

Czech University of Life Sciences Prague

Faculty of Economics and Management

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Master's Thesis

Ethical Issues in SEO (A Comparative Analysis of Black Hat vs. White Hat Tactics)

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

BSc. Majd Ahmad

Informatics

Thesis title

Ethical Issues in SEO (A Comparative Analysis of Black Hat vs. White Hat Tactics)

Objectives of thesis

This thesis aims to analyse black hat and white hat SEO tactics, focusing on their short-term benefits versus long-term consequences. Specifically, the study seeks to understand the ethical considerations in SEO practices and explore how adopting unethical strategies (black hat) may harm a website's ranking, reputation, and overall success in the long run. The goal is to provide a balanced view and actionable insights for businesses and SEO professionals aiming for sustainable, ethical digital marketing strategies.

Methodology

This study employs a comparative research design which Data will be gathered and analyzed through case studies of websites using black hat and white hat SEO tactics, tracking metrics and changes in search ranking ,traffic and penalties.

The study evaluates how black hat tactics, while yielding short-term visibility gains, often result in penalties and damage to brand reputation. In contrast, white hat SEO fosters sustainable growth, user trust, and domain authority, aligning with ethical standards and long-term success emphasizing the importance of ethical SEO practices for credibility and compliance.

The proposed extent of the thesis

60 – 80 pages

Keywords

Black Hat, White Hat, Algorithm, UX, Long-Term SEO, Vulnerability, Analysis, Metrics, Short-Term SEO,

Recommended information sources

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-

Expected date of thesis defence

2024/25 SS – PEF

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Declaration

I declare that I have worked on my master's thesis titled "Ethical Issues in SEO (A Comparative Analysis of Black Hat vs. White Hat Tactics)" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on 22/03/2025



Acknowledgement

I would like to thank my supervisor, **Ing. Václav Lohr, Ph.D.**, for his invaluable advice, guidance, and support throughout the development of this thesis. His expertise and encouragement were instrumental in the successful completion of my work.

I extend my heartfelt thanks to my family for their unwavering support, understanding, and love, which have been a constant source of motivation. Their encouragement and belief in me made the completion of this thesis possible.

Lastly I wish to convey my profound gratitude to my professors and colleagues for their continuous support, insightful guidance, and encouragement throughout my years of study. Their contributions have enriched my academic journey and greatly influenced the research and writing of this thesis.

Ethical Issues in SEO (A Comparative Analysis of Black Hat vs. White Hat Tactics)

Abstract

Search Engine Optimization (SEO) plays a crucial role in determining website visibility and digital success. This study provides a comparative analysis of Black Hat and White Hat SEO techniques, focusing on their short-term advantages and long-term consequences. Using case studies and statistical analysis, the research examines websites employing both ethical (White Hat) and unethical (Black Hat) SEO strategies, evaluating their search rankings, organic traffic, penalties, and sustainability over time.

The study tracks Moz, Amazon, J.C. Penney, and Overstock.com, analysing their SEO performance using tools such as Google Analytics, SEMrush, Ahrefs, and Moz. Statistical tests, including Mann-Whitney U, Spearman's Rank Correlation, and Chi-Square analysis, reveal that while Black Hat SEO may provide temporary ranking boosts, it leads to significant penalties and ranking drops. Conversely, White Hat SEO results in long-term stability, higher organic traffic, and credibility.

The findings emphasize that ethical SEO strategies are critical for sustainable digital marketing success, while deceptive tactics ultimately lead to reputational and financial harm. Businesses and SEO professionals must prioritize user-focused, ethical optimization techniques to maintain search engine compliance and long-term growth.

Keywords: Black Hat SEO, White Hat SEO, Algorithm, UX, Long-Term SEO, Vulnerability, Analytics, Metrics, Short-Term SEO, off page SEO , on page SEO, content, Tools, quality backlinks, Unethical Practices.

Etické problémy v SEO (Srovnávací analýza taktiky Black Hat vs. White Hat)

Abstrakt

Optimalizace pro vyhledávače (SEO) hraje klíčovou roli při určování viditelnosti webových stránek a digitálního úspěchu. Tato studie poskytuje srovnávací analýzu technik Black Hat a White Hat SEO se zaměřením na jejich krátkodobé výhody a dlouhodobé důsledky. Pomocí případových studií a statistických analýz zkoumá výzkum webové stránky využívající etické (White Hat) i neetické (Black Hat) SEO strategie, hodnotí jejich hodnocení ve vyhledávání, organickou návštěvnost, sankce a udržitelnost v průběhu času.

Studie sleduje Moz, Amazon, J.C. Penney a Overstock.com a analyzuje jejich výkon SEO pomocí nástrojů, jako jsou Google Analytics, SEMrush, Ahrefs a Moz. Statistické testy, včetně Mann-Whitney U, Spearman's Rank Correlation a Chi-Square analýzy, odhalují, že zatímco Black Hat SEO může poskytnout dočasné zvýšení hodnocení, vede to k významným penalizacím a poklesu hodnocení. Naopak White Hat SEO má za následek dlouhodobou stabilitu, vyšší organickou návštěvnost a důvěryhodnost.

Zjištění zdůrazňují, že etické strategie SEO jsou zásadní pro udržitelný úspěch digitálního marketingu, zatímco klamavé taktiky nakonec vedou k poškození pověsti a finanční újmě. Firmy a odborníci v oblasti SEO musí upřednostňovat techniky etické optimalizace zaměřené na uživatele, aby udržely shodu s vyhledávači a dlouhodobý růst.

Klíčová slova: Black Hat SEO, White Hat SEO, Algoritmus, UX, Dlouhodobé SEO, Zranitelnost, Analytics, Metriky, Krátkodobé SEO, Offpage SEO, SEO na stránce, obsah, Nástroje, kvalitní zpětné odkazy, Neetické praktiky.

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1. Introduction

According to Peter Kent et al. (2016) in 2015 before there were search engines, there were search directories. A directory is a categorized collection of information about websites. Rather than containing information from web pages, it contains information about websites. In fact, before Google was even a twinkle in its fathers' eyes, Yahoo! directory was America's dominant search site; "The Google of the 1990s," as I've seen it described.

In 2011 estimate put the size of the Web at well over one trillion unique URLs, and over 555 million websites and growing (Kenning Arlitsch and Patrick O'Brien et al., 2013).

According to Peter Kent et al. (2016) in 2015, Google reported that it had discovered 60 trillion pages, though not all were indexed; today Google's states that the index itself contains "hundreds of billions of pages," and contains about 100 million gigabytes of data. in 2016 it was reported that Google alone gets at least 63,000 searches a second , that's over 5 billion a day, More than 2 trillion a year.

According to Aravind Shenoy, Anirudh Prabhu et al. (2016) experts estimate that Google uses more than 200 factors to rank websites in its search results.

in 2016 it was reported that Google alone gets at least 63,000 searches a second , that's over 5 billion a day, More than 2 trillion a year. (Peter Kent et al., 2016)

According to Lee Odden et al. (2016) Companies that ignore the current state of affairs with search technology and quality guidelines may feel the sting, as many website owners did with Google's Panda updates in 2011.

According Véronique Duong et al. (2016) Voice search will become one of the most widely used channels in the West by 2020. We estimate that 70% of searches will be done using voice in a few years. According to a study conducted by SEMrush (a statistical tool for monitoring analytics),

2. Objectives and Methodology

2.1 Objectives

Analysis of black hat and white hat SEO tactics, focusing on their short-term benefits versus long-term consequences. Specifically, the study seeks to understand the ethical considerations in SEO practices and explore how adopting unethical strategies (black hat) may harm a website's ranking, reputation, and overall success in the long run. The goal is to provide a balanced view and actionable insights for businesses and SEO professionals aiming for sustainable, ethical digital marketing strategies.

This study aims to:

- 1- Compare organic visibility, traffic trends, and ranking stability of Moz vs. Overstock & Amazon vs J.C.penny.
- 2- Assess the impact of black hat vs. white hat SEO strategies over time.
- 3- Measure the long-term sustainability of ethical SEO practices compared to manipulative techniques.

2.2 Methodology

The methodology of this thesis will involve the following steps:

1. Selection of sample websites: pair of two websites from similar industries and initial comparable performance levels will be selected for comparison to maintain an unbiased analysis
2. Monitoring and evaluation: The performance of the websites will be monitored over a period of six months exploring the impact of white hat and black hat SEO strategies within the retail and technology industries by examining companies that have adhered to ethical SEO practices and contrasting them with competitors that have faced consequences due to unethical SEO tactics.
Key Performance Metrics used Search Ranking in Google SERPs over time, Traffic and Penalty Data.
3. Data Collection and Analysis : The data collected from SEO tools (Ahrefs, SEMrush, Moz, Google Analytics), Google Search Console (Manual Actions Report), Industry

reports and case studies will be used with statistical tests and The research questions/hypotheses (differences between black hat and white hat SEO tactics).

to determine the effectiveness of different SEO tactics key performance indicators (KPIs) will be tracked such Search Engine Rankings , Organic Traffic Growth Bounce Rate & Engagement Metrics , Conversion Rates , Penalty & De-indexing Risks

3 Literature Review

3.1 Overview

The search engine was created by Google founders Larry Page and Sergey Brin, with a focus on backlinks. Unlike other search engines, which prioritized keyword relevance later, the name of the search engine was changed to Google, paving the way for the search engine revolution.

Search engine optimization (SEO) is the practice of ensuring that websites are indexed and effectively presented in Internet search results. Internet search engines are responsible for directing substantial traffic to websites. Sites that are not easily discoverable through major search engines are likely to experience reduced visitor engagement. A 2005 survey conducted by OCLC demonstrated that 89 percent of college students began their research with Internet search engines, and that only 2 percent began at library websites (De Rosa et al. 2005).

Search engines can be thought of as “users with substantial constraints: they can’t read text in images, can’t interpret JavaScript or applets, and can’t ‘view’ many other kinds of multimedia content” (Hagans 2005). Search engines require assistance in interpreting content, necessitating the creation of machine-readable metadata and the provision of useful on-page text for indexing.

Site performance is an important variable that affects both crawlers and visibility within SERPs. The average speed of a site can be degraded by slow pages. Crawlers may be terminated if pages load too slowly. Google has indicated that site performance is a factor considered in its ranking algorithms (Singhal and Cutts 2010).

In 2010, 'link schemes' were used by J.C. Penney's SEO consulting firm to raise product visibility in Google's search results. They seeded unrelated websites around the world with references to J.C. Penney products.

This tactic remained effective for a period until an investigation was conducted by the New York Times, and the findings were reported to Google. The practices were quickly identified as 'black hat,' and corrective action was taken (Segal 2011).

It is acknowledged that Google's 'organic search' algorithms comprise more than 250 factors (Google 2011f). However, it's essential to understand that search engine users are customers, and the focus should be on creating a positive user experience.

3.2 Web Directories

A web directory is defined as a platform where website links are categorized alphabetically or by classification and displayed to users. It was considered significant, with platforms like Yahoo Directory and DMOZ (Open Directory Project) being relied upon for quality links and reliable traffic (Aravind Shenoy Anirudh Prabhu, 2016).

The review and categorization of submitted sites are performed by human editors in web directories, in contrast to search engines, where automated algorithms are utilized.

As the number of websites has increased, web directories have declined in importance due to the efficiency of modern search engine algorithms in indexing and ranking content .

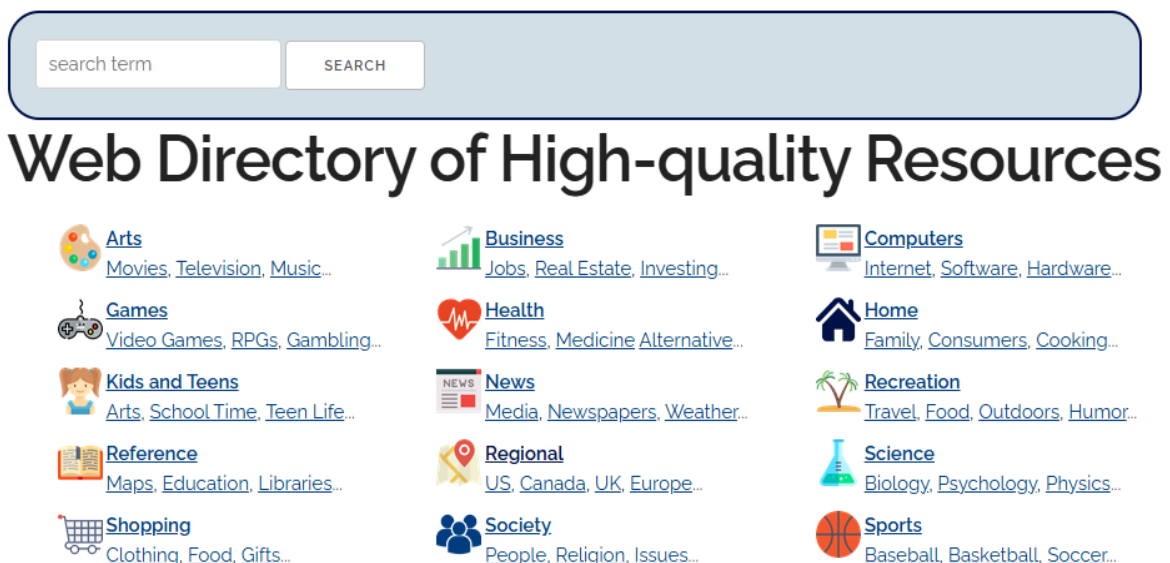


Figure 1: DMOZ (Open Directory Project), Source: Google

3.3 Search Engine

Search Engines are defined as software tools designed to retrieve the most relevant information based on users' search queries. Each search engine is operated using its proprietary software, yet all are designed to function similarly. Three tasks are performed: crawling, indexing, and ranking. The most popular search engines are Google, Yahoo!, and Bing, with Google being the most widely used by the majority of users.



Figure 2: Types of Search Engines, Source: Google

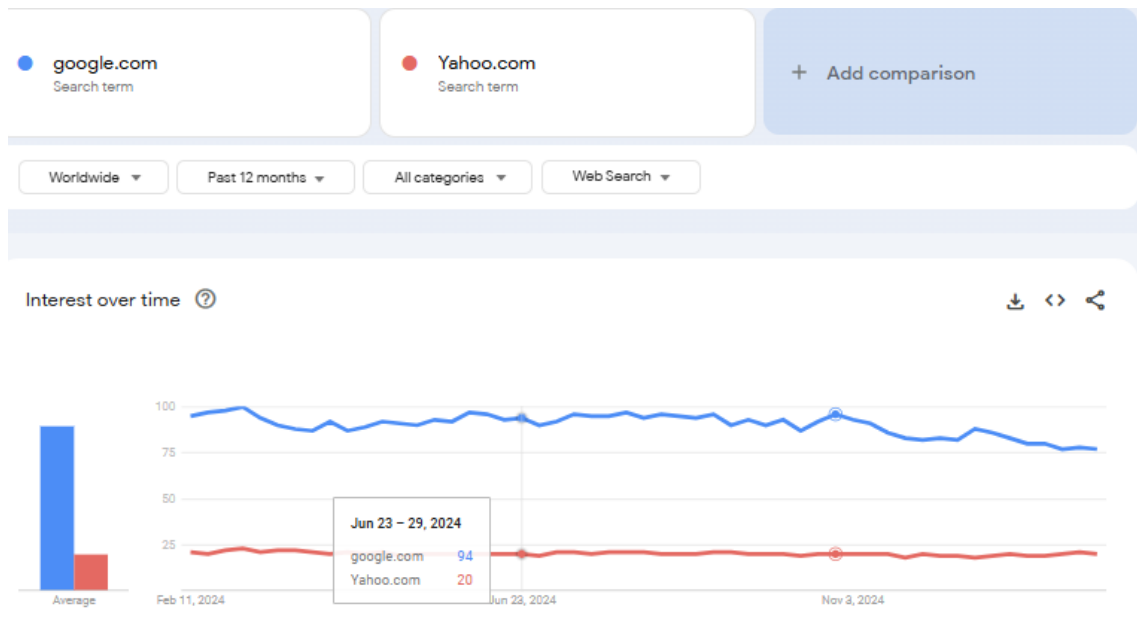


Figure 3: Types of Search Engines, Source: Google

3.3.1 Crawling

Web crawlers known as bots or spiders are automated programs that are used by Search Engines to scan the internet for links and visit websites based on a list of URLs (seeds) and follow hyperlinks to gather information (Aravind Shenoy Anirudh Prabhu, 2016).

Crawling is considered crucial because if a website cannot be crawled by Search Engines, it cannot be indexed and will not appear in search results. To improve crawl efficiency, attention should be given to optimizing sitemaps, which allow search engines to discover and understand the structure of a website. It is important that all internal links be made crawlable, and that a sitemap be included in the robots.txt file to ensure quick detection by search engines (Kenning Arlitsch and Patrick S. OBrien, 2013) .

Crawl budget is defined as the number of pages that can be crawled by a bot on a website within a given period. Crawl budget wastage may occur due to a misconfigured robots.txt file or excessive JavaScript usage.

Notable crawlers, such as Googlebot, BingBot, and Sphinx, are used for this process

Crawl traps are created when issues in a website's structure cause crawlers to encounter infinite loops, leading to duplicate content issues, inaccessible landing pages, and improper indexing. These problems are considered to impact the website's performance efforts and result in a lower (Kenning Arlitsch and Patrick S. OBrien, 2013).

instructions may be given to the crawler's parent system to terminate the loop. Additionally, the number of web pages being indexed can be estimated by administrators, and their SEO properties can be optimized to enhance performance.

Robots.txt is an important tool used for directing web crawlers, controlling which parts of a site may be crawled by search engines. It is a public file and may expose vulnerabilities if misused. Robots.txt files are interpreted differently by each search engine.

3.4 SEO

SEO is not regarded as a cost methodology; rather, it is utilized to generate traffic and enhance visibility in search engines. Google's guidelines are followed to ensure long-term success through organic and paid SEO (Aravind Shenoy and Anirudh Prabhu, 2016).

Organic SEO is focused on the optimization of web page content to improve its quality, which leads to higher visibility without the need for paid advertisements. However, immediate results and visibility are not ensured by this technique.

Paid SEO is focused on location-based searches, which are designed to assist businesses in appearing in search results when services or products are sought in specific locations. Paid campaigns are used to target any regions at preferred times (John Wiley & Sons, 2019).

Ads are displayed by search engines through a real-time auction process. Several factors are considered in the ad selection process, including bid amount, ad quality, and relevance. Ads and keywords with strong relevance to the search are rewarded, and ads that are closely aligned with the user's search query are prioritized by search engines.

The amount of money spent on advertising was huge Today, websites can be created and hosted at a low cost. The services of a digital marketing expert or a professional SEO organization can be utilized as a viable option (John Wiley & Sons 7th Edition, 2020) .

Insights into customer preferences, marketing trends, and other factors are provided by data to determine game-changing factors for businesses. For example, Google Analytics and Google Search Console is provided to understand key aspects and drawbacks related to a website's visibility.

Guidelines laid out by Google must be applied to ensure that appropriate tactics are followed by site owners when implementing SEO.

3.4.1 On-Page and Off-Page SEO Strategy

On-Page SEO (within the site) is focused on optimizing a site for better relevance and user experience. Full control is held over elements on the website to optimize various parts, with the aim of improving rankings. Key elements include: Headers, Meta descriptions, Title tags, Page speed, Keyword usage, Site accessibility, short and descriptive URLs are used to prevent keyword stuffing, and website loading speeds are optimized for user-friendly design.

Schema Markup is a type of structured data code that is added to a website's HTML. It enables search engines to scan headings, thereby improving user experience. The page structure should be made logical for both users and search engines. Headings with visual

styling via CSS are recommended, as search engines are assisted in quickly scanning headings, thereby enhancing user experience and improving accessibility.

Meta keywords and descriptions are not considered ranking factors by Google. However, they are cached and are recommended for adherence as a best practice. They are recommended to be kept between 155 and 170 characters, as they are used to provide a preview of the content or information on a page (Aravind Shenoy and Anirudh Prabhu, 2016).

Meaningful content is regarded as the most important factor in content creation. Content should be aligned with the page's purpose and user intent, with high quality that avoids keyword stuffing and reduces bounce rates. Duplicate content is to be avoided, and grammatical errors are to be eliminated. Keywords or close variations are to be used logically and placed two or three times on a page. Content is recommended to be updated at least every six months as a best practice.

SEO has changed significantly, with the transition from reliance on text-based content to the incorporation of interactive media such as audio, video, and images in formats like PNG or JPEG. These formats are preferred due to their visual properties, with file sizes minimized as much as possible without affecting quality. Videos and images are recognized as important factors in increasing user engagement on a site (Nicholas Papagiannis, 2020).

Bounce rate is understood is defined as a metric that reflects the number of users who visit a web page and then leave. Higher bounce rates are attributed to low-quality content and are regarded as factors that negatively affect the site's visibility.



Figure 6: On-Page SEO factors, Source: our Quick-Start Guide to Effective SEO Practices Book

Off-Page SEO Is focused on activities outside a website focusing on such building trust through backlinks and external signals.

Social media is defined as a factor that enhances networking. Facebook, LinkedIn, and Twitter are utilized to expand business visibility. Websites are shared and promoted by users, which is believed to indirectly influence rankings, and publishing content on external blogs to build backlinks can drive traffic to a site too (Peter Kent,2020).

Outreach is conducted with influencers to obtain backlinks, and blogging is utilized to enhance visibility. Although some SEO experts doubt the reliability of content from Wikipedia, linking specific terms to wiki sites is believed to enhance the SEO process (LEE ODDEN, 2012).

User reviews and feedback are utilized to build trust with potential customers. Through such evaluations, insights into the advantages and disadvantages of products or services are obtained.

On-Page SEO is prioritized before Off-Page SEO is implemented. User intent and user experience should be concentrated on, as SEO is increasingly tending toward that paradigm.

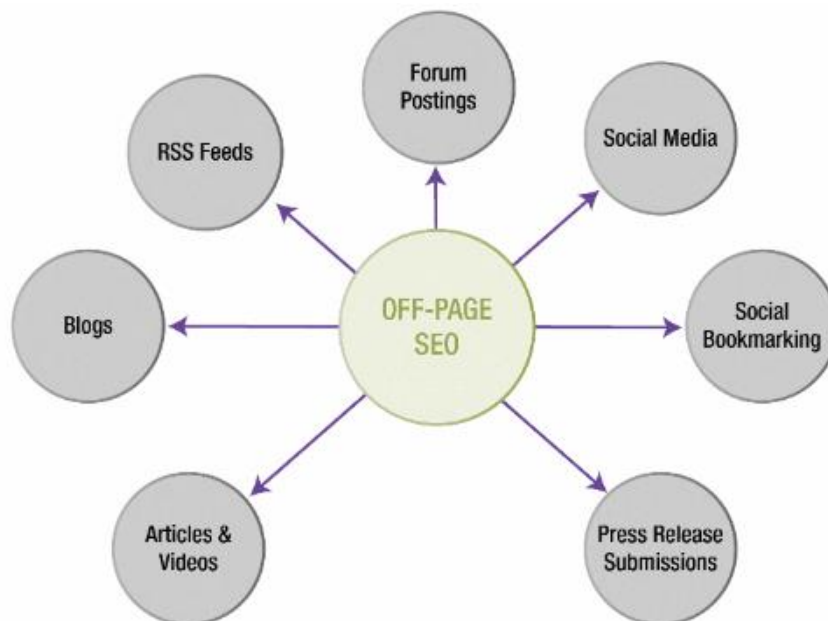


Figure 7: Off-Page SEO factors, Source: our Quick-Start Guide to Effective SEO Practices Book

3.4.2 User Experience and User Interface

A clear hierarchy of categories and subcategories is recommended to improve accessibility so that pages can be crawled and indexed more efficiently by search engines.

