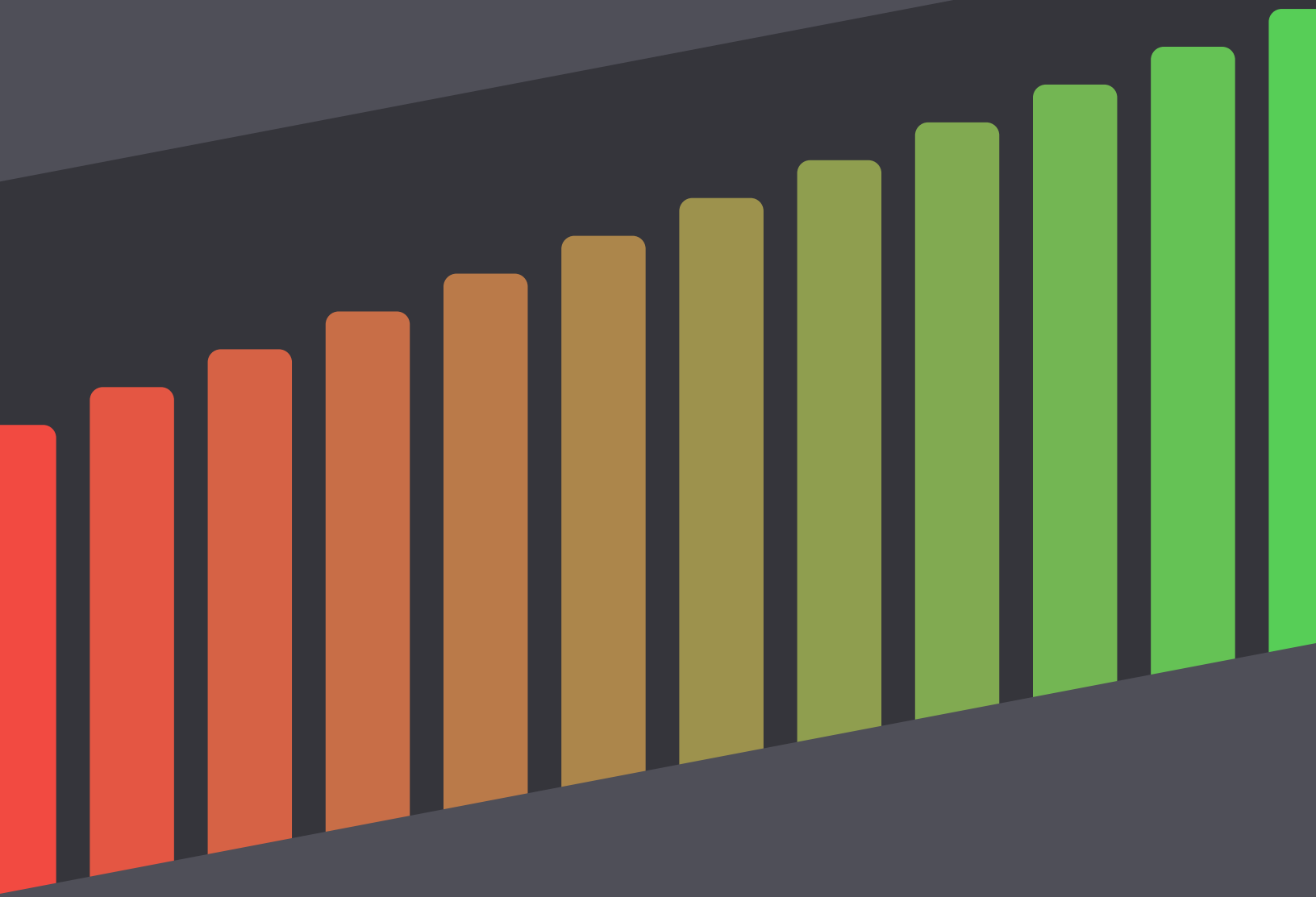
# PERFORMANCE MEETS USER EXPERIENCE

## Harnessing Micro-level Performance Benchmarks to Maximize eCommerce Bottom Line



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# INTRODUCTION

Over the past 10 years, online shoppers have developed an increased need (and expectation) for website speed. A 2006 survey by Akamai revealed that 33% of broadband online shoppers are unwilling to wait longer than 4 seconds to load a page, and a follow-up report in 2009 found that 40% of online shoppers will wait no more than 3 seconds to load a page. (JupitorResearch, 2006; see also Forrester Consulting, 2009) That same year, the O'Reilly Velocity Conference theme was appropriately titled "The Impact of Performance on the Bottom Line." (Souders, WPO – Web Performance Optimization, 2010) Once a topic largely dominated by IT and operations sectors, web performance has facilitated much thought, consideration, and action amongst other parts of organizations due to its direct impact on user experience.

While it is certain there are many factors that contribute to overall eCommerce user experience, web performance is one that transcends every department. Marketers want to show online shoppers stunning images, 360 degree views, personalized product recommendations, and lots of rich content - oftentimes at the expense of aesthetics. On the other hand, DevOps work to minimize site content by adhering to a maximum mega-byte-per-page limit. While a constant struggle exists between these departments on how to address web performance and UX, the following is certain: performance impacts overall user experience and the bottom line for eCommerce sites - regardless of type, size, and traffic volume. Amazon jumped on board with this discovery early on and realized that for every 100ms of page load time delay, their overall sales declined 1%. (Linden, 2006) Even

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smaller online retailers are affected. For one high-end clothing retailer, we discovered that if every product detail page was sped up by 100ms, the retailer could generate an additional $11,579 in one day. Performance does matter. Performance does impact revenues.

