

How Search Engine Optimization (SEO) Grew From Nascent Stages to AI

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Abstract

The journey of search engine optimization (SEO) from its nascent stage to the present day has been remarkable. Emerging alongside the proliferation of search engines, SEO quickly became an indispensable tool for businesses and marketers striving to enhance their online visibility, attract traffic, and improve rankings. However, as search algorithms advanced, SEO professionals encountered a dynamic landscape marked by evolving trends and new obstacles. For this reason, over time, the factors influencing website ranking have undergone a significant expansion, evolving from a limited set to a multifaceted array. Specific components, such as high-quality backlinks, mobile optimization, local SEO strategies, integration with social media platforms, and the optimization of user experience, have emerged as pivotal determinants of SEO success. These elements assume a critical role in achieving elevated rankings and heightened visibility across search engines, thereby shaping the contemporary landscape of SEO practices. More recently, as search engines and SEO evolve in sophistication, Artificial Intelligence (AI) has found relevance in its integration into SEO. This involvement of AI amidst its benefits, also introduced new challenges and ethical dilemmas into the discussion on search engine optimization (SEO). SEO strategies must exhibit adaptability to maintain efficacy in driving visibility, traffic, and revenue. It is crucial to strike a balance between data-driven decision-making and empathetic marketing. Businesses shouldn't rely solely on AI to preserve the human touch in their marketing endeavors. Hence, navigating the ever-changing terrain of SEO requires marketers and SEO experts to remain attuned to emerging trends and adept at adapting strategies to meet evolving challenges. By leveraging the diverse array of factors influencing SEO success, businesses can enhance their online presence and effectively engage with their target audience in the competitive digital landscape. For this reason, ethical considerations, including data privacy and customer trust, mustn't be side-lined in favor of optimization. Prioritizing ethical practices over all else safeguards the integrity of SEO efforts amidst AI integration.

Keywords: Search engine, Search engine optimization, SEO strategies, Artificial Intelligence, AI integration

1. Introduction

In today's digital world characterized by rapid technological advancements, securing a prominent online presence especially on search engines emerges as a non-negotiable necessity for individuals, their personal brands and corporate business alike. Central to bolstering this visibility is the operation of SEO (in full Search Engine Optimization), which adopts a strategic stance to elevate a website's positioning on Search Engine Results Pages (SERPs). Fundamentally, SEO encompasses a diverse array of methodologies and practices aimed at fine-tuning a website's content, framework, and prominence, thereby augmenting its

relevance and standing within the purview of search engine algorithms (Veglis & Giomelakis, 2019; Ziakis et al., 2019). At its core of its operation, SEO involves the process of employed in enriching a website's visibility and standing on search engine results pages via organic traffic rather than paid avenues (usually advertising). This intricate process entails a series of strategies and tactics meticulously crafted to enhance a website's relevance, authority, and credibility in the sharp eyes of prominent search engines such as Google, Yahoo and Bing. Effective optimization necessitates the harmonization of both on-page and off-page elements to so as to foster greater influx of organic traffic to the website. This heightened traffic invariably produces results of elevated conversion rates, which originally is the strategic objective of a brand engaging search engine optimization. With this, its right to say, an increase in free/organic traffic leading to higher conversion rate is goals achieved (Drew Fortin, 2023; SearchEngineLand, 2023). The ultimate aim of the optimization endeavour is to attract a pool of visitors from search engines, thereby so as to boost the expansion of the company's pool of prospects, leads, and sales. According to research conducted by Kisiel in 2010, the efficacy of SEO is gauged based on its capacity to augment a company's prospects, leads, and sales. Dou et al. in 2010 further underscore the benefits accruing to companies that maintain commendable positions in search results through SEO, noting a pronounced enhancement in the branding of their products or services (Dou et al., 2010; Kisiel, 2010).