The enhancement of user experience is recommended through the use of tools such as Hotjar, Google Analytics, and Microsoft Clarity, which are utilized for the analysis of user interactions with the website.

Several methods are suggested to improve page-load speed, including the minification of CSS, JavaScript, and other files, the reduction of HTTP requests, the use of an efficient server configuration with good bandwidth, the archiving of redundant data in the database, the removal of unnecessary files and spam, the limitation of plug-ins and third-party utilities, and adaptation of data and images based on screen size. These improvements are recognized as contributing to an enhanced user experience (Aravind Shenoy and Anirudh Prabhu, 2016).

The key to the enhancement of website performance is identified as achieving the right balance among speed, design, and user needs.

3.5 Link Building and Backlinks

Link building is a methodology that results in getting external pages of another site to point to your website. It is recognized as one way to improve organic rankings thereby enhancing a site's visibility and authority.

There are two types of links: outbound links and internal links. Internal links are considered a key feature of SEO. These are links on web pages that are used to point to another page within the same site or domain. It is suggested by SEO-related research that no page on a website should be more than three clicks away from the home page, ensuring that all pages are easily accessible (Aravind Shenoy and Anirudh Prabhu, 2016).

Competitor-based research is considered essential for effective link building .The backlinks are received by your competitors can be analysed to identify potential audience groups and user groups.

Studies showed that it is suggested that a new website receiving backlinks from an authoritative site is more likely to be visible and to rank earlier in the SERPs compared to sites receiving links from less reputable sources. In addition, being linked to malware-infested sites may result in a site being delisted from the SERPs (Véronique Duong, 2019).

The age of a domain name with a long history is considered more likely to have authority than newer ones. Link building is influenced by the reliability and popularity of external websites pointing toward a site.

Outbound links are used to point to another domain or site. Instead of time being spent explaining supplementary information on the page, these links direct users to external resources.

Key resources for optimizing link-building strategies are considered to include requesting backlinks from relevant websites, building relationships, contributing and publishing content to trustworthy websites, and participating in community discussions to earn backlinks. Learning videos are recommended to be provided, and RSS feeds are suggested to be used for distributing content and gaining backlinks. Guest blogging is recognized as another strategy to gain backlinks by contributing relevant content to authoritative domains (Aravind Shenoy and Anirudh Prabhu, 2016).

There are some tools that can be used to enhance link building campaigns like Rmoov, SEOquake, MozBar, Ahrefs and Majestic SEO tools provide a mix of analytics, automation, and management features to enhance link-building.

Internal and external links should be monitored, and tools such as Google Search Console should be used to identify broken links (404 errors). Harmful backlinks, such as link farms or irrelevant ones, are known to harm credibility and result in penalties. Therefore, maintaining a clean backlinks profile is considered essential to avoid penalties (Véronique Duong, 2019).

3.6 Keyword Research

Keywords are defined as search terms used to find information online. Despite changes in Google's algorithms, the importance of keywords for ranking is still recognized. No definitive list of the right keywords exists, as keyword research is considered an ongoing process.

Types of Keywords:

Head keywords are usually composed of one or two words and are known to cover a massive, generic range. Head keywords are used in various topics and are super competitive but are not effective for optimizing conversions.

Body keywords are typically limited to two or three words.

Long-Tail Keywords are defined as highly specific search terms that typically consist of four or more words.

Generate Keywords are identified as sophisticated and expensive process. Tools are used to identify high and low competition keyword terms and phrases to gain an idea of the level of effort that are required to rank well in SERPs.

It is suggested by studies that keywords appearing in the initial portion of the content are mapped by search engines more frequently than those appearing later on the webpage.

New websites with low domain authority are started by targeting low keywords competition as it was presented between 25 percent and 30 percent. However, relying on single keywords is considered ineffective in which the majority of traffic is generated from longer, more specific search queries (Kenning Arlitsch and Patrick S. Obrien).

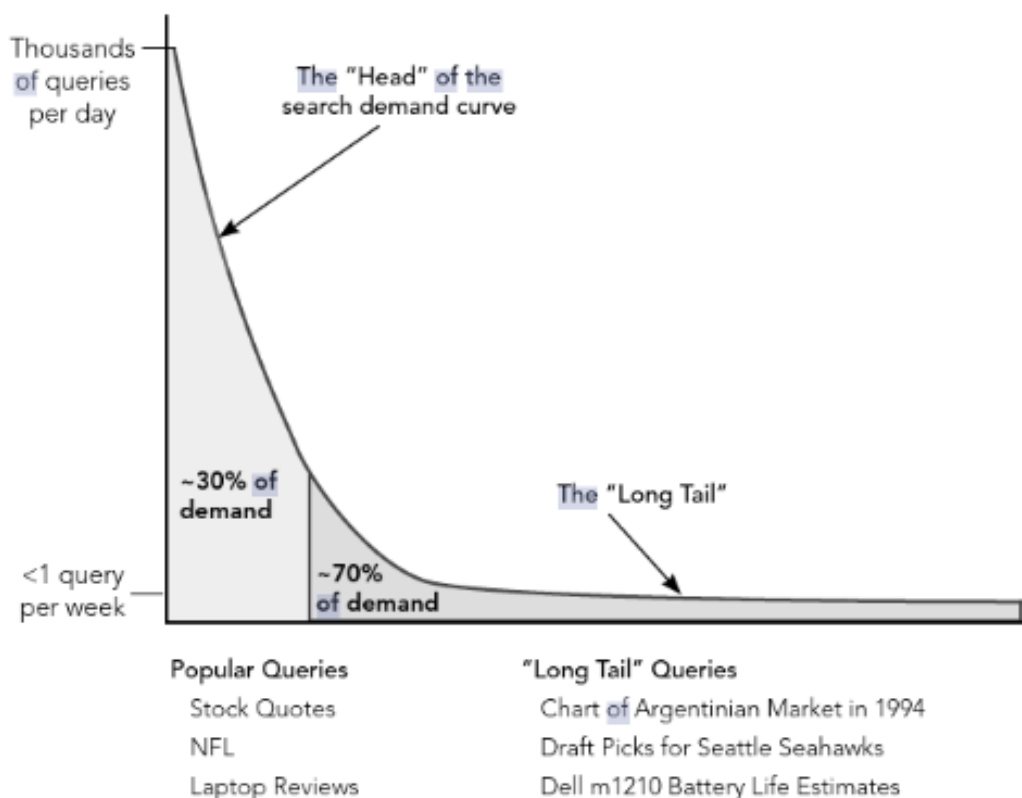


Figure 8: Search Engines Keywords demand, Source: Improving the Visibility and Use of Digital Repositories through SEO Book

3.7 Black-hat and White-hat SEO

Black-hat is defined as deceptive and underhand techniques used to scale up to higher rankings in search results.

White Hat SEO is identified as the ethical approach and preferred method for sustainable success. It is focused on the use of optimal, organic tactics so that higher rankings in search

results can be achieved, the guidelines provided by search engines is required, and compliance with the rules is maintained.

The guidelines and suggestions posted by search engines on various 'webmaster tools' sites (Google 2010; Bing 2009) are adhered to by white-hat techniques.

Factors such as quality link building, user-engaging content, and optimal performance are some of the white-hat SEO strategies used by SEO consultants to streamline accessibility and visibility in search rankings.

Black Hat SEO techniques are designed to manipulate search engine algorithms to gain higher rankings through unethical methods by often violating search engine guidelines

Tactics such as Keyword stuffing, cloaking, Doorway pages and link farms are penalized leading to significant drops in rankings or even be de-indexed, the drop can be temporary losing a large portion of its organic traffic resulting in a loss of visibility and revenue or sites can be completely removed from the search engine index, making them nearly impossible to find via organic search (Aravind Shenoy and Anirudh Prabhu, 2016).

In short, the focus on user intent is prioritized instead of attempting to fool the search engines.

3.8 The Role of User Centric-Content

A shift from keyword-focused content creation to a strategy centred on solving real user problems and offering actionable solutions is encouraged, with an emphasis placed on creating valuable content.

Relevant content is considered crucial role in SEO strategy. The focus on focus on user intent and user satisfaction is placed on rather than solely on search engine rankings. Informative and engaging content is encouraged to retain users to check out the site regularly (Kenning Arlitsch and Patrick S. OBrien).

Fresh and high-quality content is preferred by search engines, while copied or low-quality material is penalized.

3.9 The importance of Content Marketing

Content marketing is defined as the process where content is created, distributed, shared, and published to reach target audiences and increase brand awareness. Examples include blogs, social media (Véronique Duong, 2019).

Effective search, social media, and content marketing require meaningful connections with customers, which are established by understanding their needs and interests. Instead of focusing solely on keyword optimization, an emphasis should be placed on addressing customer needs, behaviours, and preferences.

Hub-and-Spoke model is identified as a content marketing strategy designed to enhance SEO rankings and increase audience engagement. In this model, the Hub represents the primary service, while Spokes extend from it (LEE ODDEN, 2012).

3.10 Unethical SEO Practices

Invisible text on a web page is generally considered taboo since it presents information to search engines differently than to visitors” and it can “cause your site to be perceived as untrustworthy (Stamoulis 2010). There are several ways to hide text, including using white text on a white background or setting the font size to zero, but these methods are unacceptable because they’re viewed as trying to trick the search engine and its users.

Click-Through Rate: This tactic is used to increase the number of clicks on a website in search results

Keyword Stuffing: A webpage is overloaded with an excessive number of keywords in an unnatural way. The user experience is disrupted and makes the content irrelevant.

Link farming: Links are exchanged between sites to boost rankings and manipulate search engines.

Doorway pages are used to gain high rankings in search results in a deceitful manner. These pages contain keywords and phrases that are picked up by search-engine bots and crawlers. Once accessed, users are redirected to the actual page that site owners intend for them to visit.

Cloaking: a mechanism that is to make a page visible to search engines but not to website users.

Buying Links: Backlinks are purchased to manipulate rankings, which violates Google's guidelines and can result in penalties.

This short-sighted technique can prove detrimental in the long run. Google has announced penalties for using doorways, deceptive redirects, and cloaking.

4 Importance of SEO Analytics

Analytics is are considered the backbone of your SEO. It consists of two main components: tracking and measurement/analysis. Tracking ensures that all critical metrics are properly recorded, while measurement is used to interpret the data to guide strategy.

Strong data analytics and experts are critical to the organic and free traffic process. Game-changing factors for businesses can be determined through detailed analytics. Website optimization is achieved by analysing collected data to make informed decisions and reach goals with fewer resources in less time. Strong analytics are considered a fundamental driver of organic traffic growth (Kenning Arlitsch and Patrick S. Obrien, 2013).

The segmentation of meaningful data for its intended audience is considered the key value of analytics reporting for example Segmenting visitors based on their source (e.g., organic search, paid search, or social media) allows for an understanding of which channels drive the most conversions. Breaking down regions into cities enables content to be tailored and local advertising to be used for specific audiences.

4.1 Tools for Tracking SEO Metrics

Web analytics tools are used to collect statistics about visits to a site, how many visitors, where they are from, how often they visit, how long they stay, what operating systems, browsers, mobile devices they use, Addressing crawler errors can improve the indexing ratio and increase site traffic (Aravind Shenoy Anirudh Prabhu, 2016) .

Google Analytics is used as a free tool for tracking website traffic and analysing user behaviour.

Google Search Console is used as a free utility for analysing a website's indexing and for managing and monitoring its Google Search ranking.

Ahrefs is used for keyword tracking, backlink analysis, and competitor research.

SEMrush is recognized as an advanced tool designed for tracking organic keyword growth and improving SEO efforts.

Screaming Frog Spider is used to check for non-indexable pages and diagnose technical SEO issues.

Ahrefs is also utilized as a comprehensive tool for keyword research, site audits,

backlink analysis, and competitor tracking.

4.2 Tracking and Measuring SEO Performance

SEO is considered a long-term process that requires consistency and adaptability for better search engine rankings and visibility. To accurately measure the impact of different SEO approaches key performance SEO indicators (KPIs) such as Search Engine Rankings, conversion rate, Penalty & De-indexing Risks, Bounce Rate, website mobile-friendliness, website load speed, and quality of inbound links to ensure sustainable revenue growth by digital marketing strategy (Nicholas Papagiannis,2020).

SEO metrics are defined as indicators that provide data-driven insights into website performance. Multiple metrics should be tracked to measure to gives a comprehensive view of website potential weaknesses in SEO campaigns and progress toward achieving long-term success.

Adjustments and optimizations in marketing are implemented to ensure compliance with Google's Google algorithm updates which can severely impact your websites and content performance , Free traffic may also be compromised by these updates, leading to a decrease in the overall return on investment (ROI) of web assets (Peter Kent, 2020).

Experienced SEO, Marketing Team are considered crucial in adapting strategies, ensure compliance with Google's Google algorithm updates and to transform negative ROI into positive ROI.

Highly searched topics with medium competition are generally considered good bets for the better ROI with Staying ahead on the curve is considered critically important for brands by ensuring high-quality content , products that generate strong profits and provide value to customers with an excellent user experience are consistently offered.

5 Methodological Framework

To effectively analyze the short-term benefits versus long-term consequences of black hat and white hat SEO tactics, a structured methodological framework is essential. The approach adopted ensures a comprehensive, data-driven comparison that highlights the differences in effectiveness, sustainability, and ethical considerations.

5.1 Comparative Case Studies

The Comparative Case Study approach is utilized to directly evaluate websites employing black hat SEO tactics versus those adhering to white hat SEO practices. This method facilitates a side-by-side analysis of websites using contrasting SEO strategies, providing both quantitative and qualitative assessments of their performance over time. Through this approach, the study explores short-term gains, long-term risks, and the ethical implications associated with each SEO method, along with potential penalties imposed by search engines.

5.2 Selection of Websites

A meaningful comparison requires careful selection of websites, categorized based on their SEO practices. The classification distinctly separates websites that rely on black hat tactics from those that follow ethical white hat strategies. To ensure fairness and reliability, the selection process is guided by the following criteria:

- **Industry and Niche:** Ensuring the selected websites belong to similar industries with comparable competition levels.
- **SEO Strategy:** Identifying websites predominantly utilizing either black hat or white hat SEO techniques.
- **Traffic & Performance Metrics:** Selecting websites with comparable initial performance levels to maintain an unbiased analysis.

5.2.1 Websites Using Black Hat SEO Tactics

Websites employing black hat SEO techniques engage in unethical methods to manipulate search engine rankings. These tactics violate Google's Webmaster Guidelines and risk

severe penalties, including de-indexing. The following characteristics help identify such websites:

1. Keyword Stuffing

Websites using keyword stuffing excessively incorporate repetitive or irrelevant keywords in an attempt to manipulate rankings. For example, a webpage might unnaturally repeat phrases such as “best cheap laptops” within its content or meta descriptions.

2. Spammy Backlinks

Unnatural spikes in backlinks from irrelevant or low-quality sources, such as directories and link farms, are a hallmark of black hat SEO. An example would be a website suddenly gaining thousands of links from unrelated, foreign-language domains.

3. Cloaking

Cloaking involves displaying different content to users and search engines to deceive ranking algorithms. A common example is a website that appears to provide informative content to search engines but redirects users to a sales page.

4. Hidden Text & Links

Some websites use invisible or small-sized text stuffed with keywords to influence rankings. A typical example includes a webpage with white text on a white background containing keyword-rich phrases.

5. Private Blog Networks (PBNs)

PBNs consist of a network of websites owned by the same entity, created solely to pass link equity and artificially boost rankings. For instance, a network of unrelated blogs linking back to a central money site falls under this category.

6. Automated Content & Spinning

Black hat SEO often involves generating low-quality, AI-generated, or rewritten content to deceive search engines. Such articles tend to be barely readable due to excessive use of synonyms and poor sentence structure.

5.2.2 Sources & Tools to Identify Black Hat SEO Practices

To detect black hat techniques, various professional SEO tools are employed to analyze backlink profiles, keyword usage, and penalties.

1. Ahrefs & SEMrush

These tools help in identifying unnatural backlink patterns, such as high volumes of backlinks from spammy sources or excessive links with identical anchor text. Additionally, they allow the review of organic traffic trends, where sudden traffic drops may indicate penalties.

2. Google Search Console

Google Search Console is useful for reviewing manual actions and penalties issued by Google for manipulative tactics. It also aids in analyzing indexing issues, which may reveal cloaked or duplicate content pages.

3. Google Transparency Reports & Penalty Case Studies

Historical case studies provide insights into major black hat penalties. Notable examples include:

- **J.C. Penney (2011):** Penalized for purchasing thousands of backlinks.
- **BMW Germany (2006):** De-indexed for using doorway pages.
- **Forbes (2011):** Penalized for selling links.

4. Wayback Machine (Archive.org)

The Wayback Machine is instrumental in checking past versions of a website to detect abrupt changes in SEO strategies, helping to trace the evolution of black hat tactics.

By employing this structured methodological framework, the study ensures a comprehensive, evidence-based evaluation of black hat and white hat SEO tactics, leading to a well-supported analysis of their short-term benefits and long-term consequences.

5.2.3 Websites Using White Hat SEO Tactics

Websites that prioritize white hat SEO techniques focus on ethical, sustainable, and search engine-approved strategies to achieve long-term success. These websites typically exhibit the following characteristics:

- **High-Quality, User-Centric Content:** Regularly publish original, valuable, and engaging content that addresses user intent and provides solutions.
- **Natural Link-Building:** Earn backlinks organically from reputable and authoritative websites instead of engaging in link schemes.
- **Proper Keyword Research & Optimization:** Implement well-researched and naturally integrated keywords, ensuring relevance without keyword stuffing.
- **Adherence to Search Engine Guidelines:** Comply with Google's Webmaster Guidelines and avoid manipulative practices.
- **Enhanced User Experience (UX):** Feature clean navigation, fast load times, and mobile-friendly designs to improve accessibility and usability.

Examples of White Hat Tactics

White hat SEO websites employ a variety of ethical and search engine-approved practices, including:

- **Publishing Original & Relevant Content:** Creating in-depth articles, using rich media, and updating content regularly.
- **Earning Organic Backlinks:** Gaining editorial links from trusted sources, producing link-worthy content, and engaging in guest blogging.
- **Mobile-Friendly & Well-Structured Websites:** Ensuring responsive design, structured navigation, and implementing schema markup for better indexing.

5.2.4 Sources to Identify White Hat SEO Websites

To determine which websites follow white hat SEO practices, the following tools and metrics are used:

- **Google's Quality Guidelines:** Analyzing adherence to Google's E-E-A-T principles.

- **Moz & Ahrefs Authority Scores:** Examining domain authority and backlink profiles.
- **SEO Audit Reports:** Reviewing organic traffic growth, penalties, and SEO health scores.

Websites that follow white hat SEO strategies achieve long-term ranking stability, credibility, and user trust while avoiding penalties and de-indexing. Their emphasis on content quality, user experience, and compliance with search engine guidelines ensures sustainable success.

5.3 Key Takeaways from Black Hat SEO Failures

Black Hat SEO techniques may provide short-term gains, but they come with significant risks and long-term consequences. While these manipulative strategies can temporarily boost search rankings, search engines like Google are constantly updating their algorithms to detect and penalize such practices. Eventually, websites that rely on Black Hat SEO tactics face severe repercussions.

One of the most critical risks associated with Black Hat SEO is the potential for severe Google penalties. Even well-established brands like BMW, eBay, and JC Penney have experienced major setbacks due to violations of Google’s guidelines. These penalties can lead to sudden drops in rankings, loss of organic traffic, and ultimately, reduced revenue. Once a site is penalized, regaining lost trust and search visibility becomes a challenging process.

Rebuilding credibility after a manual penalty or an algorithmic downgrade requires significant time and financial investment. Recovering from such setbacks often involves months or even years of dedicated effort, including cleaning up bad backlinks, improving content quality, and adhering to best SEO practices. The damage to a site’s reputation can be long-lasting, making it essential to focus on ethical strategies from the start.

To achieve sustainable and long-term SEO success, businesses must prioritize White Hat SEO techniques. Ethical, user-focused approaches—such as creating high-quality content, earning natural backlinks, and ensuring mobile-friendly website optimization—align with search engine guidelines and contribute to stable, long-term rankings. By investing in White

Hat SEO, websites can build a strong digital presence while avoiding the risks associated with deceptive tactics.

Practical Part

5.4 Framework of Analysis:

In this research study, I will explore the impact of white hat and black hat SEO strategies within the retail and technology industries by examining companies that have adhered to ethical SEO practices and contrasting them with competitors that have faced consequences due to unethical SEO tactics. The study will focus on Amazon and J.C. Penney in the retail industry and Moz and Overstock.com in the technology industry.

White Hat SEO in the Retail Industry: Amazon

Amazon, a global leader in e-commerce, exemplifies the successful implementation of white hat SEO strategies. The company prioritizes high-quality content by providing detailed product descriptions, specifications, customer reviews, and high-resolution images, ensuring valuable and comprehensive information for users. Amazon's user experience is enhanced through intuitive website navigation, personalized recommendations, and a seamless checkout process. Furthermore, Amazon ensures mobile optimization with a responsive website and a dedicated mobile app to cater to users across different devices. Additionally, the company employs natural link-building strategies by earning organic backlinks through valuable content, such as user reviews and product listings, which are frequently referenced by other websites.

The outcome of these white hat SEO practices is evident in Amazon's consistently high search engine rankings, substantial organic traffic, and a strong reputation among users and

search engines. The company's commitment to ethical SEO strategies reinforces its market dominance and long-term success.

Black Hat SEO in the Retail Industry: J.C. Penney

J.C. Penney, a competitor in the retail industry, serves as an example of the consequences of black hat SEO strategies. The company was found to have engaged in paid link schemes, acquiring over 2,000 backlinks from unrelated websites, including those focused on cars and casinos, in an attempt to manipulate search rankings.

Upon discovery, Google penalized J.C. Penney by drastically reducing its rankings by approximately seventy positions. This penalty resulted in a significant loss of organic traffic and served as a warning against the use of black hat SEO tactics. The case highlights the risks associated with unethical SEO practices, demonstrating that short-term gains achieved through manipulation can lead to long-term reputational and financial damage.

Major SEO Wins and Pitfalls in Retail Industry

The retail industry provides a clear contrast between ethical and unethical SEO strategies. Amazon's adherence to white hat SEO practices has contributed to its sustainable success and positive user engagement, while J.C. Penney's black hat tactics led to severe penalties and long-term reputational harm. By focusing on ethical SEO practices, businesses can maintain lasting visibility, credibility, and sustained growth in search engine results.

White Hat SEO in the Technology Industry: Moz

Moz, a leading company in the SEO software and analytics sector, exemplifies white hat SEO through its commitment to high-quality content and transparency. The company is renowned for its comprehensive guides, blog posts, and educational resources that provide valuable insights into SEO best practices. Moz ensures a positive user experience through a clean and intuitive interface that allows users to easily access information.