From here, the logical progression is to address how an eCommerce site can know for certainty that performance is imacting UX and arguably most important, their bottom line. Despite the prevalence of performance and business analytic data available today, influential voices in the web performance community continue to set certain "one-size-fits-all" performance benchmarks - and many eCommerce sites continue to follow them. A commonly cited Akamai report states that a 1 second delay in page load time can decrease conversions by 7%. (Forrester Consulting, 2009) Studies like these are often taken out of context and should not

be used to influence performance and infrastructure investment decisions. Before spending thousands, eCommerce sites must have access to actionable data from their real end users and take into account the difference in tuning thresholds between each page category (home, product detail, checkout, etc.).

The purpose of this white paper is to demonstrate the impact web performance has on user experience, proving that there is no "one-size-fits-all" page speed benchmark. By analyzing real user data collected over time, we reveal how site performance impacts conversions and bounce rates for three online retailers.

## BACKGROUND

Mesquita and Tsai's *Human Behavior, Psychology, and Social Interaction in the Digital Era* accurately defines user experience as "a person's behaviors, attitudes, and emotions about using a particular product, system, or service." (Mesquita & Tsai, 2015) For years, the correlation between page speed and user experience has been a hot topic, particularly for online retailers. But until 2012, these companies have had a difficult time connecting their site's performance to real business metrics. Having real-user data is only the first step to this connection; the data must become actionable to best increase conversions and sales. Harnessing micro-level performance benchmarks is a clear and obvious solution to improve business metrics.

One of these micro-level benchmarks is knowing exactly where to direct performance investments. If page speed is impacting user experience metrics (sales, conversions, bounce rate) more on one page than another, it is clear where time and money investments need to be made first. In a recent Blue Triangle case study, a cosmetics retailer created a new version of their online store. They spent 3 months improving performance by 1.5 seconds on average, implementing A/B testing to ensure the site was production-ready. Upon launching the new "faster site", they noticed no real results in conversion rates and top-line revenue because **the wrong pages were sped up**. The importance of speeding up the right pages is clear. Performance investments could have been saved or directed towards a page more sensitive to conversion rates.

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To support the argument that there is not a "one-size-fits-all" page speed goal to

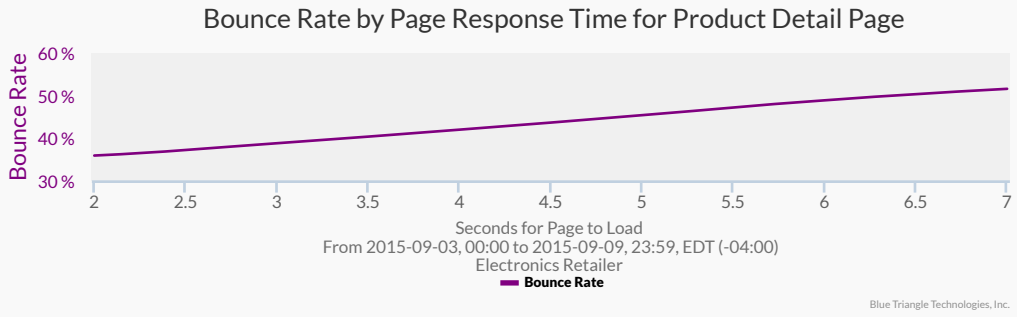
best support user experience improvements and overall sales, three different eCommerce retailers are analyzed using Blue Triangle data in this study. Due to confidentiality agreements, their names have been redacted. The methodology is as follows: data from each site is collected using Blue Triangle Technologies' proprietary Javascript tag. The dates measured are consistent (9/3 – 9/10) and same page is analyzed (Product Detail) amongst all three sites. In addition, there are no filters applied to the types of traffic analyzed or the user's browser, operating system, device, location, or net speed.

- **Site 1:** Electronics Retailer
- **Site 2:** High-End Clothing Retailer
- **Site 3:** Jewelry Retailer

## PERFORMANCE MEETS BOUNCE RATES

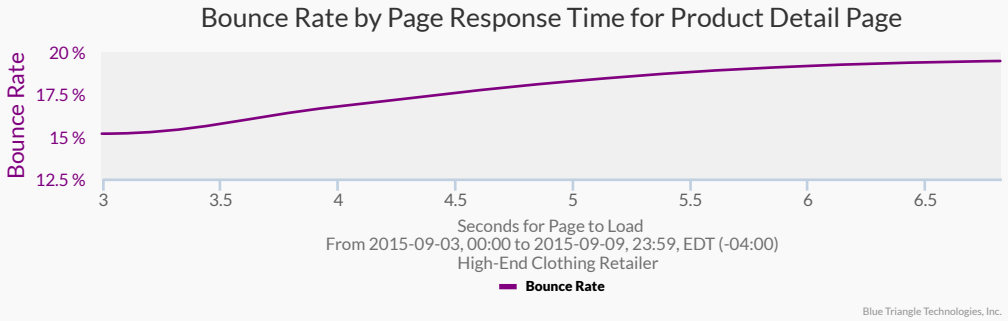
A bounce occurs when a site visitor leaves after viewing one page only. Bounce rate is determined by taking the total number of one-page visits and dividing this by the total number of entries to a page. Amongst all three eCommerce retailers presented, bounce rate increases as page load time increases.

### SITE 1: Electronics Retailer



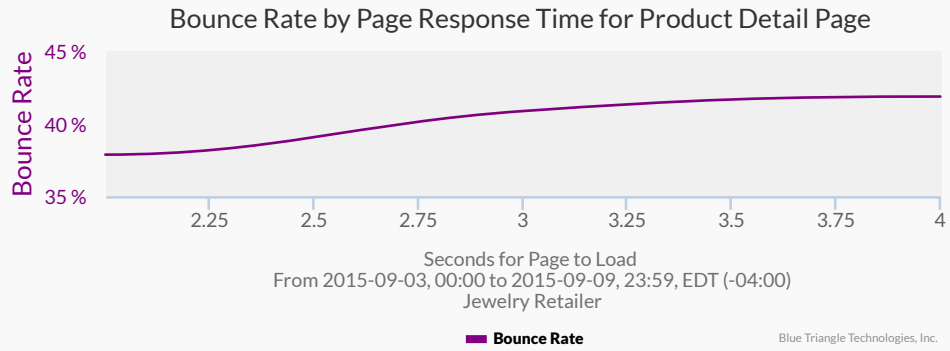

Bounce rate increased from 37.6% at a 3 second page load to 50.4% at a 7 second page load.

## SITE 2: High-End Clothing Retailer



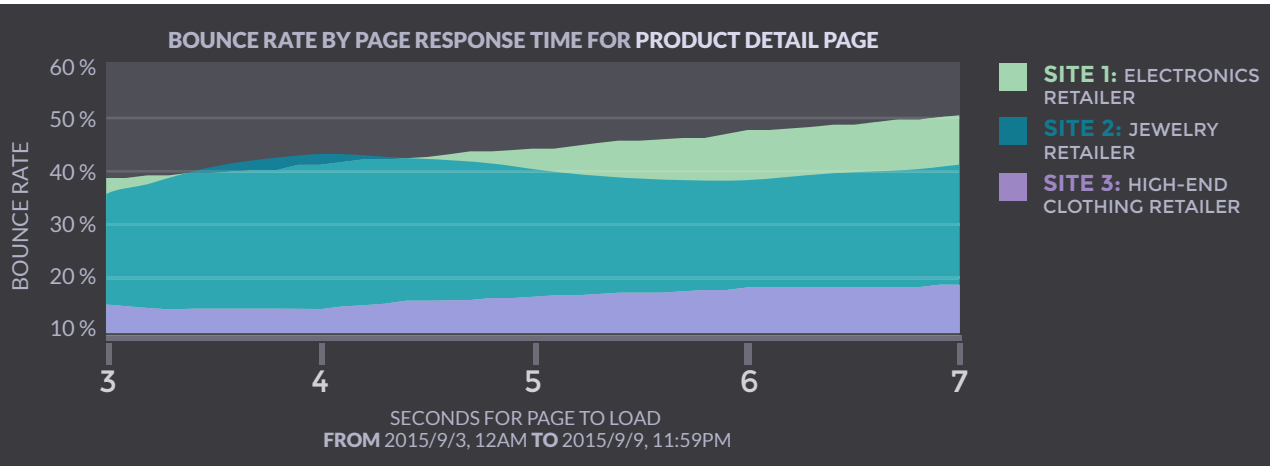

Bounce rate increased from 17% at a 3 second page load to 19.5% at a 7 second page load. The site's bounce rate is less sensitive to page speed than the Electronics Retailer's.

## SITE 3: Jewelry Retailer




Bounce rate increases from 36.6% at a 3 second page load to 43.8% at a 7 second page load. While the trend is very similar to the Electronics Retailer, the median user (50th percentile) bounced at a lower rate (38.8%) compared to the Electronics Retailer's median user (42%).

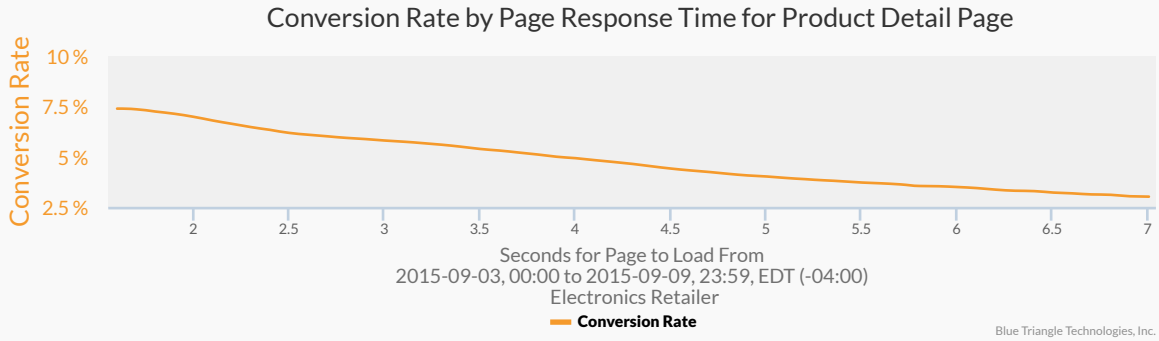
## BOUNCE RATE for All Sites



# PERFORMANCE MEETS CONVERSION RATES AND SALES

When a user completes a desired action on a website (e.g. buys something), they convert. For eCommerce sites in particular, conversions are one of the most important metrics measured, simply because a decline in conversions almost always means a decline in sales. In this study, all three eCommerce retailers saw declining conversion rates as page load time increased.