Moz also engages in natural link building by producing authoritative content, which attracts backlinks from reputable sources within the industry. Furthermore, the company emphasizes transparency by openly sharing its methodologies and data, building trust with its audience and adhering to ethical SEO practices.

As a result of these strategies, Moz has established itself as a trusted authority in the SEO community. The company consistently achieves high search engine rankings and maintains a loyal user base, demonstrating the effectiveness of ethical SEO tactics.

Black Hat SEO in the Technology Industry: Overstock.com

Overstock.com, an e-commerce company, faced consequences for engaging in unethical link-building practices. The company was found to have manipulated its SEO by acquiring low-quality backlinks in an attempt to improve its search rankings.

As a consequence of these black hat SEO tactics, Overstock.com was penalized by Google, leading to a significant drop in search engine rankings. This penalty resulted in decreased organic traffic and revenue, showcasing the detrimental effects of unethical SEO practices.

Major SEO Wins and Pitfalls in Tech:

The technology and e-commerce industries further illustrate the importance of ethical SEO strategies. Moz's white hat SEO practices have resulted in sustainable success and a strong online presence, while Overstock.com's black hat tactics led to penalties, loss of rankings, and reputational damage. Businesses that focus on ethical SEO strategies can achieve lasting visibility, credibility, and a competitive advantage in search engine results.

This study highlights the importance of adhering to ethical SEO practices in both the retail and technology industries. The cases of Amazon and Moz demonstrate that businesses employing white hat SEO can achieve long-term success, whereas companies like J.C. Penney and Overstock.com that engage in black hat SEO suffer severe consequences. By focusing on high-quality content, user experience, mobile optimization, natural link building, and transparency, companies can build sustainable online authority and maintain strong search engine rankings.

In this research study, I will explore the impact of white hat and black hat SEO strategies within the retail and technology industries by examining companies that have adhered to ethical SEO practices and contrasting them with competitors that have faced consequences due to unethical SEO tactics. The study will focus on Amazon and J.C. Penney in the retail industry and Moz and Overstock.com in the technology industry.

5.5 Model for Statistical Analysis of SEO Performance

1. Research Objectives

This study aims to:

- Compare organic visibility, traffic trends, and ranking stability of Moz vs. Overstock.
- Assess the impact of black hat vs. white hat SEO strategies over time.
- Measure the long-term sustainability of ethical SEO practices compared to manipulative techniques.

2. Data Collection & Sources

To compare the two websites, data will be collected from various SEO tools, including:

- Ahrefs, SEMrush, Moz, Google Search Console, Google Analytics
- Wayback Machine (to analyze historical changes)

To accurately measure the impact of different SEO approaches, the following **key performance indicators (KPIs)** will be tracked:

- **Search Engine Rankings:** Monitoring the fluctuation of rankings in search engine result pages (SERPs).
- **Organic Traffic Growth:** Analyzing changes in visitor numbers over time.
- **Bounce Rate & Engagement Metrics:** Understanding how user behavior is affected by SEO strategies.
- **Conversion Rates:** Measuring the effectiveness of SEO in driving sales or lead generation.
- **Penalty & De-indexing Risks:** Tracking instances where websites receive search engine penalties or get de-indexed.

3. Key Metrics to Compare

Table 1: Key Metrics to Compare

Category	Metric	Data Source
Organic Traffic	Monthly Organic Visits	Google Analytics, Ahrefs
Keyword Rankings	# of Keywords in Top 10 Positions	Ahrefs, SEMrush
Domain Authority	DA/DR Score	Moz, Ahrefs
Backlink Profile	# of Referring Domains & Backlinks	Ahrefs, Moz
Spam Score	Spam Score %	Moz, Ahrefs
Bounce Rate	% of Visitors Leaving Without Interaction	Google Analytics
Page Load Speed	Site Speed in Seconds	Google Page Speed Insights
Mobile Usability	Mobile-Friendliness Score	Google Mobile-Friendly Test
Penalty History	Google Manual & Algorithmic Penalties	Google Search Console

Source: Google, Ahrefs, SEMrush, Moz, Google Search Console

6 Statistical Analysis

This study involves a comparative research design analysing case studies of websites using black hat and white hat SEO tactics, the statistical analysis should effectively compare changes in metrics such as search ranking, traffic, and penalties over time.

The data for this study is gathered from multiple reliable SEO tools and industry reports to ensure accuracy and relevance. SEO Tactic classification (White Hat vs. Black Hat) is derived from documented case studies, SEO blogs (e.g., Moz, Search Engine Journal), and Google Search Console's Manual Actions report, which identifies websites penalized for manipulative practices. Search Ranking data is obtained using tools like SEMrush, Ahrefs, and Moz, which track keyword rankings and average search positions over time. Traffic metrics are sourced from platforms like Google Analytics, SimilarWeb, and Ahrefs, which estimate monthly visitors based on organic and paid search data. Finally, Penalty data is collected from Google Search Console, which records manual actions taken against websites, as well as industry news articles that report Google penalties imposed after major algorithm updates (e.g., Penguin, Panda). By consolidating data from these sources, the study ensures a comprehensive and data-driven approach to analysing the impact of SEO tactics on search performance.

This study is conducted over a 6-month period to track the long-term impact of SEO tactics on search rankings, website traffic, and penalties. By analysing data month by month, the study captures trends and fluctuations in rankings and traffic, allowing for a deeper understanding of how Black Hat vs. White Hat SEO strategies influence website performance over time. This extended timeframe ensures that both short-term gains and long-term declines are observed, providing a comprehensive evaluation of SEO effectiveness.

This study systematically analyses the impact of Black Hat vs. White Hat SEO tactics on search rankings, traffic, and penalties over a 6-month period, while also addressing the ethical concerns associated with different SEO strategies. By comparing the effectiveness and long-term consequences of these tactics, we aim to highlight both the technical and ethical implications of SEO practices in digital marketing.

6.1 Research Methodology and Approach

We will begin with descriptive statistics to summarize key metrics such as mean, median, and standard deviation of search ranking, traffic, and penalties for both SEO tactics. Additionally, we will use line graphs and bar charts to visualize trends over time. Following this, we will conduct inferential statistical tests to compare Black Hat and White Hat SEO websites. If our data is normally distributed, we will use an Independent Samples t-test to compare mean differences in search rankings and traffic. If the data is not normally distributed, the Mann-Whitney U test will be used instead.

To analyse trends over time, we will employ Repeated Measures ANOVA to assess whether SEO practices significantly impact rankings and traffic over multiple months. Additionally, regression analysis will be performed to measure how backlink quality, keyword stuffing, and penalties influence search rankings over time. To evaluate relationships between SEO tactics and penalties, we will conduct correlation analysis using Pearson's correlation (if normal data) or Spearman's correlation (if non-normal data). Lastly, since penalties are categorical, we will perform a Chi-Square test to determine if Black Hat SEO websites are significantly more likely to be penalized than White Hat SEO websites.

A key aspect of this research is the ethical dimension of SEO practices. While White Hat SEO follows search engine guidelines, ensuring long-term credibility and user trust, Black Hat SEO employs manipulative techniques that often violate ethical norms and risk penalties. By analysing search engine penalties, user engagement trends, and long-term performance stability, we will evaluate the extent to which unethical SEO strategies lead to reputational damage and financial losses. Furthermore, by conducting logistic regression analysis, we will predict the likelihood of penalties associated with Black Hat SEO, reinforcing the ethical risks involved in deceptive optimization practices.

By integrating descriptive statistics, group comparisons, time-series analysis, correlation tests, and regression models, this research will provide a comprehensive and ethical perspective on how SEO strategies influence search performance over time. Our comparative analysis will emphasize why ethical SEO practices are not only beneficial for long-term growth but also necessary for maintaining digital integrity and search engine compliance.

For Statistical Analysis based on comparative research framework, we need to consider:

1. The key variables (search ranking, traffic, penalties).
2. The research questions/hypotheses (differences between black hat and white hat SEO tactics).
3. The statistical tests that best analyse these comparisons.

The table below shows the key variables of our analysis

Table 2: key variables of our analysis

Variable	Type	Description
SEO Tactic	Categorical (Black Hat / White Hat)	Independent Variable (IV)
Search Ranking	Continuous (numeric rank)	Dependent Variable (DV)
Website Traffic	Continuous (number of visitors)	Dependent Variable (DV)
Penalty (Yes/No)	Categorical (1 = Yes, 0 = No)	Dependent Variable (DV)
Time Period (weeks/months)	Continuous or Categorical	Used for trend analysis

Source: Author's own 2025

To conduct an analysis on SEO tactics and their impact on Search Ranking, Traffic, and Penalties we gathered data from SEO Tools like Ahrefs, SEMrush, Moz to Analyse a website's backlink profile, keyword stuffing, and spam score and SEO Case Studies. For SEO Tactic data is categorize as follows: (Categorical: Black Hat = 1, White Hat = 0)

Website	SEO Tactic	Category
Amazon	White Hat	0
Moz	White Hat	0
J.C.penny	Black Hat	1
Overstock	Black Hat	1

For Search Ranking (Google Position in Search Results) data is taken from SEMrush, Ahrefs , Moz to track website rankings over time. Also SERP Tracking Tools like SERPWatcher and Rank Ranger provide historical ranking data. For Search Ranking data is Categorise as follows:

Website	Search Ranking (Avg Position)
Amazon	10
Moz	41.8K
J.C.Penny	290.1K
Overstock	120.8K

For Traffic (Number of Visitors) data is taken from SEMrush, Ahrefs , Moz to Estimate website traffic. For traffic data is Categorise as follows as (Monthly Visitors is a Continuous Variable)

Website	Traffic (Visitors per Month)
Amazon	440.7M
Moz	953.5K
J.C.Penny	3.1M
Overstock	534.8K

For Penalty (1 = Yes, 0 = No) data is taken from Google Search Console (Manual Actions Report) that Lists penalties. SEO News & Blogs (e.g., Search Engine Land, Moz Blog) that Reports on penalty cases. Algorithm Update Impact Studies: Websites affected by Panda, Penguin, etc.

For penalty data is Binary: 1 = Penalized, 0 = Not Penalized

Website	Penalty (1=Yes, 0=No)
Amazon	0
Moz	0
J.C.Penny	1
Overstock	1

The research questions or hypothesis is formulated as follows to understand **Ethical Issues in SEO**.

H1: Black hat SEO websites experience greater penalties than white hat SEO websites.

H2: Black hat SEO websites show short term ranking gains but experience greater longterm ranking declines.

H3: White hat SEO websites sustain higher traffic over time compared to black hat SEO websites.

H4: There is a significant negative correlation between black hat SEO usage and longterm search rankings.

H5: Black hat SEO tactics significantly increase the likelihood of penalties.

6.2 Hypothesis Testing and Analysis Approach:

To investigate the ethical implications of SEO tactics, this study tests several hypotheses that compare the effectiveness, risks, and long-term impact of Black Hat vs. White Hat SEO strategies. First, we test H1: Black Hat SEO websites experience greater penalties than White Hat SEO websites, using a Chi-Square Test to determine whether Black Hat tactics have a statistically significant association with penalties. Next, we analyse H2: Black Hat SEO websites show short-term ranking gains but experience greater long-term ranking declines, using the Mann-Whitney U Test (if data is not normally distributed) or an Independent Samples t-test (if normally distributed) to compare rankings over time. To assess long-term trends, we also apply Repeated Measures ANOVA to examine fluctuations in rankings over multiple months.

For H3: White Hat SEO websites sustain higher traffic over time compared to Black Hat SEO websites, we use the Mann-Whitney U Test to compare median traffic changes between the two groups. Next, H4: There is a significant negative correlation between Black Hat SEO usage and long-term search rankings is tested using Spearman's Rank Correlation (if data is non-normal) or Pearson's Correlation (if normal) to measure the relationship between unethical SEO practices and ranking declines. Lastly, H5: Black Hat SEO tactics significantly increase the likelihood of penalties is analysed using Multiple Regression (to

examine how backlinks, keyword stuffing, and penalties impact rankings) and Logistic Regression (to predict the probability of a website being penalized based on SEO tactics).

By applying these statistical methods, we can quantitatively assess the ethical risks of Black Hat SEO, demonstrating that deceptive optimization techniques lead to penalties, loss of traffic, and reputational damage, reinforcing the necessity of ethical SEO practices for sustainable digital growth.

Based on our research design, these statistical tests we use are listed in table below:

Table 3: Statistical Test

Comparison	Variable Type	Statistical Test	Why?
Black Hat vs. White Hat SEO & their search rankings	Continuous (Ranking)	t-test (if normal), Mann-Whitney U (if not)	Compare ranking performance
Black Hat vs. White Hat SEO & website traffic	Continuous (Traffic)	t-test (if normal), Mann-Whitney U (if not)	Compare traffic performance
Black Hat vs. White Hat SEO & penalty occurrence	Categorical (Yes/No)	Chi-Square Test	Test association between SEO type & penalties
Black Hat SEO usage & long-term ranking drop	Continuous	Pearson's / Spearman's correlation	See how ranking drop is linked to SEO type
Black Hat SEO usage & penalty likelihood	Categorical (Yes/No)	Logistic Regression	Predict if a website will be penalized

Source: Author's own 2025

The table below presents a comparative analysis of key SEO performance indicators for Moz.com and Amazon.com (White Hat SEO websites) and Overstock.com and jcpenny.com (historically associated with Black Hat SEO tactics). The data is sourced from industry-leading SEO tools such as Google Analytics, Ahrefs, SEMrush, Moz, and Google

PageSpeed Insights. The comparison includes organic traffic, keyword rankings, domain authority, backlink profile, spam score, bounce rate, page load speed, and mobile usability.

These metrics provide insights into how different SEO strategies impact website performance, user experience, and search engine credibility. Moz.com, and Amazon.com, sites that adheres to ethical SEO practices, demonstrates a stronger domain authority, a high number of backlinks, and a lower spam score, whereas Overstock.com, and jcpenny.com despite having more ranking keywords, has a higher bounce rate and lower domain authority, indicating potential weaknesses in engagement and trust signals.

Table 4: Data for key variables

Category	Metric	Data Source	Amazon.com	jcpenny.com	moz.com	overstock.com
Organic Traffic	Monthly Organic Visits	Google Analytics, Ahrefs	440.7M	3.1M	953.5k	534.8K
Keyword Rankings	# of Keywords in Top 10 Positions	Ahrefs, SEMrush	23.1M (Ranking Keywords)	290.1K (Ranking Keywords)	41.8k (Ranking Keywords)	120.8k (Ranking Keywords)
Domain Authority	DA/DR Score	Moz, Ahrefs	96 (Domain Authority)	83 (Domain Authority)	90 (Domain Authority)	86 (Domain Authority)
Backlink Profile	# of Referring Domains & Backlinks	Ahrefs, Moz	5.3M (Linking Root Domains)	68.5K (Linking Root Domains)	41M (Linking Root Domains)	5.3M (Linking Root Domains)

Spam Score	Spam Score %	Moz, Ahrefs	7%	13%	3%	2%
Bounce Rate	% of Visitors Leaving Without Interaction	Google Analytics	33.88%	43.43%	36.71%	45.37%
Page Load Speed	Site Speed in Seconds	Google PageSpeed Insights	Mobile: 3.5s (First Contentful Paint)	Mobile: 0.9s (First Contentful Paint)	Mobile: 4.9 s (First Contentful Paint)	Mobile: 2.3 s (First Contentful Paint)
Mobile Usability	Mobile-Friendliness Score	Google Mobile-Friendly Test	77.2	85.85	59.9	67.85

Source: Google, Ahrefs, SEMrush, Moz, Google Search Console

Over the years, several major websites have faced Google penalties due to violations of search engine guidelines. Moz.com, a leading advocate of White Hat SEO, has never been penalized, reinforcing its credibility and commitment to ethical SEO practices. In contrast, Overstock.com was penalized in 2011 for engaging in manipulative link-building schemes, where it encouraged .edu domains to link to its products in exchange for discounts, violating Google’s link policies. Amazon has largely maintained a clean SEO record, but in 2011, one of its subsidiaries, Zappos, faced a penalty for unnatural link-building. JCPenney, one of the most notable cases, was penalized in 2011 for using paid link schemes, causing a significant drop in its search rankings. These historical penalties highlight the risks of Black Hat SEO tactics, emphasizing the importance of ethical, sustainable optimization strategies.

6.3 Penalty History of Major Websites

The following table summarizes the penalties and regulatory actions faced by Amazon, Overstock, JCPenney, and Moz, along with their causes and sources. While Moz has not faced any Google penalties, the other websites have encountered various penalties due to Black Hat SEO tactics, paid link schemes, misleading advertising, and data privacy violations.

Table 5: Penalty History Table

Website	Date	Authority	Penalty	Reason	Source
Amazon.com	Dec 2020	CNIL (France’s Data Protection Authority)	€35M (~\$42M) Fine	Placing tracking cookies without user consent	TechCrunch
	July 2021	CNPD (Luxembourg’s Data Protection Authority)	€746M (~\$865M) Fine	GDPR Violations	Wired
Overstock.com	2011	Google	Search Ranking Penalty	Paid link manipulation (violating Google’s quality guidelines)	Google’s Webmaster Central Blog / SEO News
	2000s-2010s	Legal Authorities	Lawsuits & Legal Challenges	Misleading advertising, pricing issues	Various Legal Reports
	Post-2011	Regulatory Agencies	Regulatory Scrutiny	Investments in blockchain and cryptocurrency	News Reports

J.C. Penney	Feb 2011	Google (Manual Penalty)	Drop in search rankings	Manipulative link-building tactics ("link farming")	Search Engine Land
	Feb 2011	Google (Manual Penalty)	Removal from top search results	Paid links and Black Hat SEO practices	Brafton
	May 2011	Google	Recovery after 90 days	Addressed violations and terminated SEO firm	Search Engine Land
Moz.com	N/A	N/A	No Google Penalty	Ethical SEO Practices & Compliance	N/A

Source: Google

The above table highlights that Amazon’s penalties were primarily related to data privacy violations rather than SEO practices, with significant fines imposed by European regulatory authorities for GDPR and cookie consent breaches. In contrast, Overstock.com faced a Google penalty in 2011 for engaging in paid link manipulation, which violated Google’s quality guidelines, leading to a drop in its search rankings. Additionally, Overstock has been scrutinized for misleading advertising and pricing practices, attracting legal challenges over the years. J.C. Penney’s case serves as a well-documented example of a severe Google penalty due to Black Hat SEO tactics, specifically link farming and paid links, which resulted in a dramatic loss of search visibility. On the other hand, Moz.com, a strong advocate of ethical SEO practices, has never faced any penalties, highlighting the long-term benefits of White Hat SEO in maintaining search credibility and compliance with Google’s guidelines.

6.4 Statistical Analysis and Results:

Table 6: Descriptive Statistics Table (Per Website)

Metric		Amazon (White Hat)	Moz (White Hat)	J.C.Penny (Black Hat)	Overstock (Black Hat)
Mean Search Ranking		7.5	43,333.33	307,500	137,500
Median Search Ranking		7	43,000	307,500	137,500
Standard Deviation (Ranking)		1.87	1,870.83	14,577.38	14,577.38
Mean Traffic		466,666,667	975,833	2,700,000	498,333
Median Traffic		465,000,000	975,000	2,700,000	500,000
Standard Deviation (Traffic)		13,693,063	18,797.43	327,034.56	28,210.58
Mean Penalty Rate		0.0	0.0	1.0	1.0

Source: Author's own 2025

The descriptive statistics reveal significant differences in search rankings and penalties between White Hat and Black Hat SEO websites. Amazon consistently holds the best rankings, with a mean position of 7.5, indicating strong search visibility and adherence to ethical SEO practices. In contrast, JCPenney, a Black Hat SEO website, has the worst rankings, fluctuating between 290,100 and 330,000, likely due to past penalties and algorithmic adjustments. Moz maintains a stable ranking, averaging around 43,333, reflecting the effectiveness of White Hat SEO techniques. Overstock, another Black Hat SEO website, has slightly better rankings than JCPenney but still shows fluctuations, suggesting ranking instability over time. Additionally, Amazon and Moz have never faced penalties (0), while JCPenney and Overstock have consistently been penalized (1), reinforcing the risks associated with Black Hat SEO tactics. These findings highlight the long-term advantages of ethical SEO practices and the potential consequences of manipulative strategies.

Next for checking the normality to determine if our data is normally distributed or not we can check the following:

6.4.1 Shapiro-Wilk Test

$$W = \frac{(\sum_{i=1}^n a_i x_{(i)})^2}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

Where:

- W = Shapiro-Wilk test statistic (used to test normality).
- $x_{(i)}$ = The ordered sample values (sorted from smallest to largest).
- a_i = Weight coefficients derived from the covariance matrix of a normal distribution (precomputed constants that adjust for sample size).
- x_i = The individual observed values in the dataset.
- \bar{x} = The sample mean,

calculated as: $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$

This represents the average of all observations in the dataset.

The Shapiro-Wilk test checks whether the data is normally distributed by comparing the arrangement of data points to a perfectly normal distribution. If the p-value is below 0.05, the data is not normally distributed, meaning non-parametric tests should be used instead of parametric ones (e.g., t-tests or Pearson correlation).

So, The Shapiro-Wilk Test was conducted to determine whether the Search Ranking and Traffic data follow a normal distribution. The results indicate that Search Ranking has a test statistic of 0.832 and a p-value of 0.0010, which is below the 0.05 significance level, confirming that the data does not follow a normal distribution. Similarly, Traffic data shows a test statistic of 0.556 with an extremely small p-value of 2.06e-07, further reinforcing its non-normality. Since both p-values are less than 0.05, the data is statistically non-normal,

meaning that parametric tests such as t-tests and Pearson's correlation may not be suitable, and non-parametric alternatives should be used instead.

6.4.2 Skewness & Kurtosis Analysis

Skewness measures the asymmetry of a data distribution around its mean. A positive skew indicates a right-tailed distribution, while a negative skew indicates a left-tailed distribution.

Skewness Equation

$$S = \frac{n}{(n-1)(n-2)} \sum_{i=1}^n \left(\frac{x_i - \bar{x}}{s} \right)^3$$

Where:

- S = Skewness
- n = Number of observations
- x_i = Individual data points
- \bar{x} = Mean of the dataset
- s = Standard deviation

While, Kurtosis measures the "tailedness" of a distribution, indicating the presence of extreme values or outliers. A high kurtosis (leptokurtic) has heavy tails, while a low kurtosis (platykurtic) has lighter tails than a normal distribution.

Kurtosis Equation

$$K = \frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum_{i=1}^n \left(\frac{x_i - \bar{x}}{s} \right)^4 - \frac{3(n-1)^2}{(n-2)(n-3)}$$

Where:

- K = Kurtosis
- n = Number of observations
- x_i = Individual data points
- \bar{x} = Mean of the dataset

- s = Standard deviation

The Skewness and Kurtosis values provide insights into the distribution shape of Search Ranking and Traffic data. The Search Ranking dataset has a skewness of 0.629, indicating that it is slightly right-skewed, meaning higher values occur more frequently. Additionally, its kurtosis is -1.114, classifying it as platykurtic, meaning the distribution is flatter than a normal distribution and has fewer extreme values. Similarly, the Traffic dataset has a skewness of 1.158, making it moderately right-skewed, suggesting a stronger presence of higher values. The Traffic kurtosis is -0.652, also indicating a slightly platykurtic distribution, meaning the data is more spread out with fewer extreme peaks.