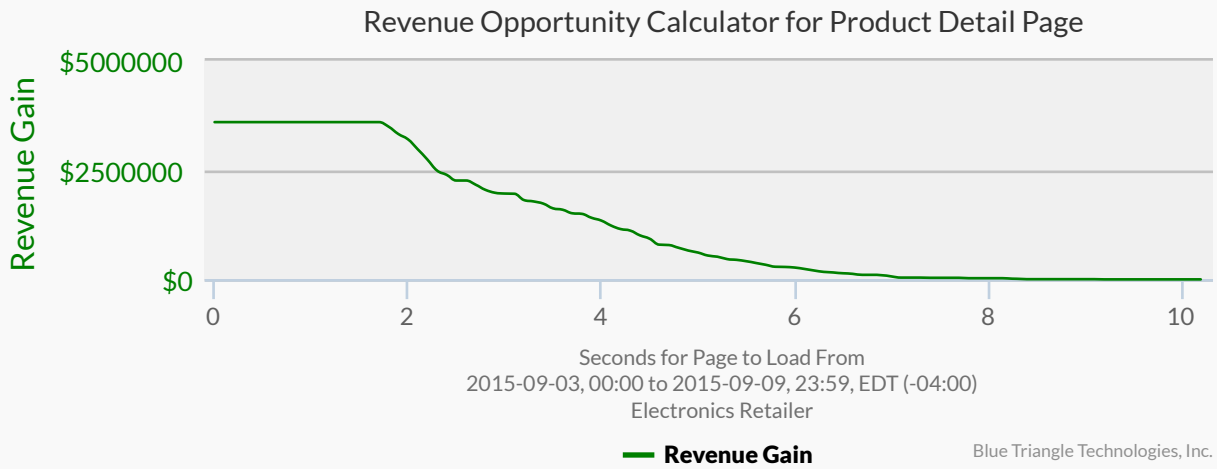
## SITE 1: Electronics Retailer



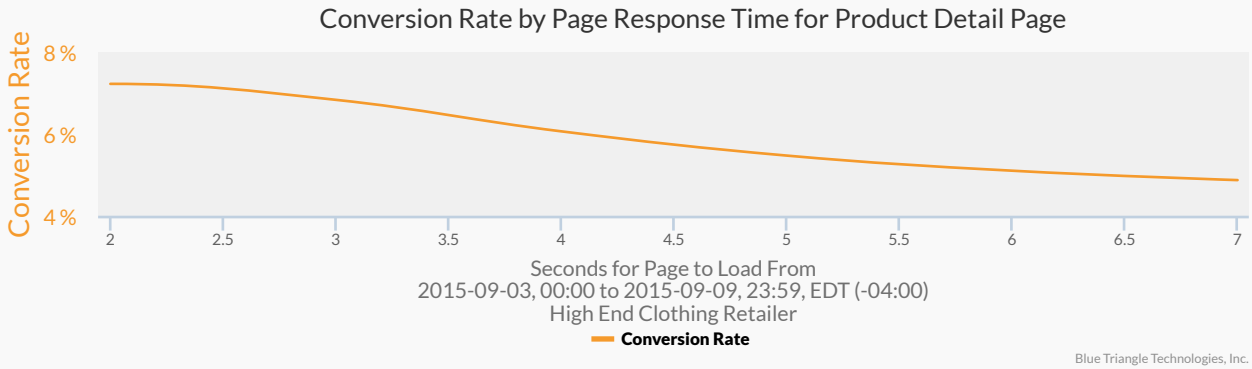

Conversion rate decreased from 5.82% at a 3 second page load to 3.04% at a 7 second page load. The median user (50th percentile) loaded the page in 4.5 seconds and converted at a rate of 4.42%.

Peak conversion rate was 7.39% and occurred at a 1.6 second page load time.

**Revenue Opportunity on Page if Slow Users Sped Up to 50th Percentile (4.5 sec): $941,730/week**



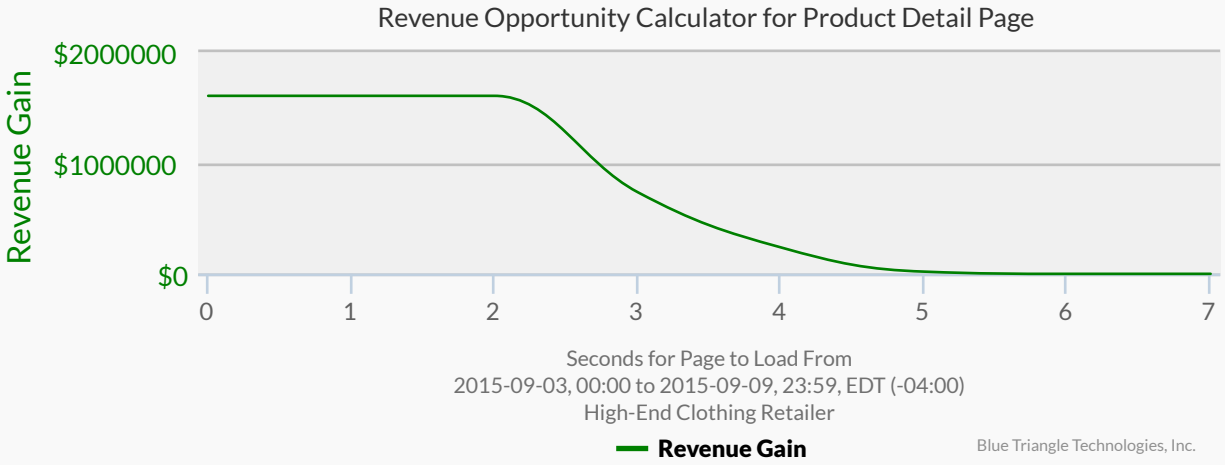
## SITE 2: High-End Clothing Retailer



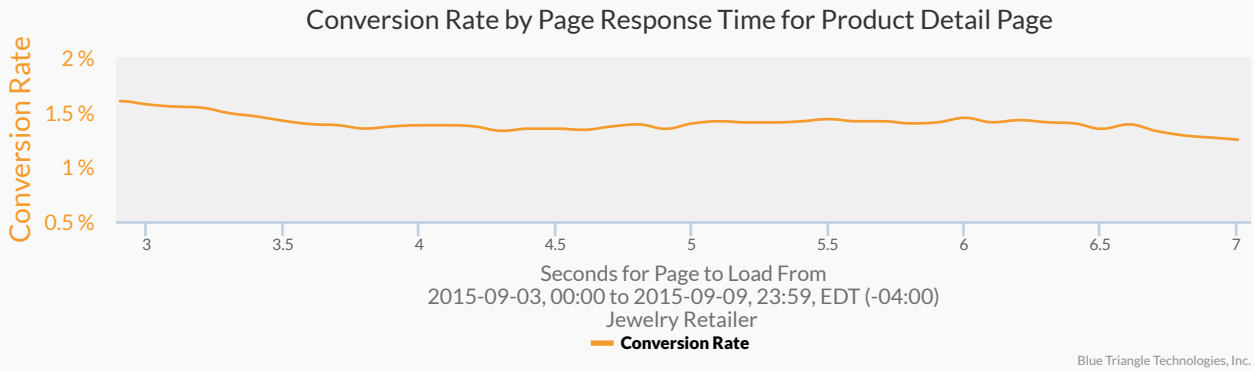

Conversion rate decreased from 7.15% at a 3 second page load to 5.09% at a 7 second page load. The median user (50th percentile) loaded the page in 3.7 seconds and converted at a rate of 6.76%.

Peak conversion rate was 7.29% and occurred at a 2.5 second page load time.