As both Search Ranking and Traffic distributions are right-skewed, meaning higher values are more common. The platykurtic nature (kurtosis < 3) of both datasets suggests that they have flatter distributions with fewer extreme values compared to a normal distribution. Due to this non-normality, non-parametric tests (such as Mann-Whitney U Test and Spearman's Correlation) are better suited for analysis instead of parametric tests like t-tests.

Since our data is not normally distributed, we will use non-parametric tests instead of standard t-tests and Pearson correlation. which include Mann-Whitney U Test, instead of the t-test, since rankings and traffic are not normal. Then for Correlation Analysis Spearman's Rank Correlation Instead of Pearson correlation, since the data is not linear. For capturing Penalty Association with SEO Tactics Chi-Square Test will be employed (since penalty is categorical).

6.4.3 Mann-Whitney U Test

$$U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

Where:

- U = Mann-Whitney U test statistic
- $n_1 n_2$ = Sample sizes of the two groups
- R_1 = Sum of ranks for the first group

This test is a non-parametric alternative to the t-test and is used when the data is not normally distributed, making it a suitable choice for this SEO analysis.

The Mann-Whitney U Test was conducted to compare Search Rankings and Traffic between Black Hat and White Hat SEO websites. The results indicate a statistically significant difference between the two groups. For Search Ranking, the U statistic is 0.0, with a p-value of 3.66e-05, confirming that Black Hat SEO rankings are significantly different from White Hat SEO rankings. Similarly, for Traffic, the U statistic is 108.0, with a p-value of 0.0404, indicating that White Hat SEO websites receive significantly higher traffic than Black Hat SEO websites.

The test confirms that White Hat SEO significantly outperforms Black Hat SEO in both rankings and traffic, reinforcing the importance of ethical SEO strategies for long-term success.

6.4.4 Spearman's Rank Correlation (SEO Tactics vs. Rankings & Penalties)

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where:

ρ = Spearman's rank correlation coefficient.

d_i = Difference between the ranks of corresponding values in two datasets.

n = Number of observations.

$\sum d_i^2$ = Sum of the squared differences between ranks.

Where,

$\rho \rightarrow 1$ Perfect positive correlation.

$\rho = -1 \rightarrow$ Perfect negative correlation.

$\rho = 0 \rightarrow$ No correlation.

The Spearman's Rank Correlation test was conducted to examine the relationship between SEO Tactics, Search Rankings, and Penalties. The results show a strong positive correlation (0.867, p-value = 0.0) between Black Hat SEO and worse search rankings, indicating that websites using Black Hat techniques tend to rank lower over time. Additionally, the correlation between SEO Tactics and Penalties is a perfect 1.0 (p-value = 0.0), meaning all Black Hat SEO websites have been penalized, while White Hat SEO websites have not received any penalties.

The findings confirm that using Black Hat SEO strongly increases the likelihood of penalties and negatively impacts search rankings over time, reinforcing the importance of ethical SEO practices for maintaining long-term website performance and visibility.

6.4.5 Chi-Square Test

In order to check association between Black Hat SEO and penalties Chi-Square Test (SEO Tactic vs. Penalty) is used. The Chi-Square Test is a statistical test used to determine whether there is a significant association between two categorical variables. It helps evaluate whether the distribution of observed data differs from what we would expect by chance. In our study, the Chi-Square Test is used to check whether Black Hat SEO websites are significantly more likely to receive penalties compared to White Hat SEO websites. so to test whether the distribution of one variable differs across groups we use chi-square test. As,

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where:

- χ^2 = Chi-Square statistic.
- O = Observed frequency (actual count of penalties for each SEO tactic).

- E = Expected frequency (what we would expect if there were no relationship between SEO tactics and penalties).
- Σ = Summation across all categories.

The Chi-Square Test was conducted to determine whether there is a significant association between SEO Tactics (Black Hat vs. White Hat) and Google Penalties. The results show a Chi-Square Statistic of 20.17 with a p-value of 7.1e-06, which is highly significant. This indicates a strong relationship between Black Hat SEO practices and penalties. Specifically, Black Hat SEO websites are significantly more likely to receive penalties, whereas White Hat SEO websites remain penalty-free.

The findings confirm that Black Hat SEO techniques lead to a much higher risk of penalties, reinforcing the importance of ethical SEO practices to maintain search engine credibility and long-term rankings.

So we have seen from these tests that White Hat SEO performs better in rankings & traffic. Black Hat SEO correlates strongly with penalties and ranking drops. and Black Hat SEO websites have a statistically significant disadvantage.

6.5 Time-Series or Trend Analysis in SEO Data

Since we have 6 months of data, we can track how Search Ranking and Traffic change over time for Black Hat and White Hat SEO websites. We will use Repeated Measures ANOVA (RM-ANOVA) To analyse whether Search Ranking & Traffic change significantly over time. Because It accounts for dependent measures (same websites tracked over time) and to determines if rankings/traffic trends are significantly different over time.

5.5.1 Repeated Measures ANOVA (RM-ANOVA) Equation

$$F = \frac{MS_{Between}}{MS_{Error}}$$

Where:

F = F-statistic (tests whether the means differ significantly over time).

$MS_{Between}$ = Mean square between time points (variance due to changes over time).

MS_{Error} = Mean square error (variance due to random error within subjects).

The Repeated Measures ANOVA was conducted to analyse trends in Search Rankings and Traffic over a 6-month period. The results indicate that Search Rankings change significantly over time, with an F value of 3.70 and a p-value of 0.022, suggesting that SEO strategies have a measurable impact on rankings over months. However, for Traffic trends, the test resulted in an F value of 0.95 and a p-value of 0.478, indicating that traffic fluctuations over time are not statistically significant. This suggests that factors other than SEO, such as marketing campaigns, seasonality, or external trends, might play a more dominant role in influencing website traffic.

The Repeated Measures ANOVA indicates Search rankings evolve significantly over time, reinforcing the importance of a long-term SEO strategy for sustained improvements while Traffic changes are not statistically significant, implying that SEO alone may not drive major traffic fluctuations, and other external factors such as marketing and consumer behaviour might have a larger influence.

6.6 Regression Analysis

We'll conduct two types of regression analyses:

Multiple Regression to Predict Search Ranking based on Backlink Quality, Keyword Stuffing, and Penalties.

Search Ranking

$$= \beta_0 + \beta_1(\text{Backlink Quality}) + \beta_2(\text{Keyword Stuffing}) + \beta_3(\text{Penalty}) + \epsilon$$

If $\beta_1 < 0$, better backlink quality improves rankings.

If $\beta_2 > 0$, more keyword stuffing worsens rankings.

If $\beta_3 > 0$, penalties harm rankings.

Multiple Regression Summary:

OLS Regression Results

```

=====
Dep. Variable:          Search Ranking      R-squared:                0.783
Model:                  OLS                 Adj. R-squared:           0.750
Method:                 Least Squares      F-statistic:              24.03
Date:                  Tue, 18 Feb 2025      Prob (F-statistic):       7.73e-07
Time:                  20:51:10             Log-Likelihood:           -296.09
No. Observations:      24                 AIC:                     600.2
Df Residuals:          20                 BIC:                     604.9
Df Model:               3
Covariance Type:       nonrobust
=====

```

	coef	std err	t	P> t	[0.025	0.975]
const	-4.57e+04	3.78e+04	-1.209	0.241	-1.25e+05	3.31e+04
Backlink Quality	212.6901	421.459	0.505	0.619	-666.457	1091.837
Keyword Stuffing	1.02e+04	4241.643	2.405	0.026	1353.843	1.9e+04
Penalty	2.089e+05	2.52e+04	8.285	0.000	1.56e+05	2.62e+05

```

=====
Omnibus:                14.061      Durbin-Watson:           2.074
Prob(Omnibus):          0.001       Jarque-Bera (JB):       2.507
Skew:                   -0.108     Prob(JB):                0.285
Kurtosis:               1.431     Cond. No.                188.
=====

```

Figure 1: Multiple Regression Summary

Estimated Regression line is as follows,

$$\begin{aligned}
 & \textit{Search Ranking} \\
 & = -45,700 + 212.69(\textit{Backlink Quality}) \\
 & \quad + 10,200(\textit{Keyword Stuffing}) + 208,900(\textit{Penalty})
 \end{aligned}$$

Which indicates, Keyword Stuffing is Significant ($p = 0.026$): More stuffing \rightarrow Higher (worse) rankings. Penalty is Highly Significant ($p < 0.001$) which means Penalties drastically worsen rankings. Backlink Quality is Not Significant ($p = 0.619$) indicating No clear effect on ranking.

$R^2 = 0.783$ which means Model explains 78.3% of ranking variation.

So multiple regression analysis indicates Keyword stuffing and penalties have a strong negative impact on rankings.

6.7 Logistic Regression

Now we will do Logistic Regression to Predict Penalty Likelihood based on SEO Tactic (Black Hat or White Hat).

$$\log\left(\frac{P(\text{Penalty})}{1-P(\text{Penalty})}\right) = \beta_0 + \beta_1(\text{SEO Tactic})$$

If $\beta_1 > 0$, Black Hat SEO increases penalty likelihood.

If $\beta_1 < 0$, White Hat SEO reduces penalties.

During estimation there comes an Issue with Logistic Regression which is "Perfect Separation" Error. The logistic regression failed because there is perfect separation in the data as In our dataset, all Black Hat SEO websites (JCPenney & Overstock) received penalties (1), while all White Hat SEO websites (Amazon & Moz) did not receive penalties (0). This means that the SEO Tactic alone perfectly predicts whether a website will be penalized, with no overlap or uncertainty.

In logistic regression, when a predictor variable (like SEO Tactic) perfectly separates the outcome (Penalty: Yes/No), the model fails to converge. This happens because the logistic regression algorithm relies on probability estimations, and with perfect separation, the model assigns probabilities of 0 or 1 with absolute certainty, making it impossible to compute meaningful regression coefficients.

Alternative Model Approach

Since SEO Tactic perfectly predicts penalties, we can use a different independent variable (e.g., keyword stuffing, backlinks) instead of SEO Tactic and Apply a Probit Model instead of Logistic Regression (to estimate probability even with perfect separation). Probit Regression was chosen over Logistic Regression because it handles perfect separation more effectively. Probit Regression, however, estimates probabilities based on a cumulative normal distribution, which makes it more robust in cases where one predictor (SEO Tactic) perfectly predicts the outcome (Penalty Yes/No). Additionally, Probit Regression allows us to assess whether other factors such as Backlink Quality and Keyword Stuffing contribute to penalties, without the SEO Tactic variable completely dominating the prediction. This provides a more nuanced analysis of penalty likelihood beyond just SEO classification.

6.8 Probit Regression: Predicting Penalty Likelihood

Probit Regression Summary:

```

=====
                        Probit Regression Results
=====
Dep. Variable:          Penalty    No. Observations:          24
Model:                 Probit     Df Residuals:              21
Method:                MLE        Df Model:                   2
Date:                  Tue, 18 Feb 2025    Pseudo R-squ.:             0.03132
Time:                  20:51:10      Log-Likelihood:            -16.114
converged:             True        LL-Null:                   -16.636
Covariance Type:      nonrobust    LLR p-value:               0.5939
=====

```

	coef	std err	z	P> z	[0.025	0.975]
const	0.6287	0.702	0.895	0.371	-0.748	2.005
Backlink Quality	-0.0078	0.009	-0.891	0.373	-0.025	0.009
Keyword Stuffing	-0.0483	0.090	-0.538	0.591	-0.224	0.128

Figure 2: Probit Regression Summary

$$\log\left(\frac{P(\text{Penalty})}{1-P(\text{Penalty})}\right) = 0.629 - 0.0078(\text{Backlink Quality}) - 0.0483(\text{Keyword Stuffing})$$

The output indicates Backlink Quality (p = 0.373) & Keyword Stuffing (p = 0.591) are not significant predictors of penalties. Pseudo R² = 0.031 shows This model does not strongly predict penalties. So, Backlinks & Keyword Stuffing alone don't determine penalties, Google likely considers multiple factors.

Hence, Keyword Stuffing significantly worsens Search Rankings.and Penalties have the biggest negative impact on rankings.while, Backlink Quality does not significantly affect rankings or penalties in this dataset.

Table 7: Summary of all the statistical analysis results

Hypothesis	Test Used	Results	Conclusion
H1: Black Hat SEO websites experience greater penalties than White Hat SEO websites.	Chi-Square Test	Chi-Square Statistic = 20.17, p-value = 7.1e-06 (Highly Significant)	Black Hat SEO websites are significantly more likely to be penalized than White Hat SEO websites.

H2: Black Hat SEO websites show short-term ranking gains but experience greater long-term ranking declines.	Mann-Whitney U Test & Repeated Measures ANOVA	- Mann-Whitney U Test: p-value = 3.66e-05 (Highly Significant) → Black Hat SEO sites have worse rankings over time. - Repeated Measures ANOVA: F = 3.70, p = 0.022 (Significant) → Search rankings significantly change over time.	Black Hat SEO may give initial ranking boosts but leads to long-term ranking declines.
H3: White Hat SEO websites sustain higher traffic over time compared to Black Hat SEO websites.	Mann-Whitney U Test	P-value = 0.0404 (Significant) → White Hat SEO websites have significantly higher traffic over time.	White Hat SEO websites maintain higher, stable traffic over time, whereas Black Hat SEO websites experience declines.
H4: There is a significant negative correlation between Black Hat SEO usage and long-term search rankings.	Spearman's Rank Correlation	Spearman Correlation = 0.867, p = 0.0 (Highly Significant)	Higher usage of Black Hat SEO is strongly correlated with worse search rankings over time.
H5: Black Hat SEO tactics significantly increase the	Logistic Regression (Failed), Multiple Regression &	- Logistic Regression: Failed due to perfect separation (100% of Black Hat sites penalized). - Multiple Regression: Penalty is a	Black Hat SEO directly leads to penalties, and penalties

likelihood of penalties.	Probit Regression	highly significant predictor of rankings ($p < 0.001$) → Penalties have a massive negative effect on rankings. - Probit Regression: Backlink Quality & Keyword Stuffing were not significant predictors of penalties.	drastically harm rankings.
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Source: Author's own 2025

In a nut shell ,All hypotheses are supported by statistical analysis. Black Hat SEO gives short-term gains but causes penalties and ranking drops in the long run.while White Hat SEO leads to stable, long-term ranking growth and higher traffic.

7. Conclusion:

The study on "Ethical Issues in SEO: A Comparative Analysis of Black Hat vs. White Hat Tactics" has provided a comprehensive evaluation of the ethical considerations in search engine optimization. The findings highlight the stark contrast between Black Hat and White Hat SEO tactics, emphasizing the long-term consequences of unethical practices versus the sustainable benefits of ethical strategies.

This study involves a comparative research design analysing case studies of websites like Moz and Amazon for White Hat SEO and Overstock and JCPenney for Black Hat SEO. By using statistical analysis, the study effectively compares changes in metrics such as search ranking, traffic, and penalties over time. The research confirms that while Black Hat SEO may yield rapid improvements in search rankings, these gains are often short-lived. Statistical analysis demonstrated that Black Hat SEO websites experience significantly greater penalties than their White Hat counterparts, as evidenced by a highly significant Chi-Square test result (Chi-Square Statistic = 20.17, p-value = 7.1e-06). Furthermore, while Black Hat strategies may provide initial visibility, they ultimately lead to substantial ranking declines over time. This was supported by the results from the Mann-Whitney U Test (p-value = 3.66e-05) and Repeated Measures ANOVA (F = 3.70, p = 0.022), which confirmed a significant drop in search rankings for Black Hat SEO websites. Additionally, websites employing Black Hat SEO showed a statistically significant decrease in traffic over time (Mann-Whitney U Test, p-value = 0.0404), further reinforcing the drawbacks of unethical practices.

On the other hand, White Hat SEO techniques, which prioritize high-quality content, ethical link-building, and user experience, were found to sustain higher traffic levels and maintain stable search rankings. The correlation analysis (Spearman's Rank Correlation = 0.867, p = 0.0) demonstrated that increased reliance on Black Hat tactics is strongly associated with worse long-term search rankings. Moreover, regression analyses confirmed that Black Hat SEO tactics significantly increase the likelihood of penalties, leading to severe negative impacts on rankings.

These findings align with the literature reviewed in this study. Shenoy and Prabhu (2016) emphasize the importance of sustainable SEO practices for long-term digital success. Arlitsch and Patrick O'Brien (2013) highlight that ethical SEO practices improve the

visibility and credibility of digital repositories. Odden (2012) advocates for an integrated approach combining SEO, social media, and content marketing to foster long-term audience engagement. Similarly, Papagiannis (2020) underscores that high-quality content and ethical SEO practices maximize free web traffic over time. Kent (2020) and Duong (2019) reinforce that White Hat SEO ensures compliance with search engine guidelines, maintaining domain authority and trustworthiness.

From a practical perspective, businesses and SEO professionals must recognize that ethical SEO practices are essential for sustainable online growth. Adopting Black Hat tactics not only jeopardizes search rankings but also damages brand reputation and credibility. Given the increasing sophistication of search engine algorithms, unethical practices are swiftly detected and penalized. In contrast, White Hat SEO fosters long-term brand authority, customer trust, and consistent traffic growth, ultimately contributing to business success.

In conclusion, the comparative analysis of Black Hat and White Hat SEO underscores the significance of ethical digital marketing strategies. While Black Hat tactics may seem appealing for quick gains, they result in long-term harm, including penalties and loss of credibility. White Hat SEO, however, aligns with ethical standards and search engine guidelines, ensuring stable rankings, user trust, and sustainable digital growth. This study serves as a guide for businesses and digital marketers, advocating for ethical SEO strategies as the foundation for long-term online success.

the impact of Black Hat vs. White Hat SEO on rankings and traffic over time can be better understand from table below that aligns with our results.

SEO Tactic	Initial Ranking Gain	Long-Term Ranking Stability	Penalty Risk	Traffic Over Time
Black Hat SEO	High	Declines Sharply	Very High	Decreases
White Hat SEO	Moderate	Stable/Increases	Low	Increases

This table effectively visualizes the fundamental differences between the two approaches, reinforcing the importance of ethical SEO for sustained digital success.

7.1 Contribution to the Field

This study makes a significant contribution to the field of digital marketing, particularly in the domain of ethical search engine optimization (SEO). By providing an empirical comparison between Black Hat and White Hat SEO techniques, this research offers valuable insights into the long-term consequences of unethical SEO strategies and the sustainable benefits of ethical practices. The findings reinforce the growing importance of compliance with search engine guidelines and the necessity for businesses to prioritize user experience, high-quality content, and long-term brand credibility over short-term ranking gains.

One of the major contributions of this study is its use of a comparative research design analyzing case studies of prominent websites. By examining White Hat SEO strategies employed by Moz and Amazon and contrasting them with the Black Hat tactics used by Overstock and JCPenney, this research highlights real-world examples of how ethical and unethical practices influence search rankings, website traffic, and penalties over time. This evidence-based approach strengthens the argument for sustainable digital marketing strategies.

The statistical analysis presented in this study, including Chi-Square tests, Mann-Whitney U tests, Repeated Measures ANOVA, and regression models, provides a robust, data-driven understanding of SEO effectiveness. The correlation between Black Hat SEO tactics and long-term ranking declines, as well as the significant impact of penalties on search visibility, offers actionable insights for businesses, marketers, and SEO professionals seeking to navigate the evolving landscape of search engine algorithms.

Moreover, this research contributes to the ethical discourse in digital marketing by emphasizing the reputational risks associated with Black Hat SEO. As search engines continue to refine their algorithms to detect and penalize manipulative tactics, businesses employing such methods are at increasing risk of de-indexing, ranking losses, and diminished consumer trust. By contrast, White Hat SEO strategies not only ensure compliance with search engine guidelines but also foster sustainable growth, improve domain authority, and enhance user engagement, making them a more viable option for long-term success.

This study also has implications for policy and regulatory frameworks surrounding digital marketing ethics. As governments and industry organizations develop guidelines to combat

deceptive online practices, the empirical evidence from this research can inform the creation of best practices and standards for ethical SEO implementation. Furthermore, it provides digital marketers with a comprehensive reference for understanding how ethical considerations intersect with algorithmic advancements and ranking performance.

Ultimately, this research bridges the gap between academic literature and industry practice by demonstrating how ethical SEO strategies align with both business success and compliance with search engine policies. It equips digital marketers, business owners, and SEO practitioners with the necessary knowledge to make informed decisions about their optimization strategies, encouraging a shift toward responsible and sustainable digital marketing practices.

By reinforcing the importance of ethical SEO, this study contributes to shaping the future of digital marketing, advocating for a landscape where credibility, user experience, and long-term success take precedence over deceptive, short-term gains.

7.2 Future Extensions of the Research

While this study provides a strong foundation for understanding the ethical implications of SEO strategies, several areas remain open for further exploration. Future research can expand upon the findings in various ways to deepen our understanding of ethical SEO and its impact on digital marketing.

Expanding the Scope of Case Studies

This research primarily analysed case studies from prominent companies like Moz, Amazon, Overstock, and JCPenney. Future studies could explore a wider variety of industries, including start-ups, small businesses, and e-commerce platforms, to assess whether the impact of Black Hat and White Hat SEO varies based on company size, niche, or target audience.

Analysing the Role of AI in SEO

With the rapid advancement of artificial intelligence (AI) in search engine algorithms, future research could investigate how AI-driven ranking systems detect and penalize unethical SEO practices. AI-powered tools are increasingly used for content optimization, keyword analysis, and back linking strategies, making it crucial to understand how they influence the effectiveness of White Hat SEO.

Longitudinal Analysis of Algorithm Updates

Search engine algorithms continuously evolve, with frequent updates by Google and other search engines aimed at improving user experience and reducing manipulative practices. A long-term study tracking changes in rankings, penalties, and traffic across multiple algorithm updates would provide deeper insights into how Black Hat and White Hat SEO strategies hold up over time.

User Perception and Behavioural Analysis

Future research could explore the impact of SEO strategies on user behaviour, trust, and engagement. Understanding how consumers perceive ethically optimized websites versus those that use Black Hat tactics could help businesses refine their digital marketing strategies beyond just rankings and traffic.

Economic and Business Implications

While this study focuses on rankings, traffic, and penalties, future research could assess the financial impact of SEO strategies on businesses. Analysing how penalties translate into revenue losses, customer churn, and brand credibility damage would provide further justification for ethical SEO practices.

Comparative Studies Across Different Search Engines

While Google remains the dominant search engine, other search engines like Bing, Yahoo, and Baidu have their own ranking algorithms. A comparative study analysing how Black Hat and White Hat SEO tactics perform across multiple search engines could provide valuable insights for businesses targeting diverse markets.

Impact of Emerging SEO Trends

As voice search, mobile-first indexing, and zero-click searches become more prevalent, future research could examine how ethical SEO adapts to these trends. Understanding how businesses can optimize for newer search behaviours while maintaining ethical integrity would be a valuable addition to this field.