**Revenue Opportunity on Page if Slow Users Sped Up to 50th Percentile (3.7 sec): $1,050,197/week**



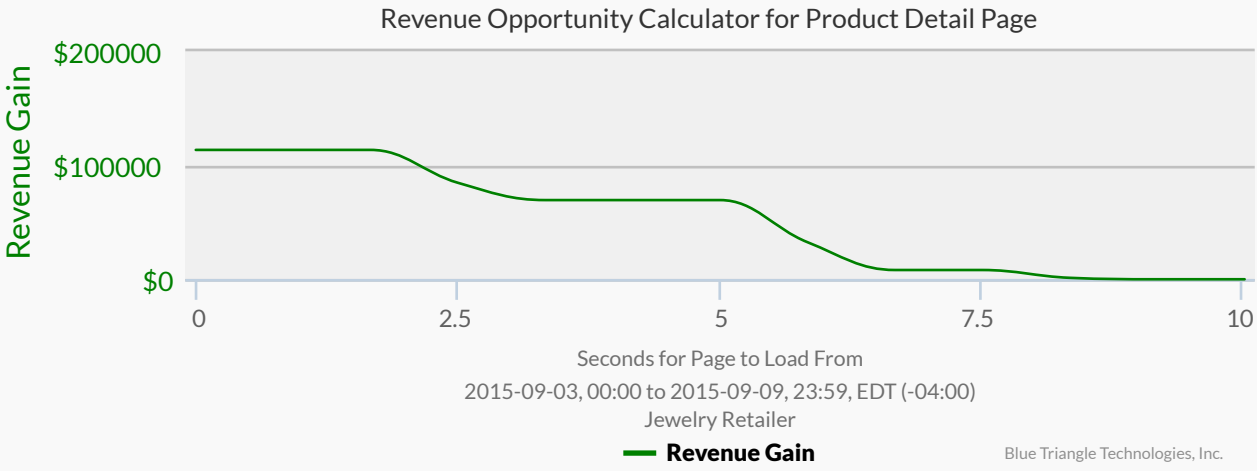
## SITE 3: Jewelry Retailer



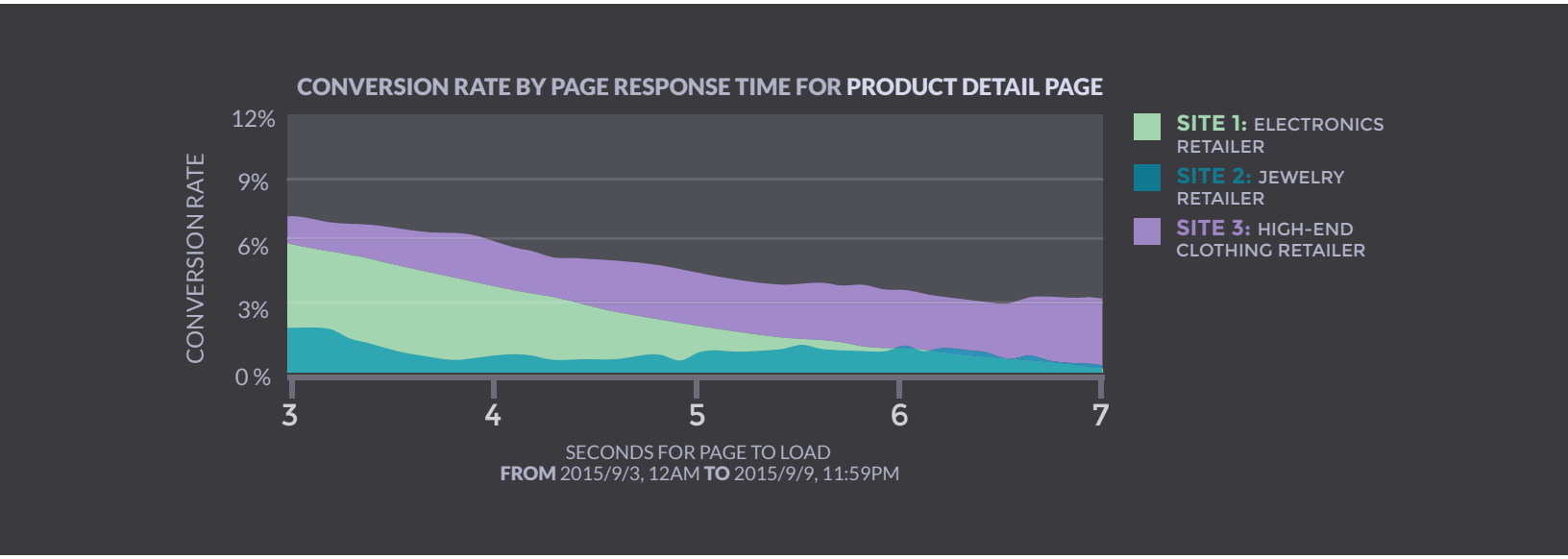

This conversion rate curve is fairly flat compared to the other retailers analyzed. As a result, this site may choose not to invest heavily in performance improvements on this page. The conversion rate decreases from 1.57% at a 3 second page load to 1.25% at a 7 second page load. The median user loaded the page in 5.6 seconds and converted at a rate of 1.42%.

Peak conversion rate was 1.60% and occurred at a 2.9 second page load time.

**Revenue Opportunity on Page if Slow Users Sped Up to 50th Percentile (5.6 sec): $69,247/week**



## CONVERSION RATE for All Sites




# SOLUTION

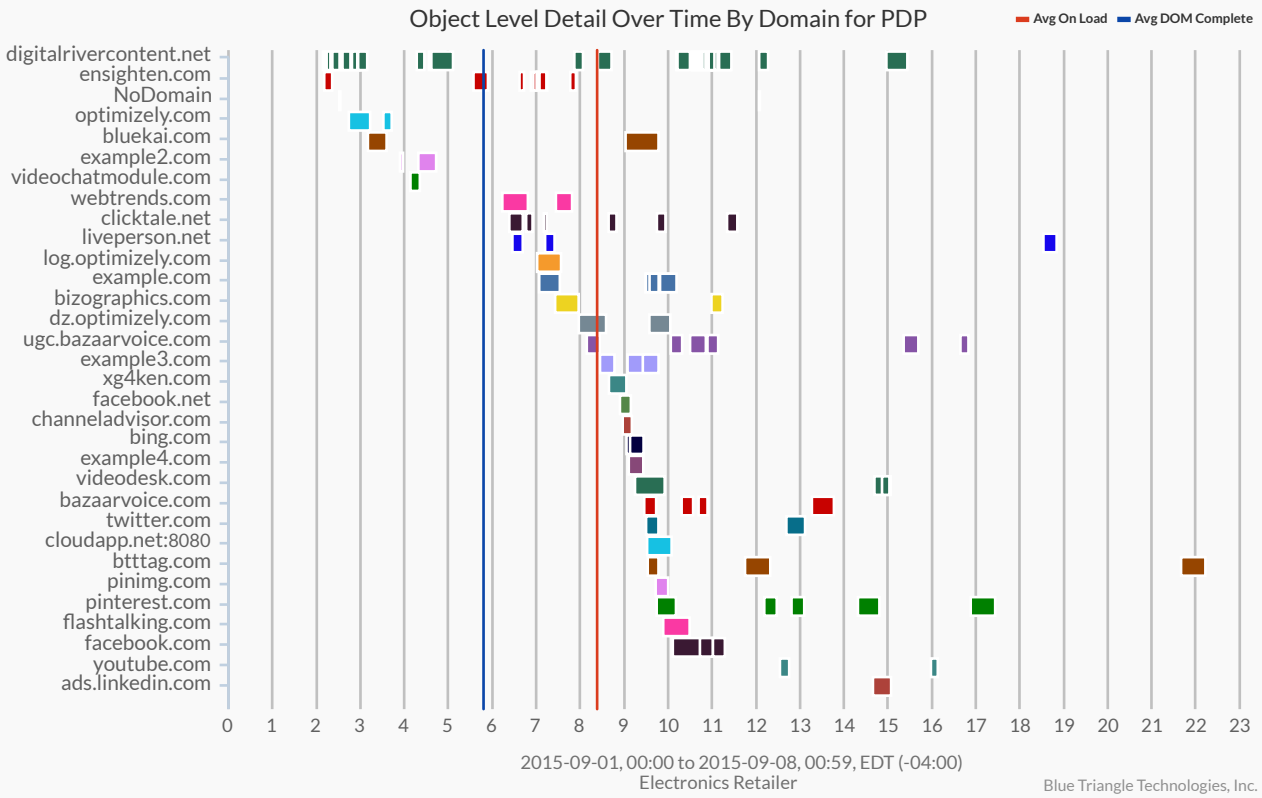
In order to effectively remediate poor conversion and bounce rate metrics from page slowdowns, every eCommerce site must understand where and how much performance is impacting user experience. With actionable data that pinpoints performance bottlenecks, DevOps efforts can be directed and prioritized. Poor-performing third party tags have consis-

> Third party tags can directly cause page slowdowns, so it is imparative that eCommerce sites know when these are firing off.

tently been an issue for many performance engineers. Every internet retailer should be using a tag manager like Satellite, Ensighten, or Tealium to monitor tags. While important for compliance and security, tag managers do not give much detail on performance, if at all. Third party tags can directly cause page slowdowns, so it is imperative that eCommerce sites know when these are firing off in relation to the DOM interaction, DOM complete, and full page load milestones.

From here, it can be easily identified which tags are impacting performance. Object

level detail with performance waterfall (seen below) is the most efficient way to identify the performance of these. Drilling down to the root cause of page slowdowns is imperative for any online retailer so any issue can be remediated quickly.




Performance can often suffer at the expense of aesthetics. This is not necessarily a bad thing. Just like page speed, attractive and rich content play an important role in a positive user experience as well. Therefore, when aesthetics are sacrificed in exchange for performance improvements, the results can sometimes be detrimental. One trendy clothing retailer conducted an A-B test between a faster site with lower quality images and a slower site with high quality images. The company experienced a 10-15% decline in conversions on the speedier site, showing that sacrificing aesthetics for speed can negatively influence user experience, and most importantly, sales and conversion rates. Conducting an A/B test and correlating page speed with conversion rates between the two sites is the best way to approach significant site design changes. Often, Site B will convert slightly higher overall, but Site A may have a better conversion rate for those who have fast page experiences. If this is the case, a decision could be made to keep Site A because it might have better potential with some performance tuning (e.g. speeding up slow users).

If site performance is negatively impacting user experience and micro-level performance benchmarks have been set, there are a host of solutions that can remediate the issue.

### Web Design Solutions

- **Image Optimization:** Reducing images down to 200 KB or less can dramatically improve page load times. Images can be optimized using a variety of services like TinyPNG that remove unnecessary data. JPEG is the recommended file type, as all browsers on mobile, tablet and desktop support it. SVG (vector) graphics with an image fallback for older, unsupported browsers is also a viable solution and can decrease page response time.

- **Reduce the Amount of Files Loaded:** Reducing HTTP requests speeds up sites. Consider using CSS Sprites, which combines images together on one file to improve site performance.

- **Reduce the Number of Plugins:** Many sites have plugins that aren't necessary or aren't even used on every page – if at all. Plugins can compromise security and increase load time.

### Strategic Solutions

- **Infrastructure Changes:** Reducing or eliminating server redirects and improving base page response time increases performance – and consequently – conversions. If base page response time increases, it may be indicative of server delays that need to be addressed or remediated.

- **Content Delivery Network (CDN) Maximization:** Many eCommerce sites are not getting the most out of their current CDN. It's important to constantly monitor its ROI and consider alternative solutions that will better improve performance.

- **FEO Treatments:** Web performance pioneer Steve Souders states: "80-90% of the end user response time is spent on the front-end. Start there." (Souders, The Performance Golden Rule, 2012) Understanding the exact pages that need to be treated relative to how well they convert is vital for justifying performance investments.

- **Optimizing Content Dynamically:** eCommerce sites that are optimizing content personally for each user in real time are truly providing a 5-star user experience. Analyzing the conversion rate vs page speed curve for all users across different days and pulling or changing certain site features (3rd party ads, amount of products per page) that are causing a decline in overall conversions is effective as well.