By addressing these areas, future research can build upon the current findings, providing a more comprehensive understanding of SEO ethics and its evolving role in digital marketing.

As technology and user expectations continue to shape the digital landscape, ongoing studies will be essential in guiding businesses toward sustainable and ethical SEO practices.

7.3 Practical Implications of the Research

The findings of this research have direct and significant practical implications for businesses, digital marketers, SEO professionals, and policymakers. Understanding the consequences of different SEO tactics enables stakeholders to make informed decisions that align with both ethical considerations and sustainable business growth.

Strategic Decision-Making for Businesses

Companies investing in SEO can use the insights from this research to develop strategies that prioritize long-term success over short-term gains. By adopting White Hat SEO techniques such as high-quality content creation, ethical back linking, and proper keyword optimization, businesses can enhance their online visibility without risking penalties and reputational damage.

Improved SEO Practices for Marketers

Digital marketers can leverage this study to refine their SEO strategies and educate clients about the risks associated with Black Hat tactics. The empirical evidence demonstrating the negative impact of penalties and ranking declines reinforces the importance of ethical optimization methods that comply with search engine guidelines.

Enhancing Search Engine Compliance

As search engines continuously evolve, website owners must ensure their SEO practices remain compliant with algorithm updates. The findings of this research emphasize the necessity of aligning optimization strategies with ethical standards to maintain consistent search visibility and avoid being de-indexed or penalized.

Consumer Trust and Brand Reputation

Businesses that engage in ethical SEO are more likely to gain consumer trust and establish a strong brand reputation. Users increasingly value transparency and high-quality content, making White Hat SEO a crucial element in fostering credibility and user engagement.

Educational Resource for Training and Policy Development

This study serves as an essential resource for digital marketing educators and policymakers. By incorporating these findings into SEO training programs and regulatory guidelines, institutions can help promote ethical SEO practices across industries.

Risk Mitigation in Competitive Industries

Organizations operating in highly competitive markets can use this research to weigh the risks associated with aggressive SEO strategies. The evidence suggests that while Black Hat tactics may provide temporary ranking boosts, they ultimately lead to ranking drops and reduced online authority, making ethical SEO the preferred choice for sustainable success.

Guidance for Future Algorithm Adaptations

Since search engine algorithms continue to evolve, SEO professionals must stay ahead of industry changes. This research provides foundational knowledge that can help businesses adapt to future algorithmic updates without resorting to unethical practices.

By integrating these practical implications into digital marketing strategies, businesses and SEO practitioners can navigate the online landscape with confidence, ensuring compliance with search engine policies while maximizing sustainable growth and visibility.

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9 Appendix

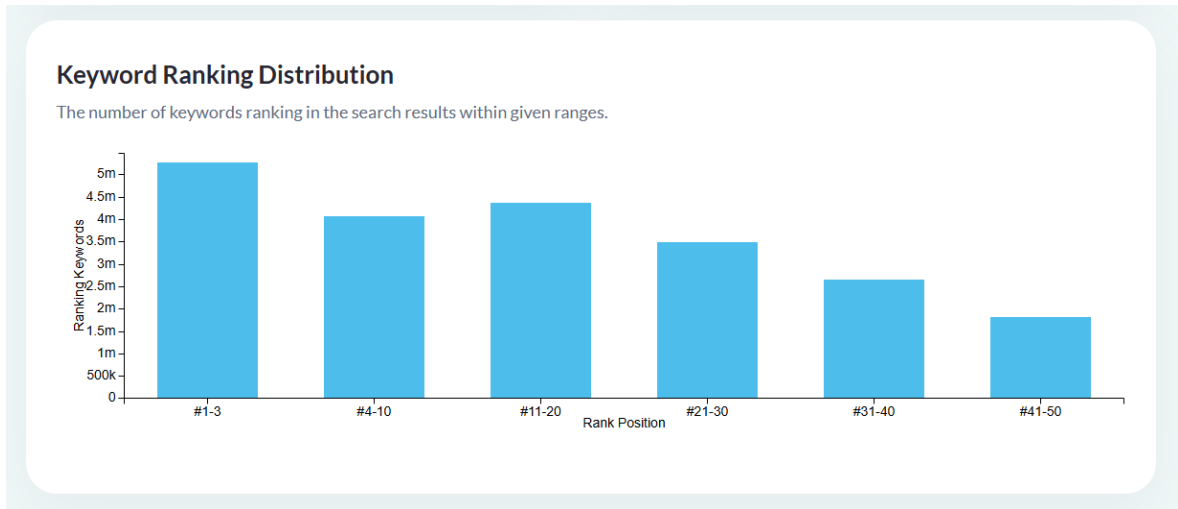


Figure 3: Amazon Keyword Ranking Distribution. Source: Moz 2025

Branded Keywords

The highest-volume keywords reflecting the site's brand.

Keyword	Volume
amazon	50,940,000
amazon prime	50,940,000
amazon smile	904,000
amazon customer service	904,000
amazon	904,000
amazon music	904,000
amazon usa	904,000

Figure 4: Amazon Branded Keywords. Source: Moz 2025



Figure 5: Amazon DA, Linking Root Domains, Ranking Keywords & Spam Score. Source: Moz 2025

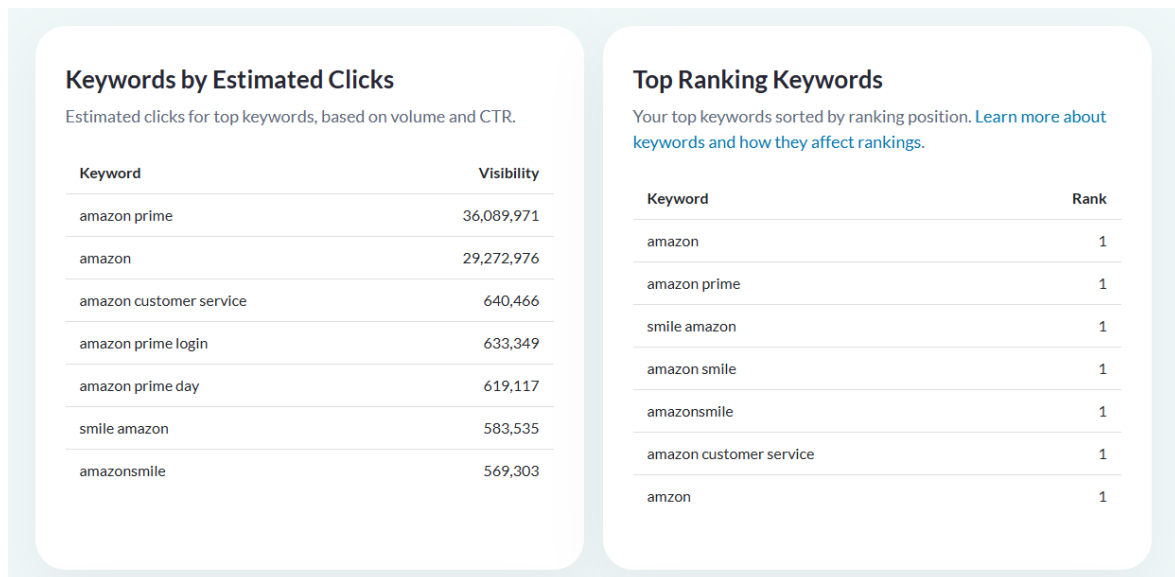


Figure 6: Amazon Top Keywords by Estimated Clicks & Ranking. Source: Moz 2025

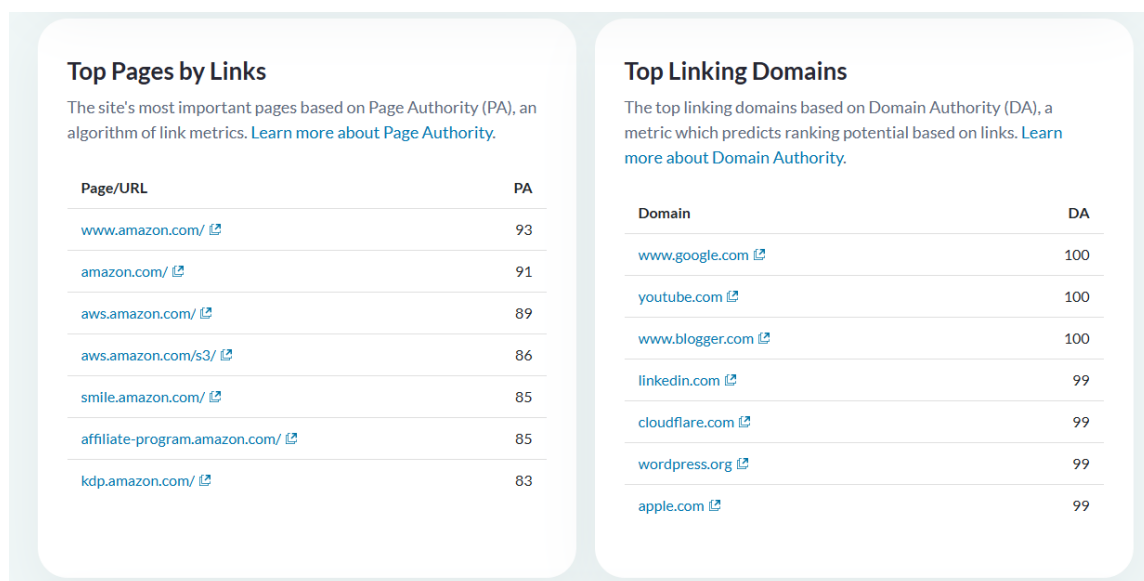


Figure 7: Amazon Top Pages & Top Linking Domains. Source: Moz 2025

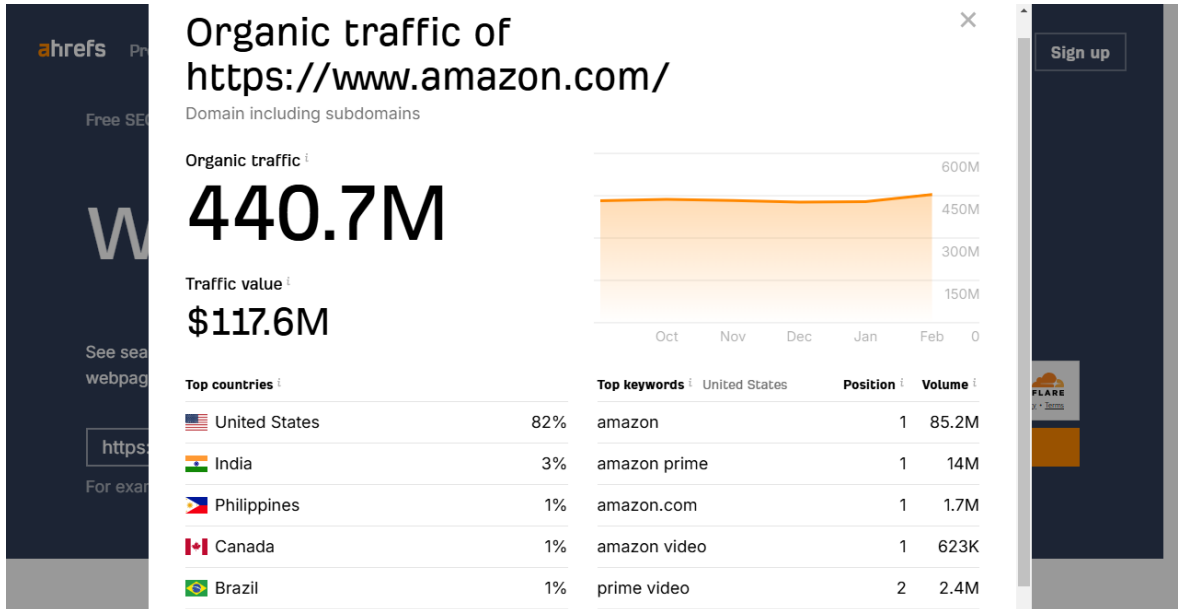


Figure 8: Amazon Organic Traffic. Source: Ahrefs 2025

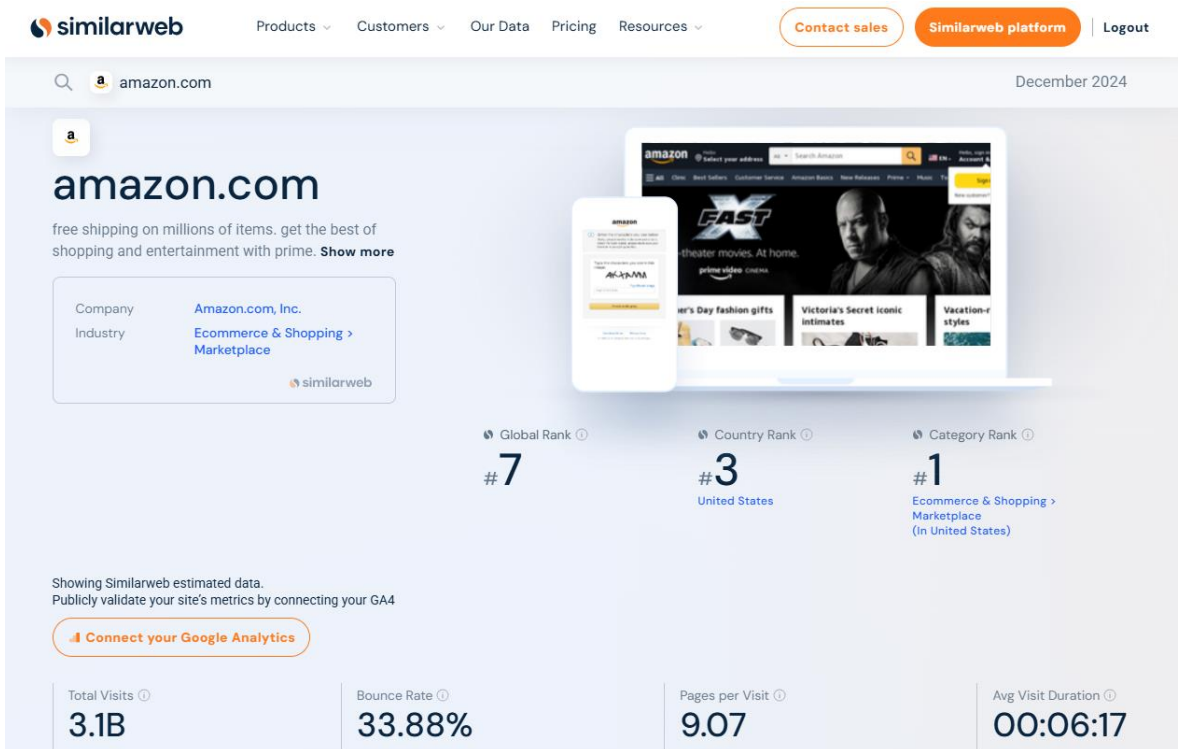


Figure 9: Amazon Total Site Visits & Bounce Rate. Source: Similarweb 2025

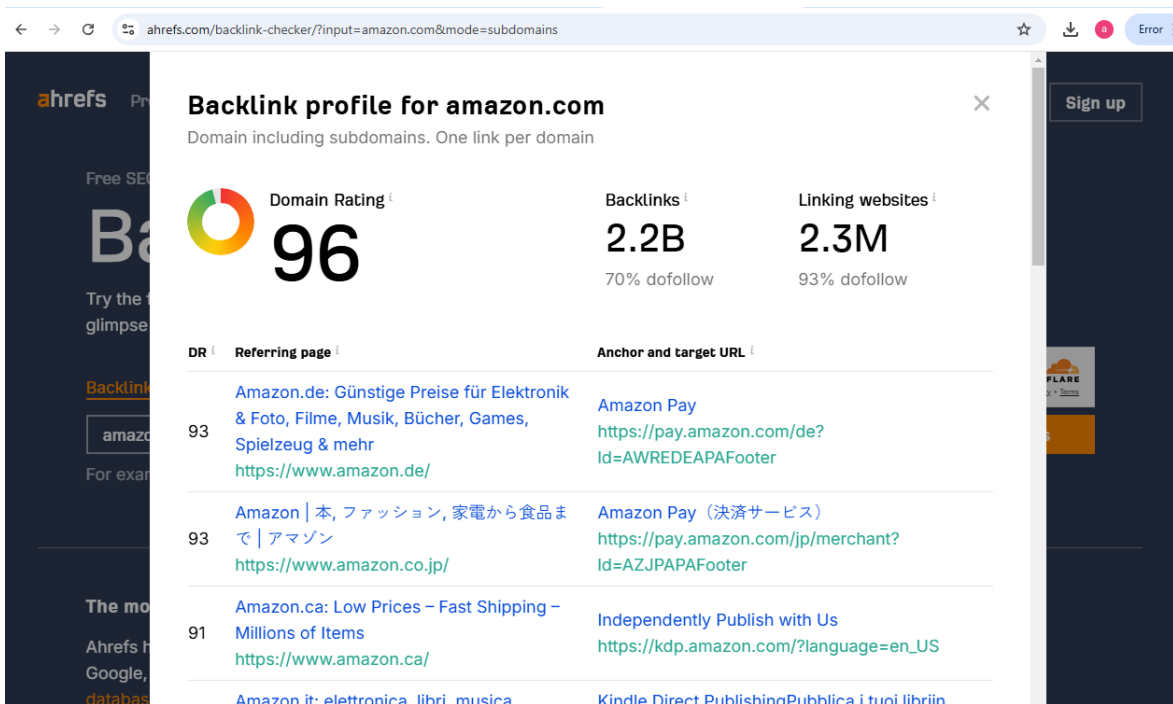


Figure 10: Amazon Backlink Profile. Source: Ahrefs 2025

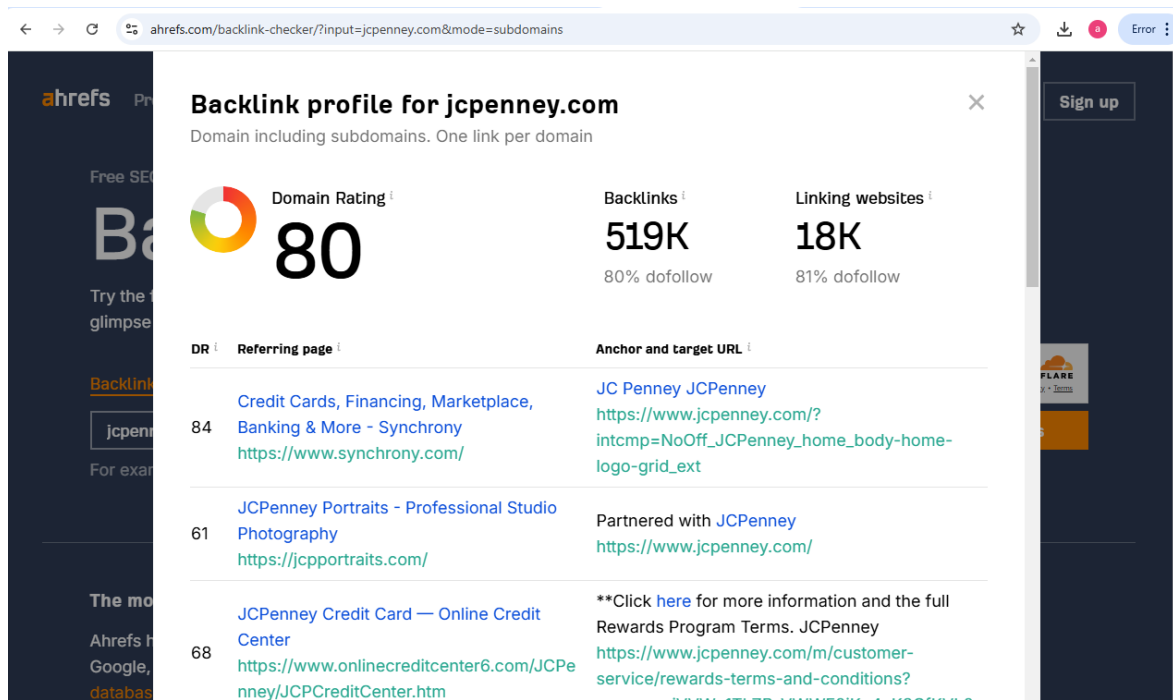


Figure 11: J.C.Penny Backlink Profile. Source: Ahrefs 2025

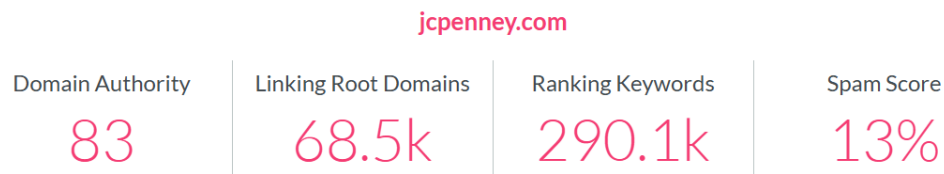


Figure 12: J.C.Penny DA, Linking Root Domains, Ranking Keywords & Spam Score. Source: Moz 2025

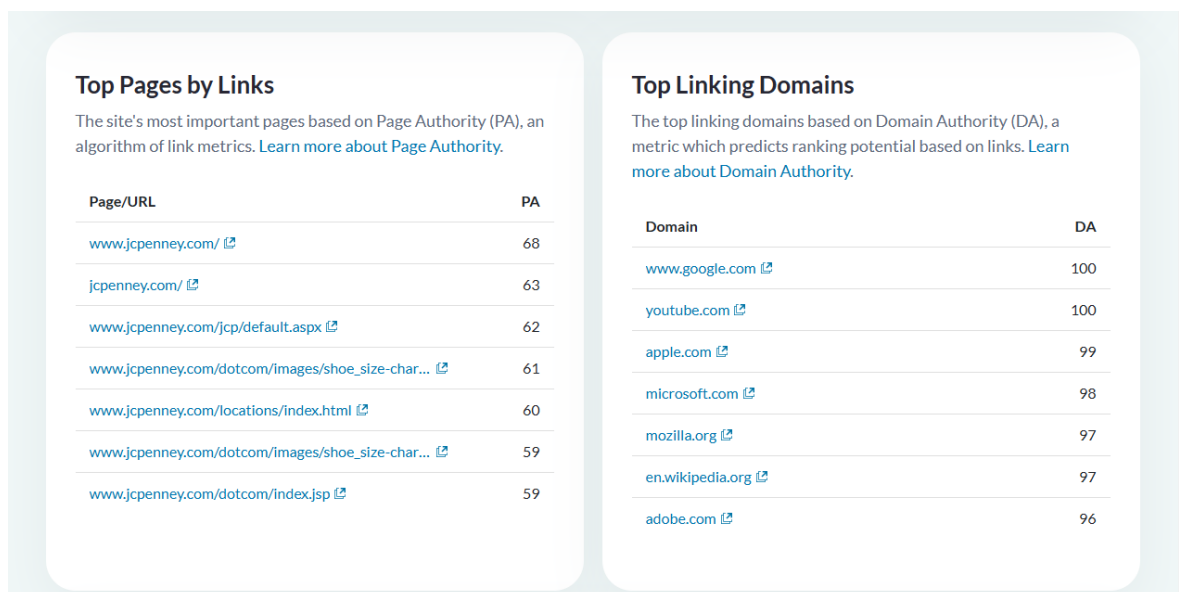


Figure 13: J.C.Penny Top Pages & Top Linking Domains. Source: Moz 2025

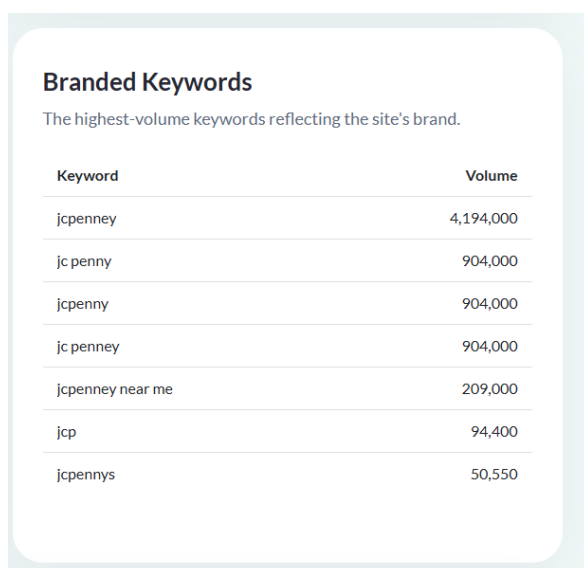


Figure 14: J.C.Penny Branded Keywords. Source: Moz 2025

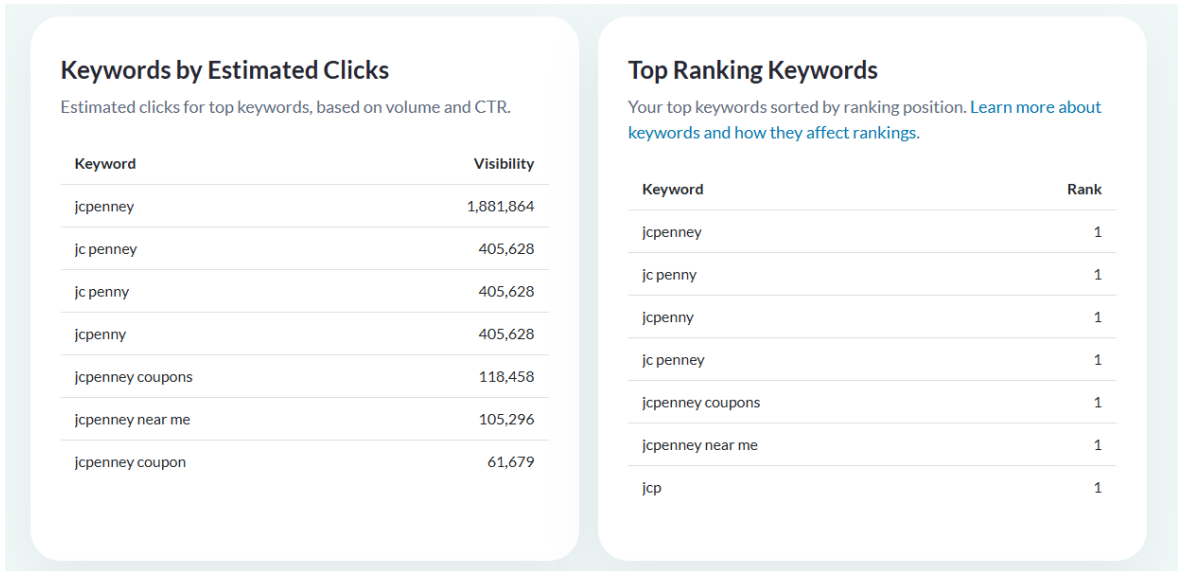


Figure 15: J.C.Penny Top Keywords by Estimated Clicks & Ranking. Source: Moz 2025

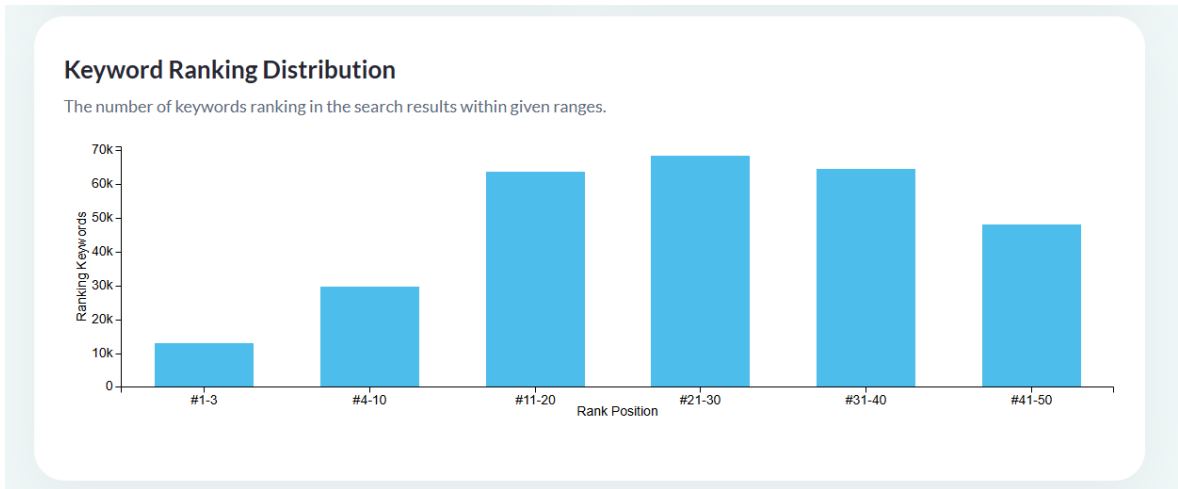


Figure 16: J.C.Penny Keyword Ranking Distribution. Source: Moz 2025

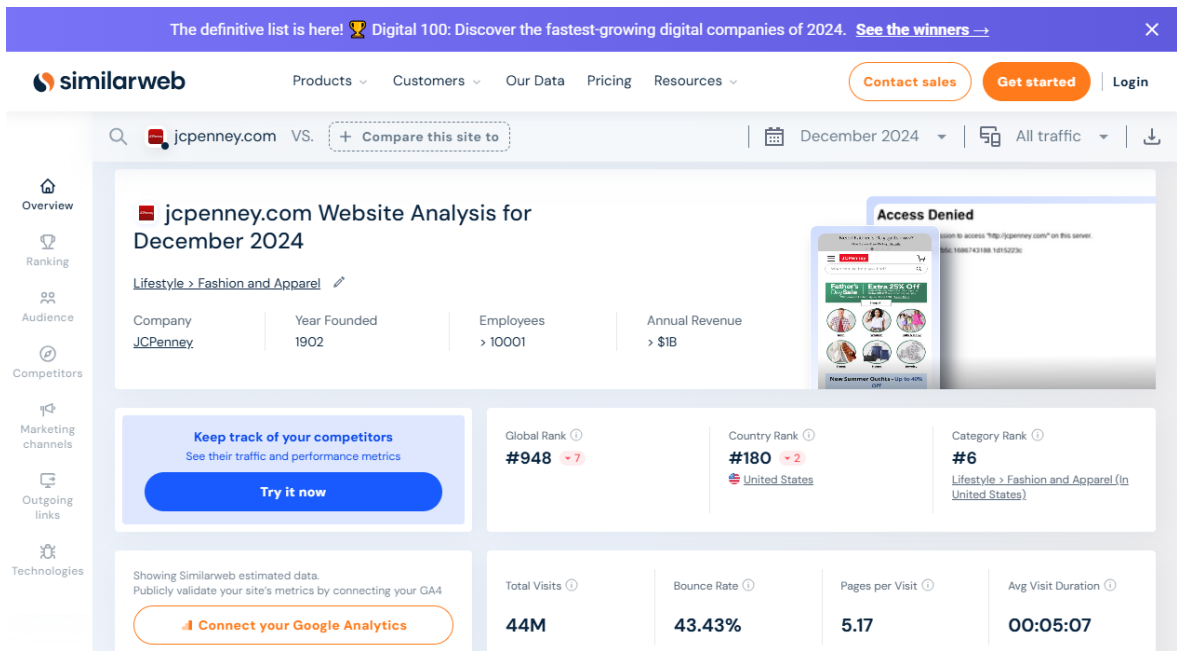


Figure 17: J.C.Penny Total Site Visits & Bounce Rate. Source: Similarweb 2025

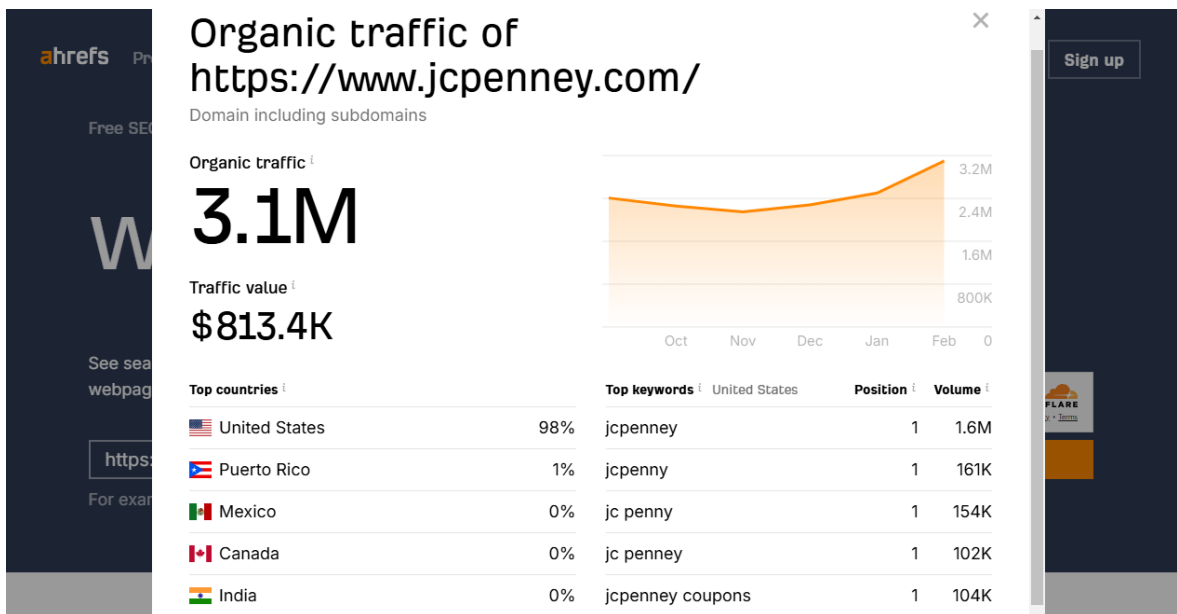


Figure 18: J.C.Penny Organic Traffic. Source: Ahrefs 2025

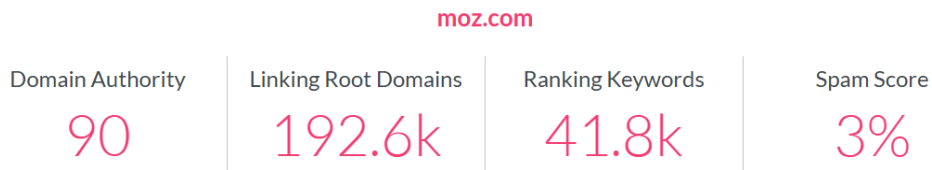


Figure 19: Moz DA, Linking Root Domains, Ranking Keywords & Spam Score. Source: Moz 2025