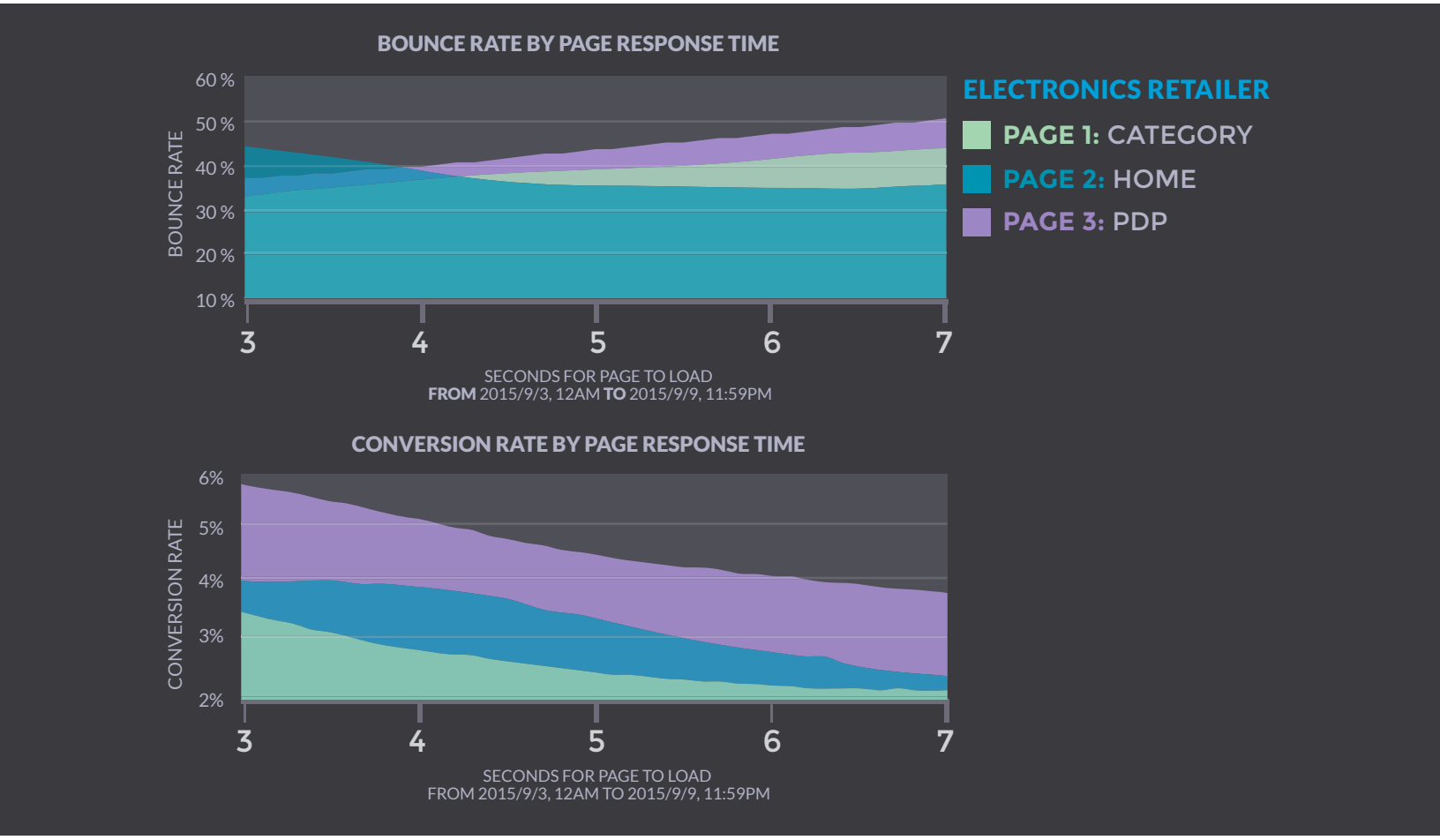
## DOES ONE SIZE FIT ALL?

With all the specific site data and performance remediations presented, it is clear that there is no "one-size-fits-all" page speed goal. These macro-level performance benchmarks are

neither accurate nor logical. A popular article from O'Reilly lists some rules-of-thumb for eCommerce sites: it states that site abandonment reaches 40% when page load time surpass-

> Macro-level performance benchmarks are neither accurate nor logical.

es 3 seconds. However, data from a High-End Clothing retailer shows that at a 3 seconds page load, bounce rate was 17%. In addition, O'Reilly (and many others) cite a popular case study from Amazon, stating that for every 100 milliseconds in page speed delay, sales decrease 1%. (Swanson, 2014) eCommerce sites are wasting their time, energy and resources following benchmarks like these. It is vital to know where and how much performance is impacting user experience. Looking at each page's sensitivity to user behaviorial metrics gives internet retailers the full picture. Notice that there is a clear difference in conversion rates and bounce rates between the Home, Product Detail, and Category pages of this site.



## Real User Monitoring (RUM)

To understand the impact web performance has on business metrics, the experience of real end users much be measured. Many eCommerce sites continue to use synthetic monitoring to provide a snapshot of customer experience, but this experience is fabricated using robots, not real people. This form of monitoring is simply not accurate. Real user monitoring (RUM) is quickly becoming the industry standard. Using RUM data, every experience and transaction is measured in real time and can be correlated with performance metrics – specifically page speed.

## Conclusion

Based on the real user data collected, bounce rates differed amongst all three retailers. The High-End Clothing Retailer enjoyed a significantly lower bounce rate and page speed/bounce rate sensitivity compared to the other eCommerce sites studied. This could be a result of the niche market the retailer serves. The site's 50th percentile of users bounced at a rate of 15%, while the 50th percentile of the Jewelry Retailer's users bounced at a rate of 38.8%. Clearly there is no macro-level performance benchmark to achieve a certain bounce rate, but it is certain that page speed impacts bounce rates.

Conversion rates differed significantly as well. The Jewelry Retailer's median conversion rate was significantly lower than others: 1.42%. An explanation for this low conversion rate could be the length of the consumer decision making process for jewelry. Alternatively, the highest conversion rate median for this week was the High-End Clothing Retailer, at 6.76%. The page load time of peak conversion rates differed amongst all retailers. While the Electronics Retailer had a conversion rate peak at a 1.6 second page load time, the Jewelry Retailer's peak occurred at a 2.9 second page load time.

The data presented proves that not only does page speed impact user experience, but also that there are no rules-of-thumb for page speed – especially once every page's performance is analyzed separately.

Blue Triangle Technologies harnesses micro-level performance benchmarks for a variety of eCommerce retailers to support increases in sales. To find out more, visit http://www.bluetriangletech.com or email us at sales@bluetriangletech.com.

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