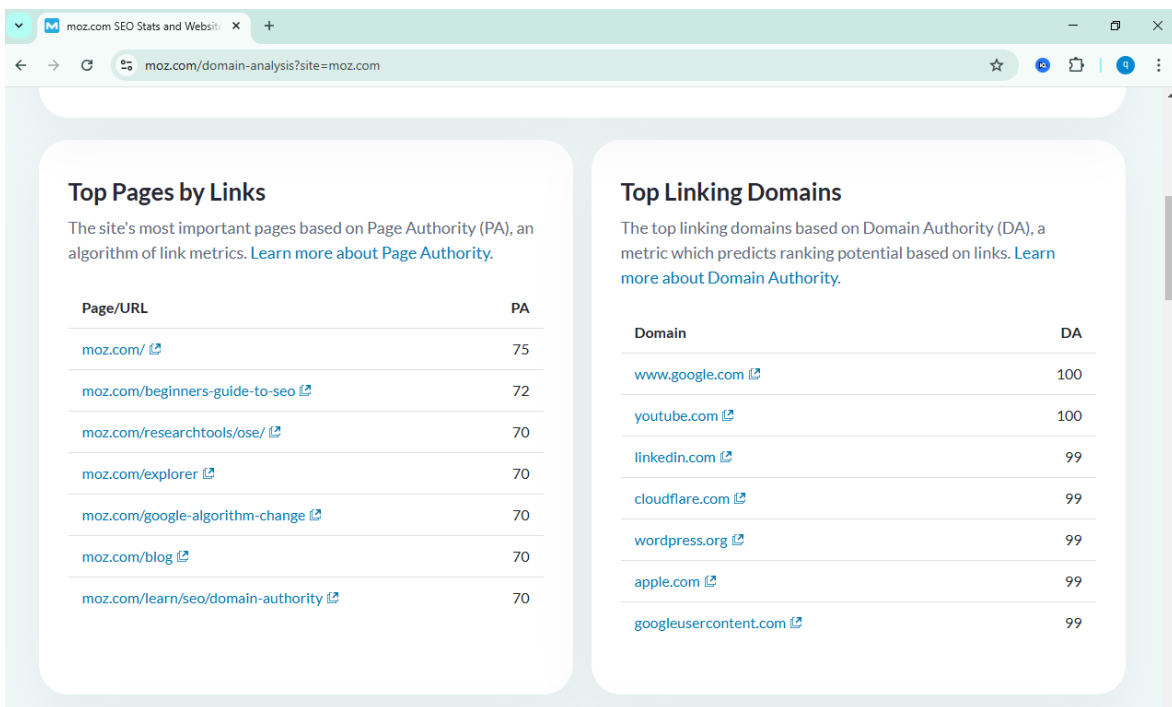


Figure 20: Moz Top Pages & Top Linking Domains. Source: Moz 2025

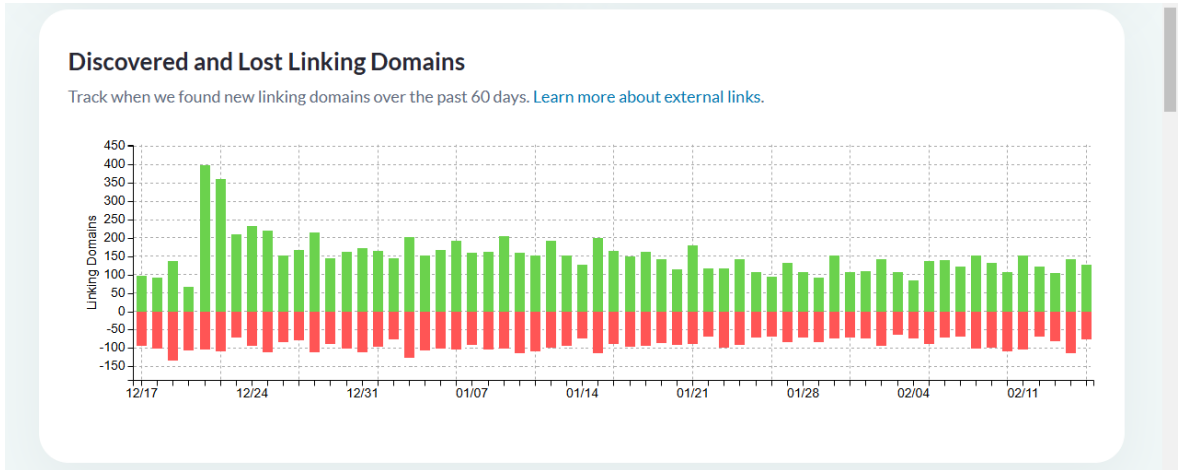


Figure 21: Moz Discovered & Lost Linking Domains. Source: Moz 2025

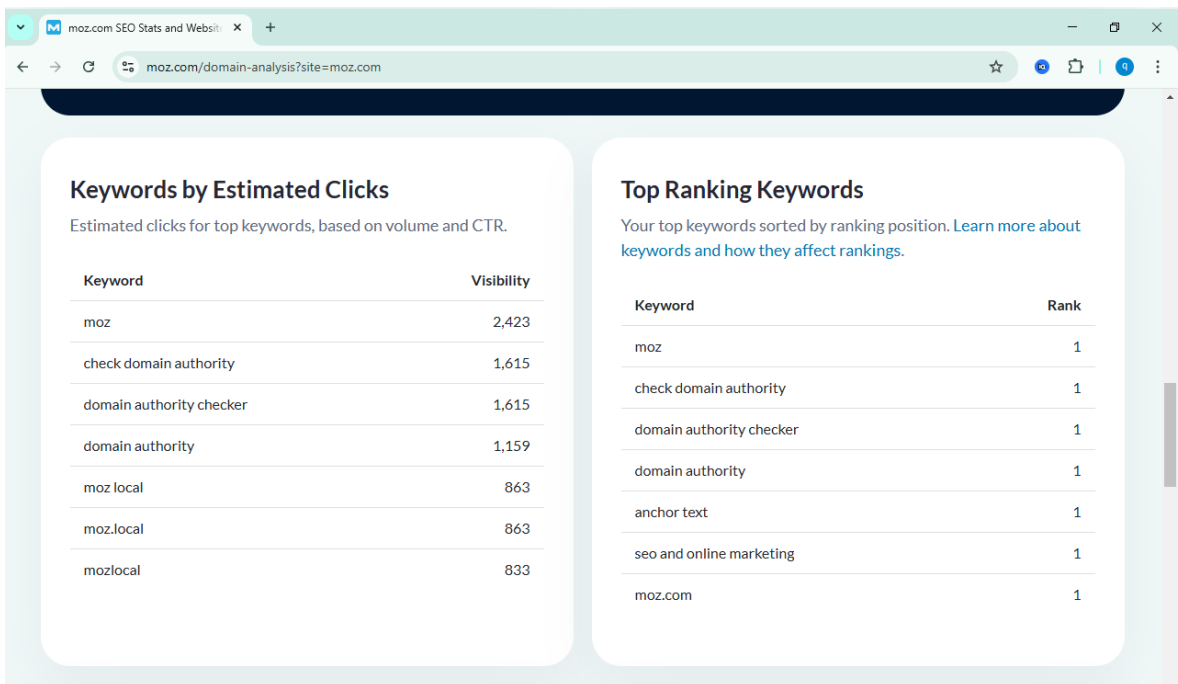


Figure 22: Moz Top Keywords by Estimated Clicks & Ranking. Source: Moz 2025

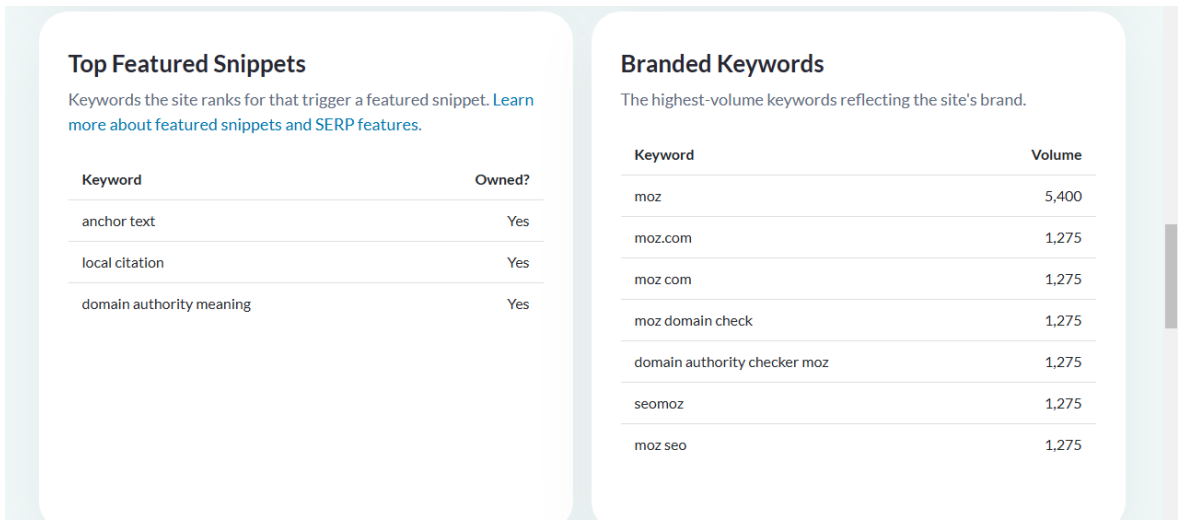


Figure 23: Moz Top Featured Snippets & Branded Keywords. Source: Moz 2025

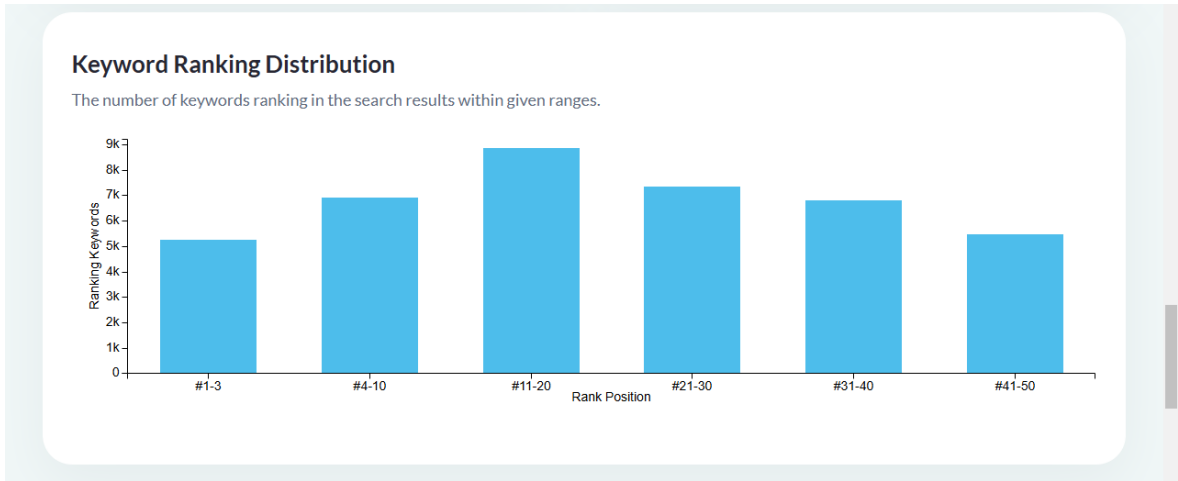


Figure 24: Moz Keyword Ranking Distribution. Source: Moz 2025

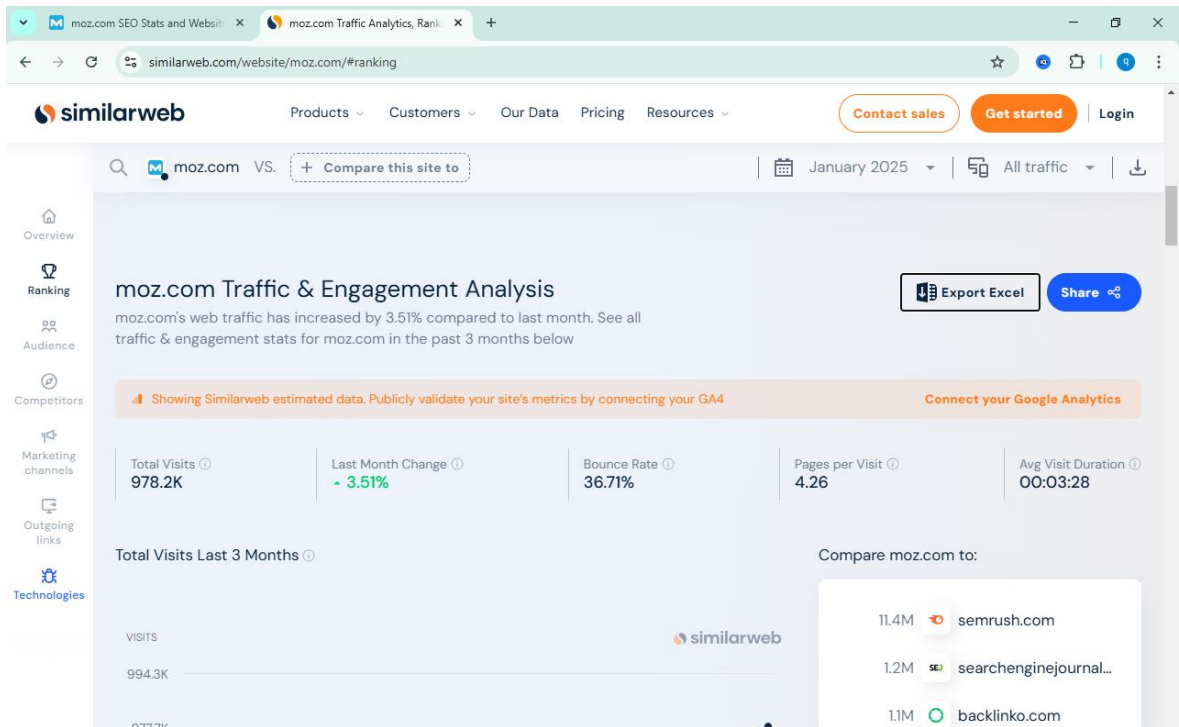


Figure 25: Moz Total Site Visits & Bounce Rate. Source: Similarweb 2025

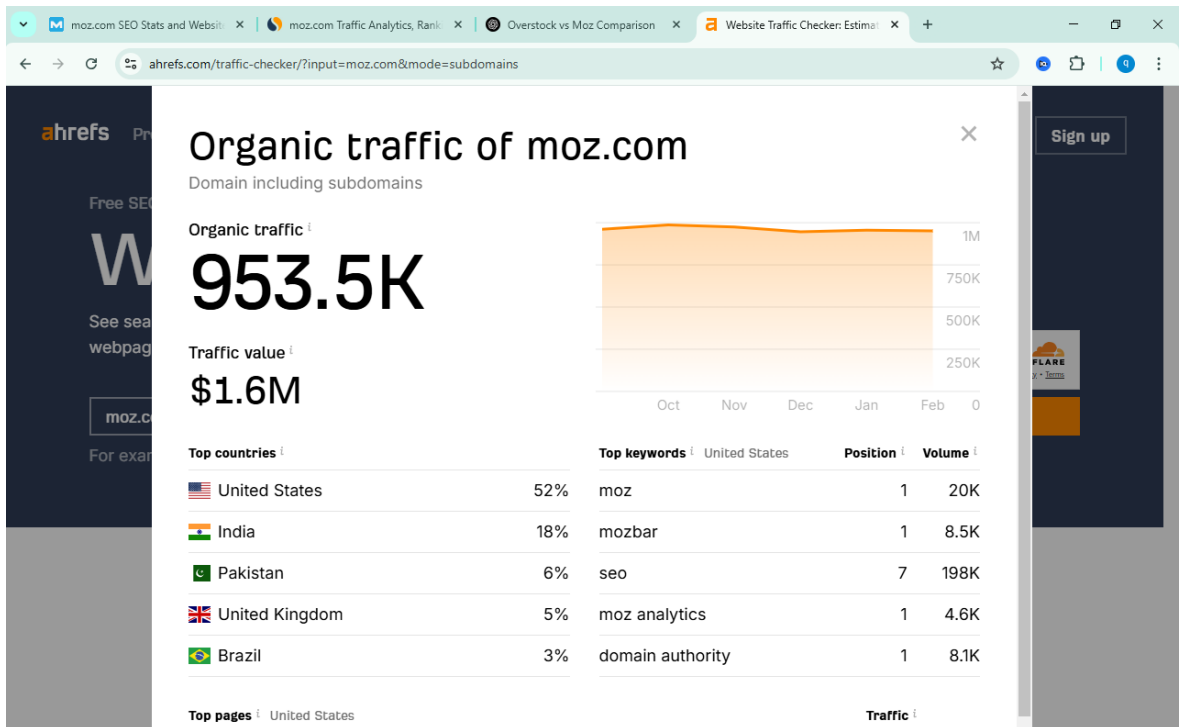


Figure 26: Moz Organic Traffic. Source: Ahrefs 2025

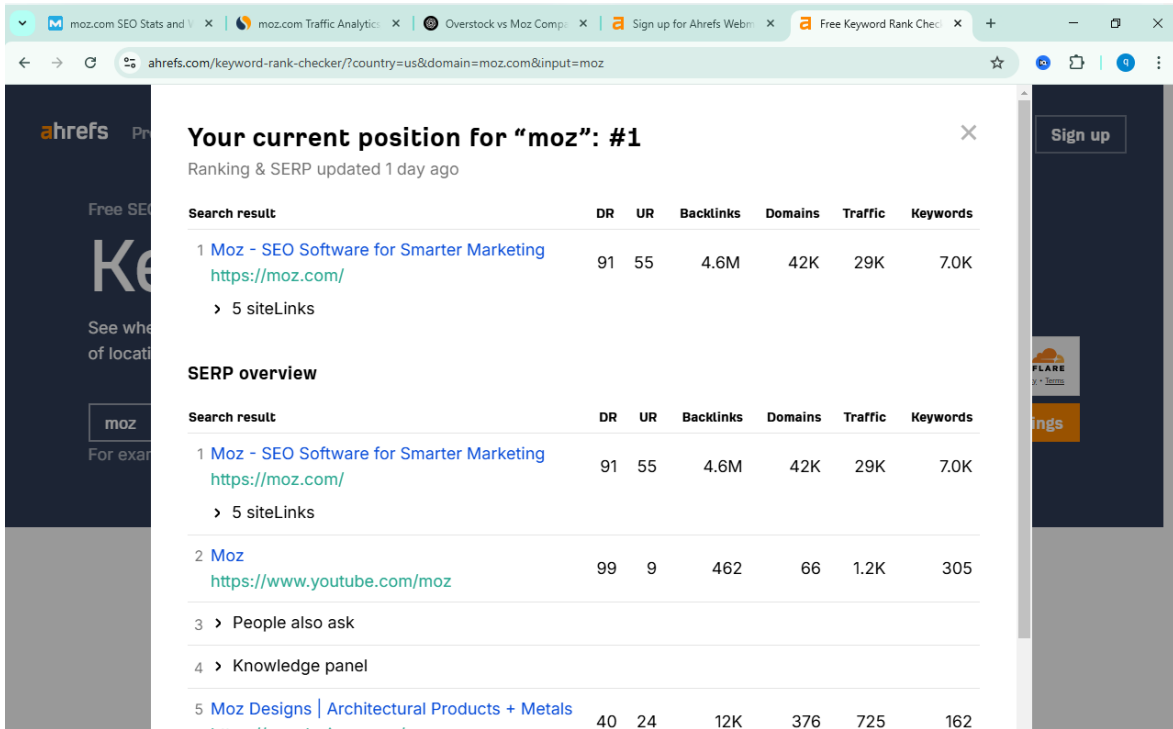


Figure 27: Moz Ranking & SERP. Source: Ahrefs 2025

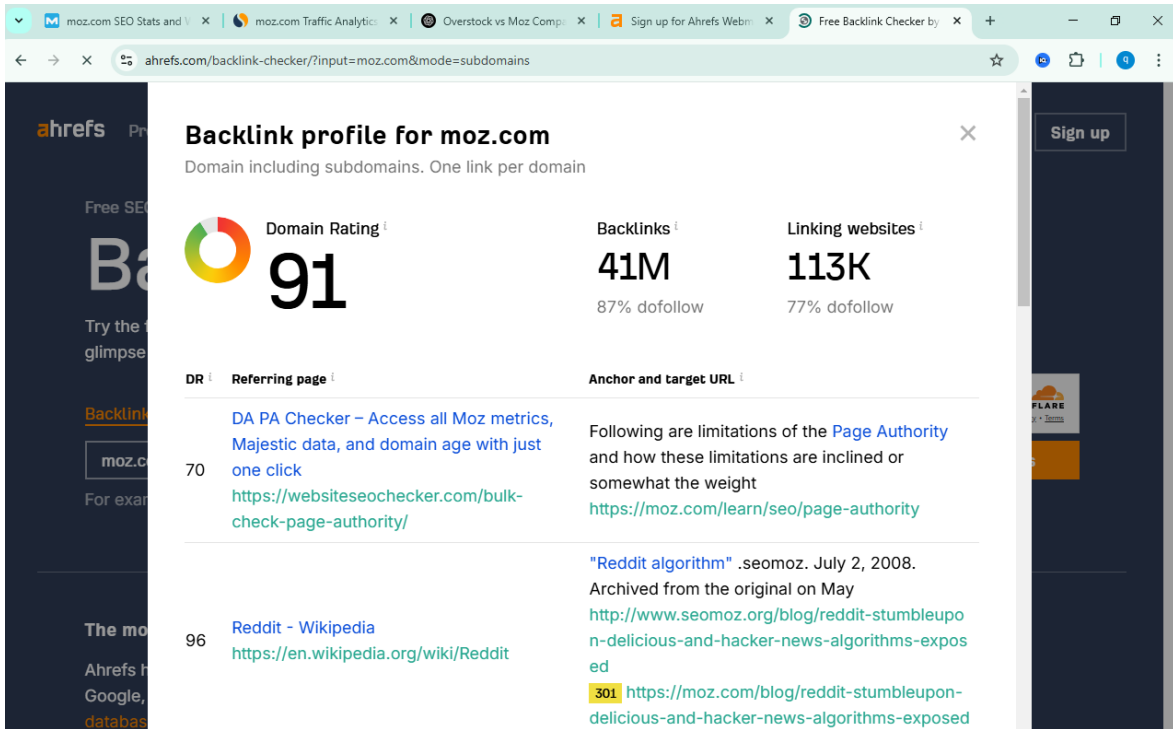


Figure 28: Moz Backlink Profile. Source: Ahrefs 2025

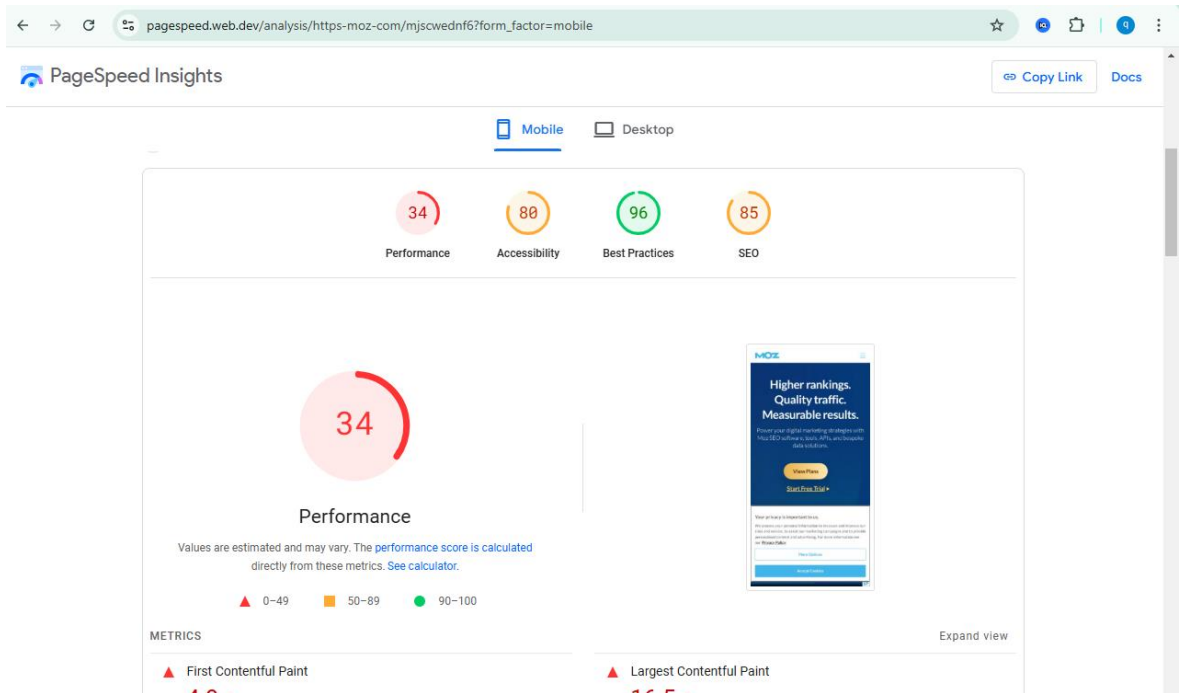


Figure 29: Moz Website Speed Mobile. Source: Page Speed Insights

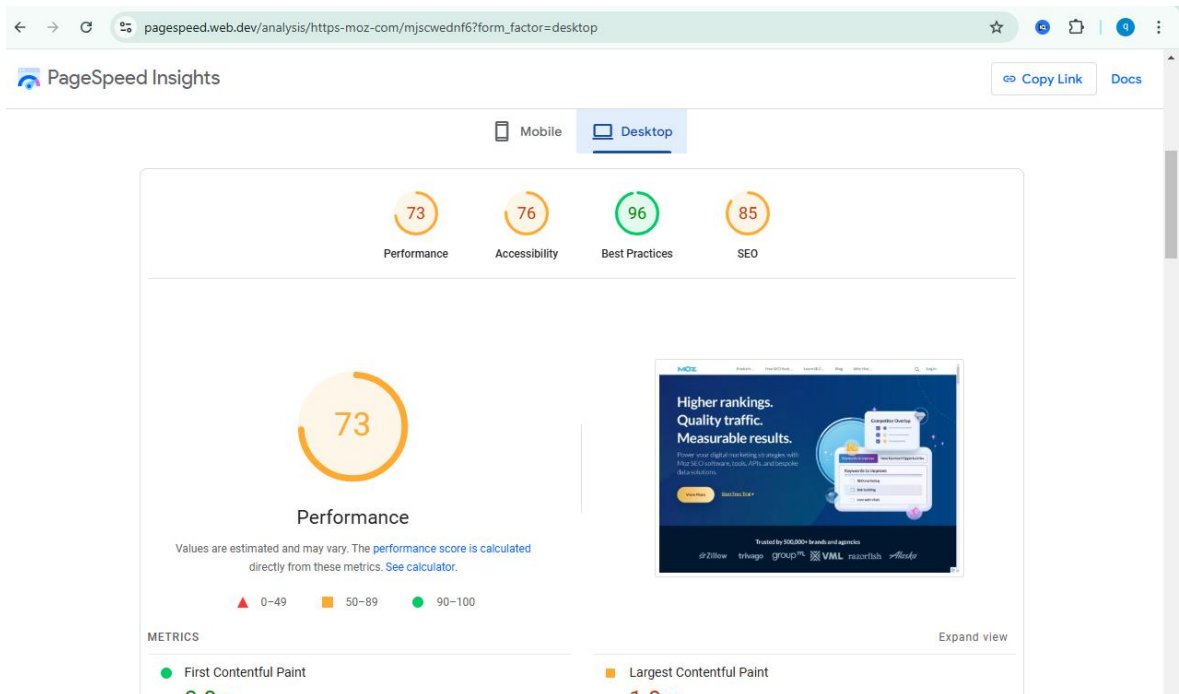


Figure 30: Moz Website Speed Desktop. Source: Page Speed Insights

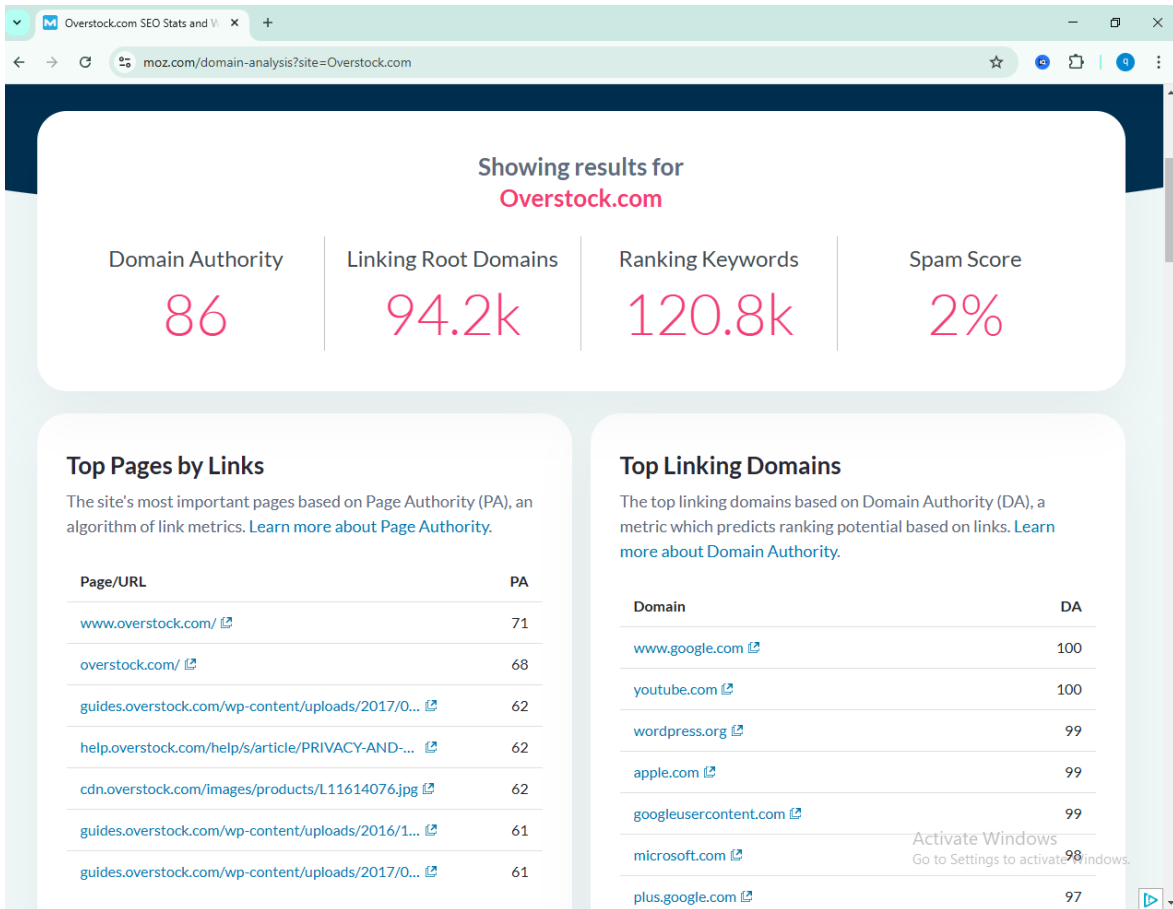


Figure 30: Overstock DA, Linking Root Domains, Ranking Keywords, top pages by links & Spam Score. Source: Moz 2025

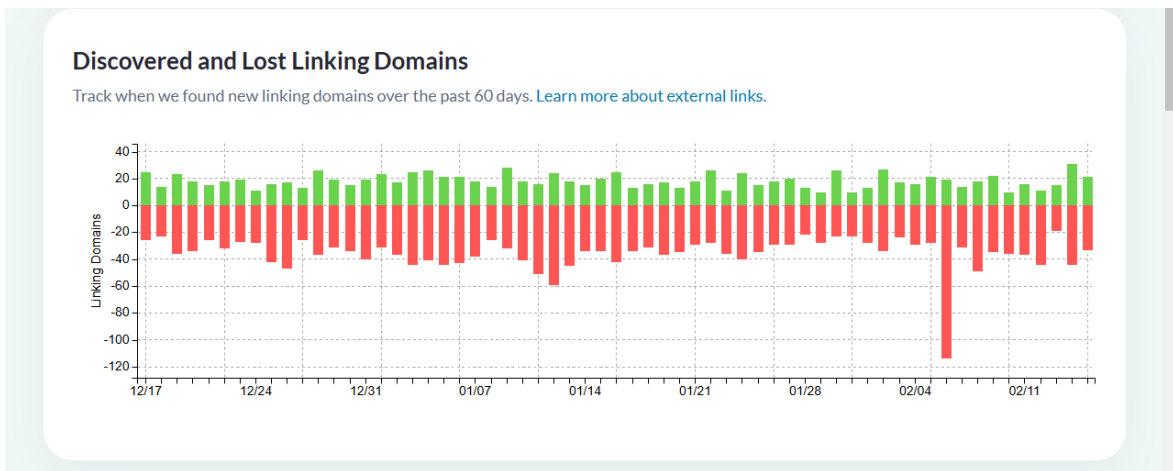


Figure 32: Overstock Discovered & Lost Linking Domains. Source: Moz 2025

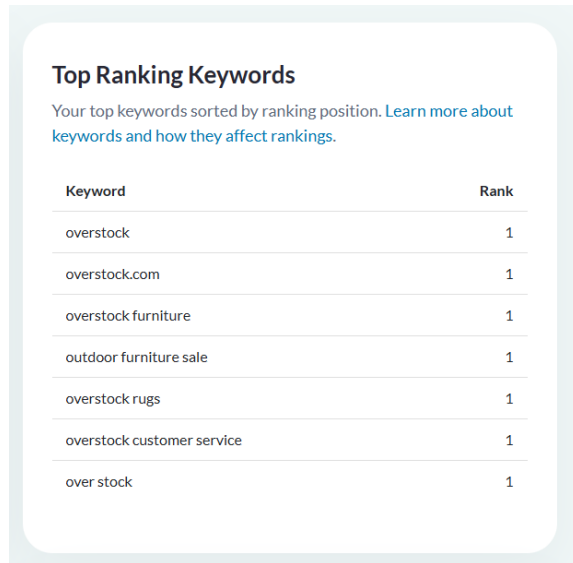


Figure 33: Overstock Top Ranking Keywords. Source: Moz 2025

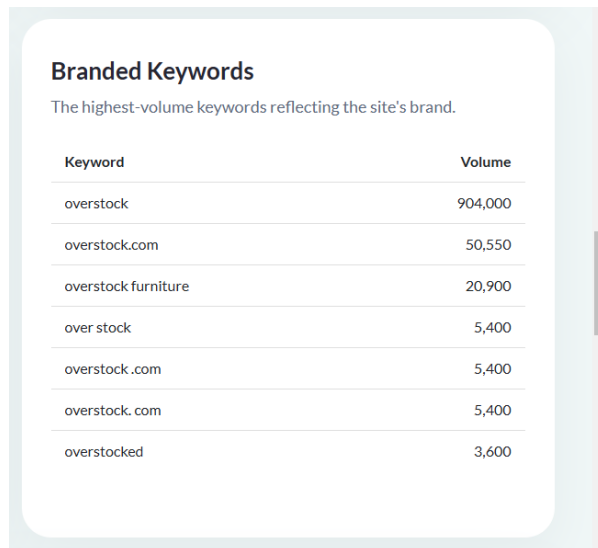


Figure 34: Overstock Branded Keywords. Source: Moz 2025

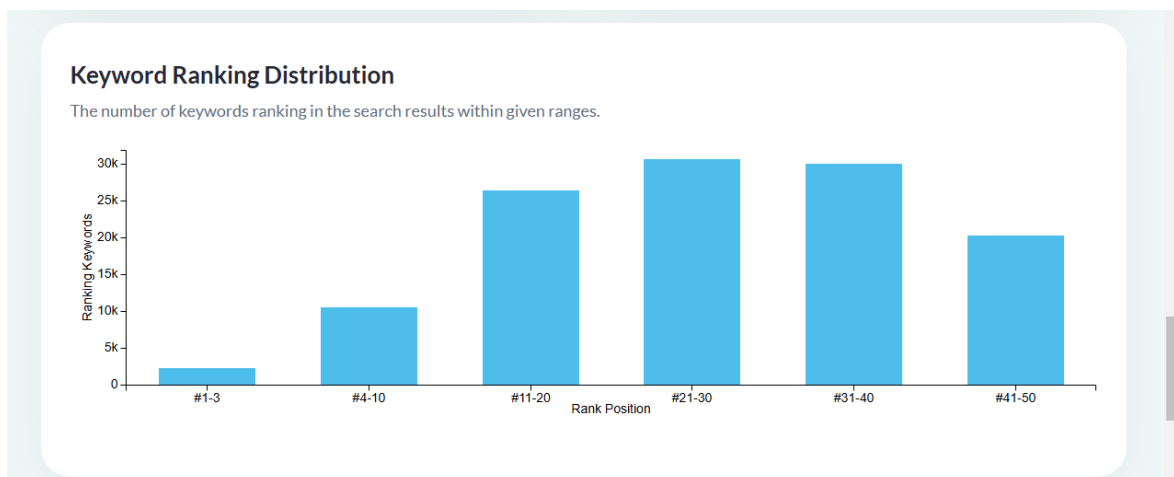


Figure 35: Overstock Keywords Ranking Distribution. Source: Moz 2025

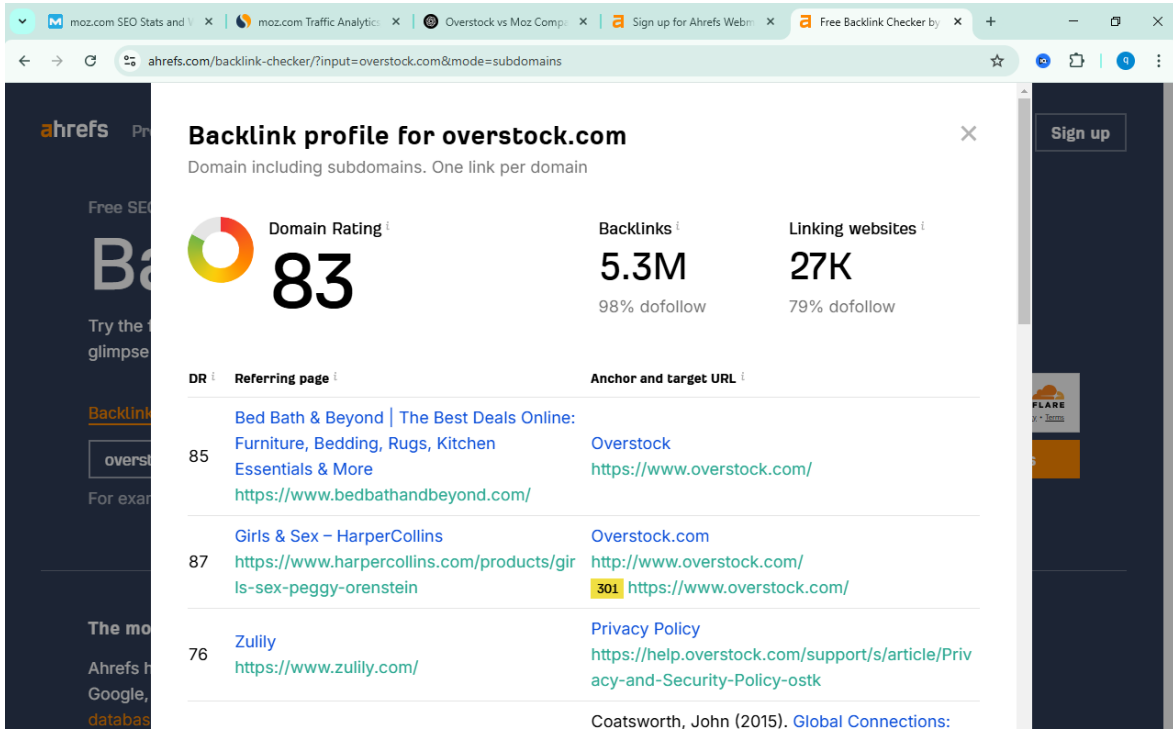


Figure 36: Moz Backlink Profile. Source: Ahrefs 2025

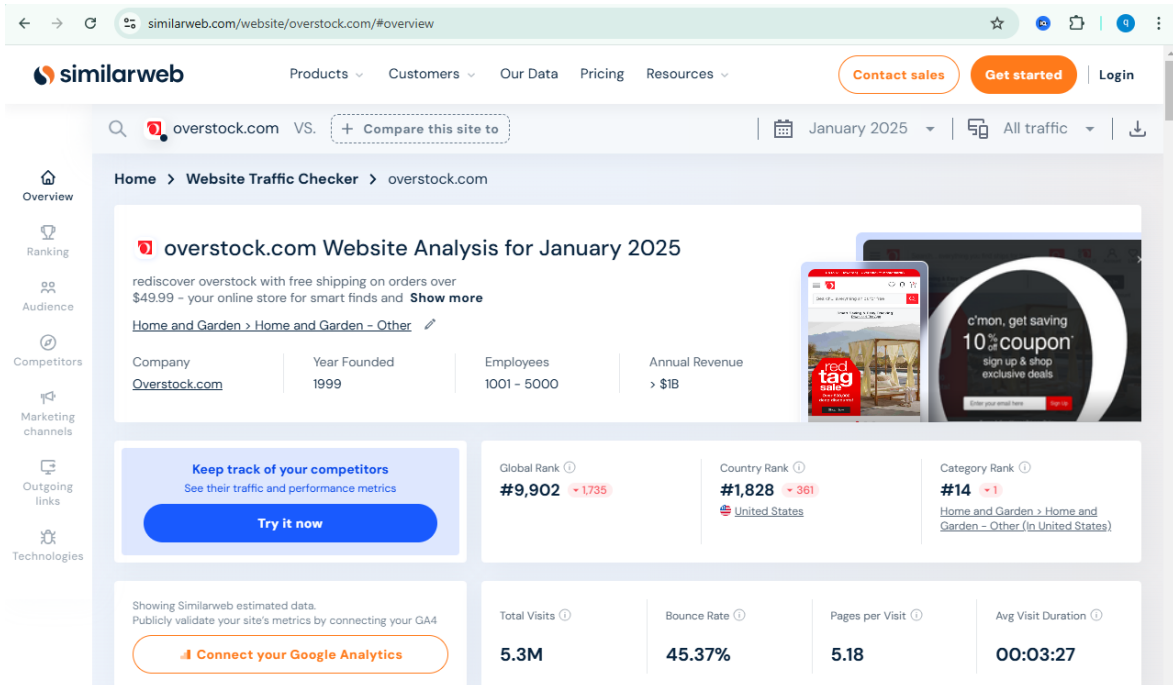


Figure 37: overstock Total Site Visits & Bounce Rate. Source: Similarweb 2025

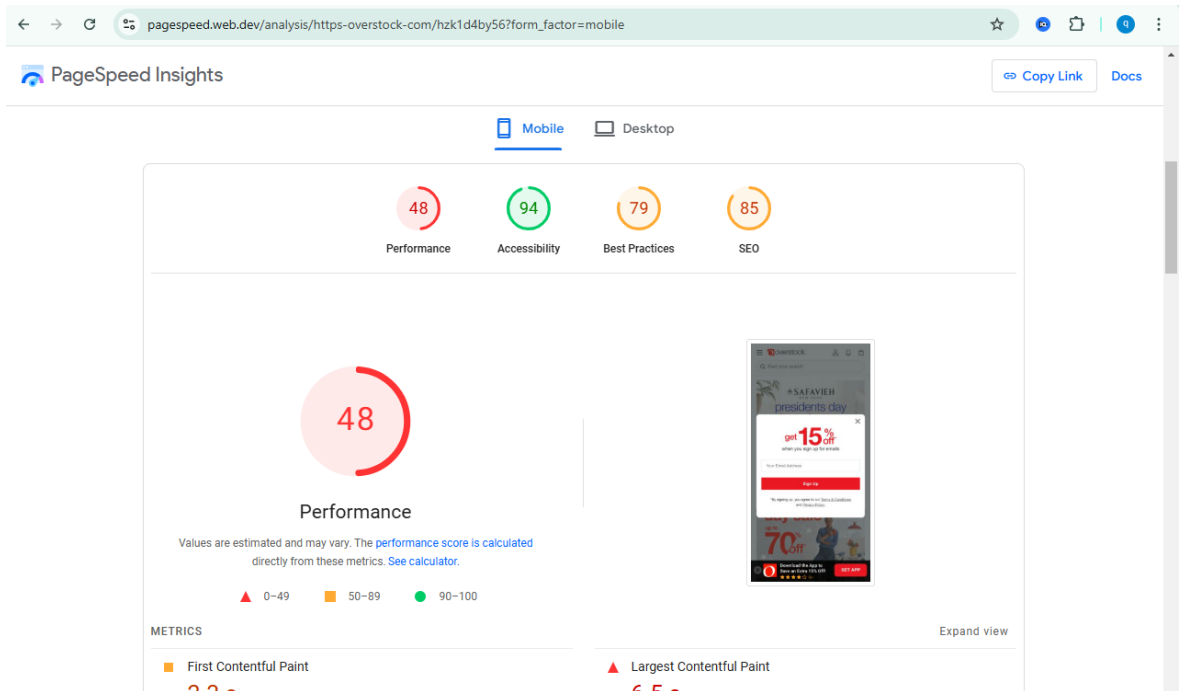


Figure 38: Overstock Website Speed Mobile. Source: Page Speed Insights

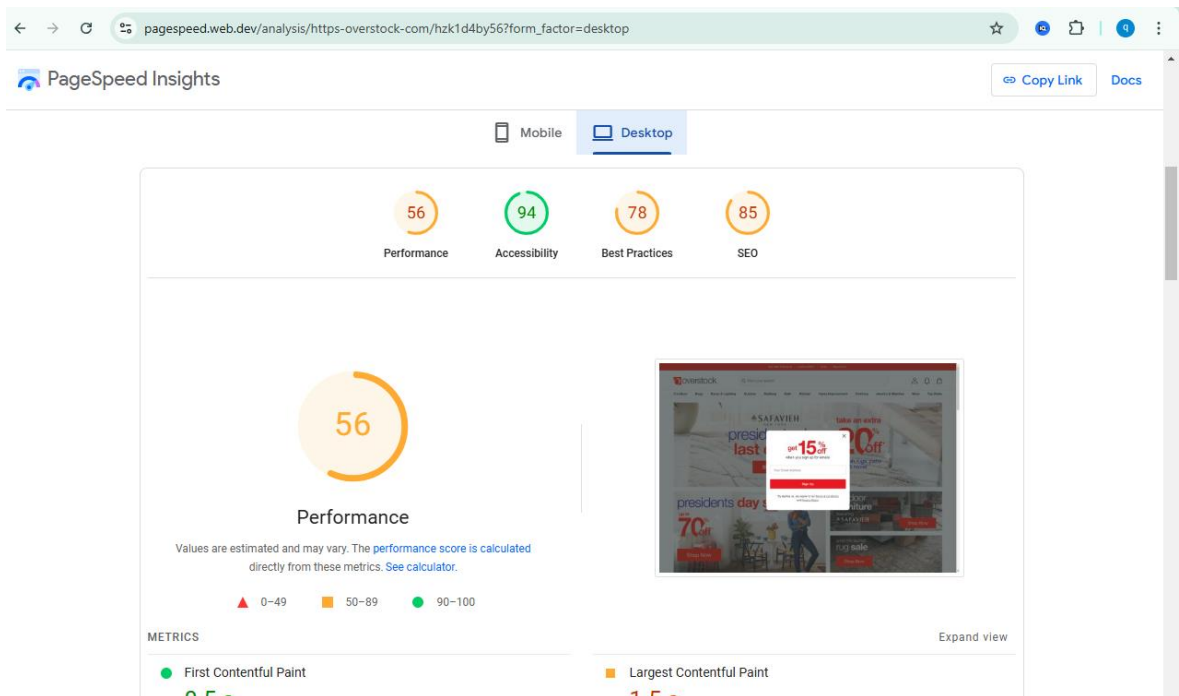


Figure 39: Overstock Website Speed Desktop. Source: Page Speed Insights

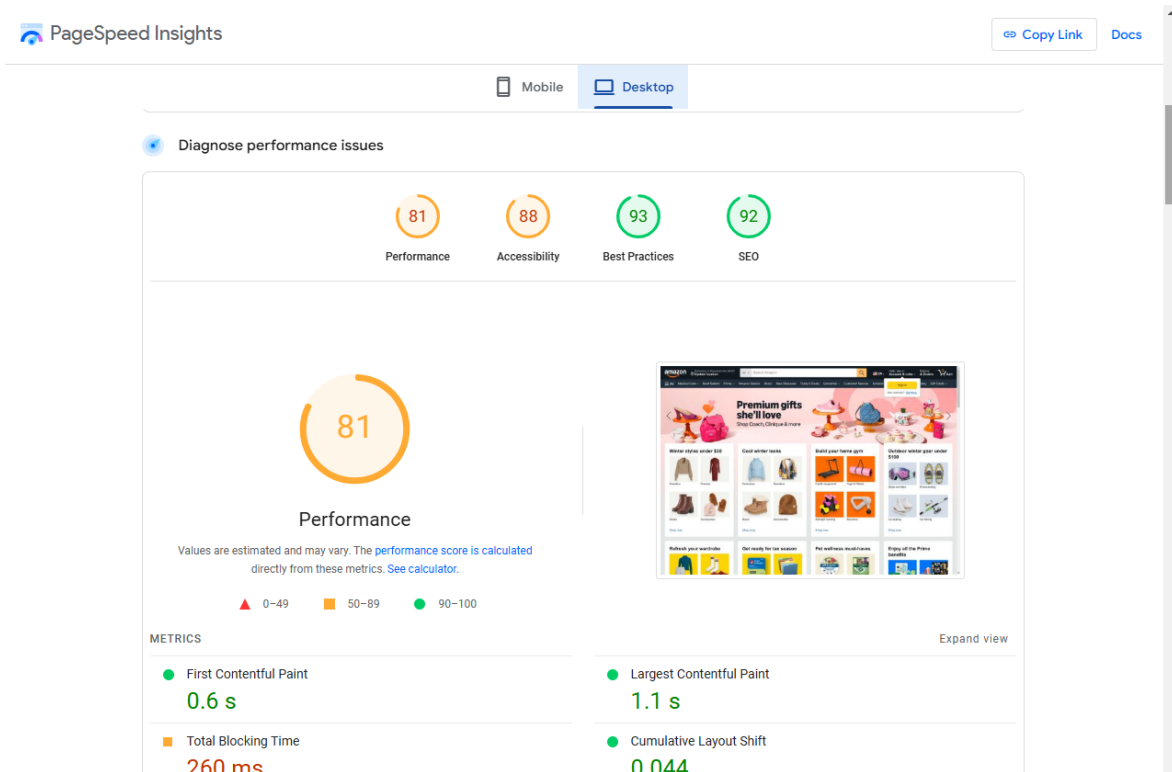


Figure 40: Amazon Website Speed Desktop. Source: Page Speed Insights

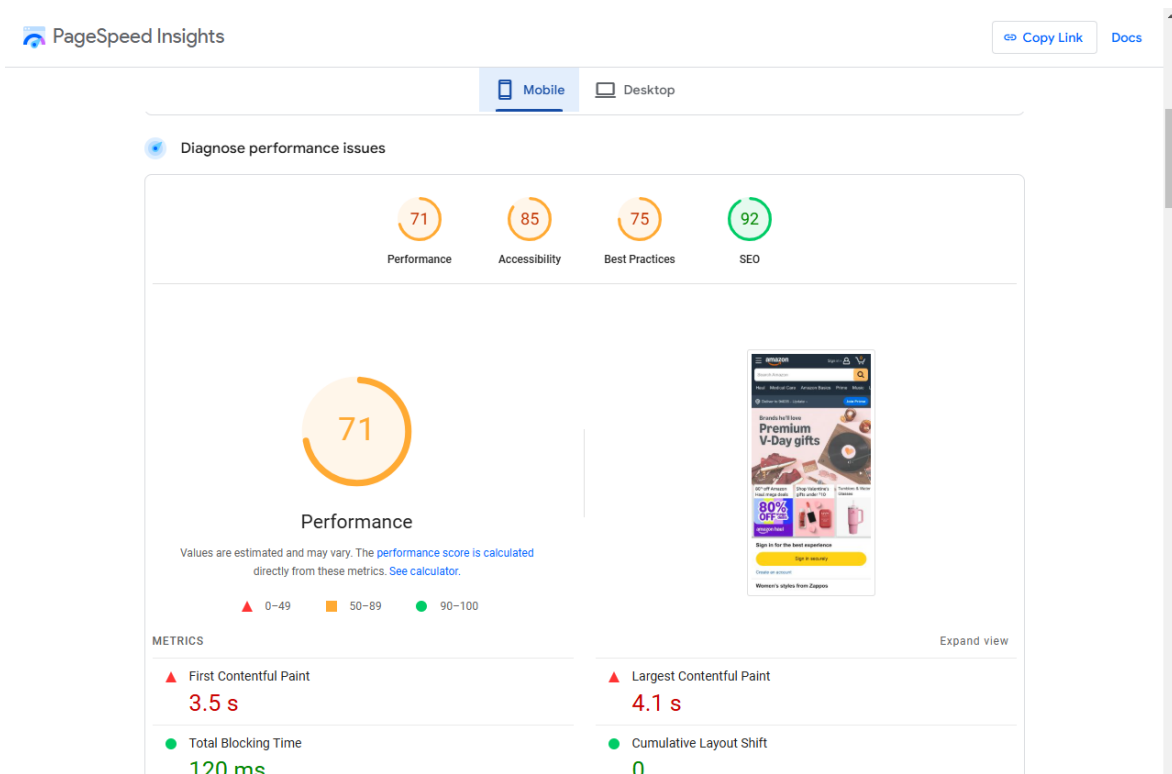


Figure 41: Amazon Website Speed Mobile. Source: Page Speed Insights

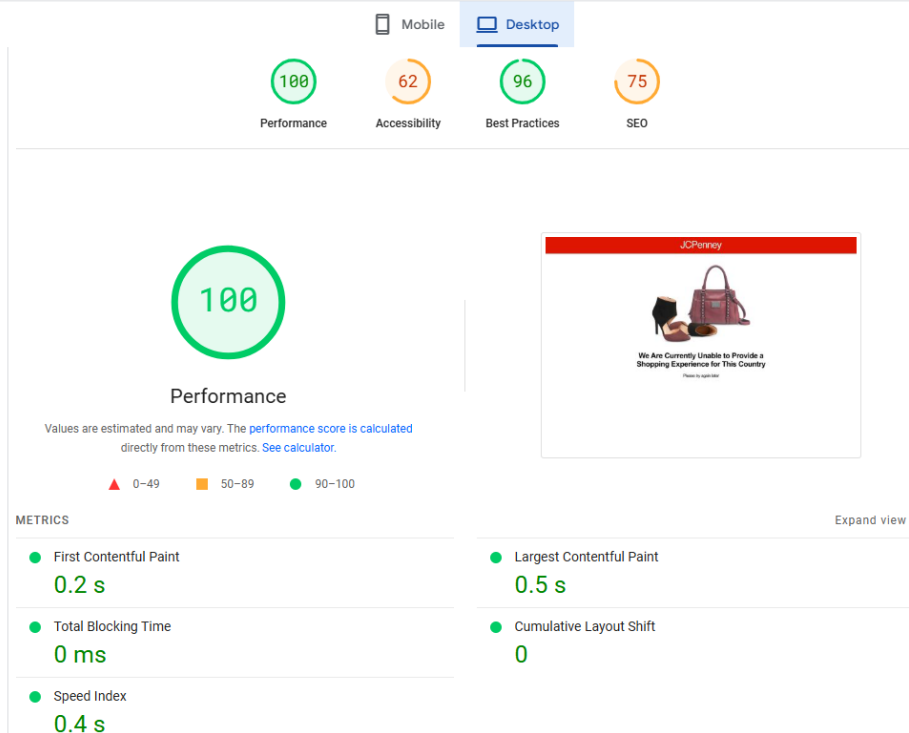


Figure 42: J.C.Penny Website Speed Desktop. Source: Page Speed Insights

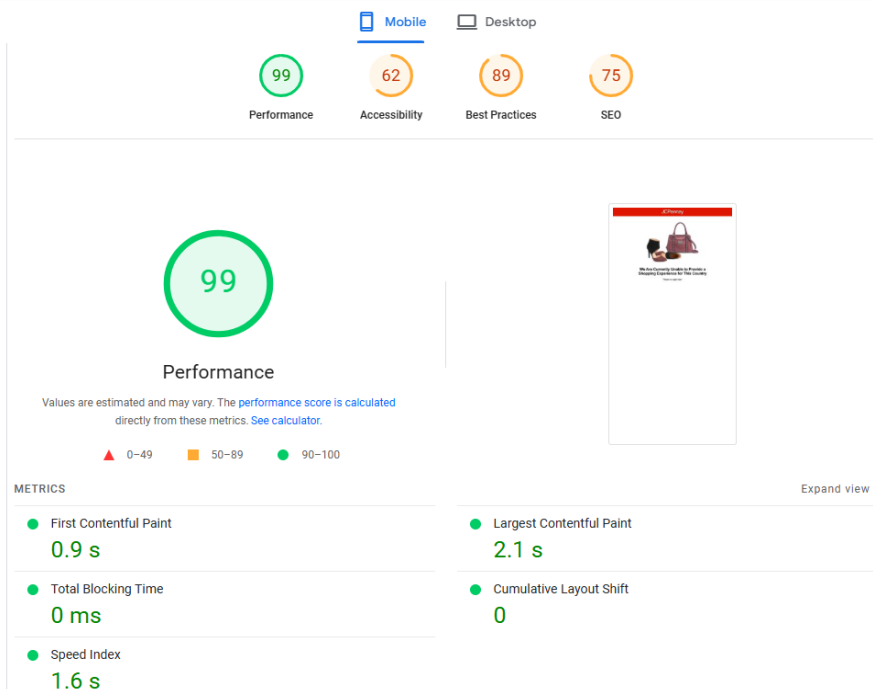


Figure 43: J.C.penny Website Speed Mobile. Source: Page Speed Insights