The importance of SEO in the digital age cannot be overstated. With conducted daily searches amounting to billions on Google alone (the current most popular search engine), understanding the principles as well as intricacies of SEO is very needful. For instance, organic search traffic, which comes free with effective SEO, delivers leads of higher quality than paid advertising, making SEO a more cost-effective marketing option. Moreover, effective SEO strategies ensure prominent website feature on search engine results pages (SERPs), ahead of competitors. In today's fiercely competitive industry, investing in such strategies is crucial to gain a competitive advantage. A high-ranking position on SERPs can significantly impact website traffic, brand visibility, and revenue generation. As such, businesses must understand the need for having a strong online presence, and thereby prioritize SEO as a vital component of their digital marketing strategy in this modern age (Digital Marketing Institute, 2021; Shibli, 2024). That being said, over the years, as search engine and search algorithms became more sophisticated, there has been a massive evolution of the entire concept of search engine optimization which has resulted in the integration and use of Artificial Intelligence (A.I) in SEO. The integration of AI-powered search engines has transformed and will continue to change the way SEO operates. With its ability to foster more accurate data-driven decision on SEO, the techniques and strategies that underline the operation of SEO has become more effective. Relevant to note though, is that the presence of AI in SEO did not surface without a share of challenges. This means that Web masters and SEO practitioners must remain vigilant to maintain the value of their SEO strategies in the face of future technological evolution (Yuniarthe, 2017).

The objective of this paper on How Search Engine Optimization (SEO) Grew from Nascent Stages to AI is to provide a comprehensive overview of the evolution of SEO, from its nascent stages to the integration of artificial intelligence (AI) technology. With the increasing importance of online presence and visibility, this paper aims to provide businesses, marketers, and entrepreneurs alike with the knowledge and tools they need to stay on top of the ever-changing SEO landscape. This scope of the paper will begin by providing an in-depth definition of SEO, highlighting its essential role in digital marketing. Then, it will move on to provide a historical overview of SEO, followed by an analysis of each of its major phases. This analysis will include its early strategies for ranking websites, the rise of keyword optimization, the era of link building, and the shift towards content quality. The paper will also discuss the influence of

mobile optimization, local SEO, and the integration of social media as it relates to SEO. Finally, this paper will address the integration of artificial intelligence into the SEO landscape, which marks a significant shift in the approaches and applications of SEO. The paper will conclude with a discussion of the ethical considerations surrounding SEO and a future outlook of SEO in an AI-driven world.

2. Historical Overview of SEO

The proliferation of online users owes much to the evolution of search engines and Search Engine Optimization (SEO). A review on this evolution of SEO shows that originally, SEO focused solely on HTML code, but has since undergone a significant transformation to keep pace with the increasingly complex algorithms of search engines. These algorithms now incorporate various ranking signals, such as domain authority, links, local signals, social signals, and site quality, among others. To fully understand the history of SEO, it is vital to grasp its old state, current state and future direction. Well, search engine itself first emerged from the necessity to navigate web servers and locate specific files on the Internet, which was initially a network of File Transfer Protocol (FTP) sites. As the number of web servers grew, the World Wide Web became the primary means of accessing the Internet, accentuating the need to organize distributed data stored in FTP web servers. Hence, the first search engine, Archie, was developed in 1990 by Alan Emtage, a student at McGill University in Montreal. Archie indexed computer files on anonymous FTP websites within a network of computers, marking a significant milestone in search engine development (Jackson, 2016).

The earliest iterations of SEO emerged alongside the inception of the first search engines in the early 1990s. However, it wasn't until the rise of the World Wide Web and the proliferation of e-commerce websites that SEO began to garner significant attention. This era witnessed webmasters aggressively promoting their online ventures, recognizing the potential of search engines in attracting visitors and driving profits (Bezovski, 2015). Sullivan, often hailed as the father of SEO, transitioned from a career in journalism to website development. Alongside a colleague, he ventured into creating websites for clients, where he encountered the importance of search engine visibility first-hand. Furthermore, Danny Sullivan embarked on his ground-breaking work in search engine optimization (SEO) during the mid-1990s, collaborating with a friend to develop websites for clients. When one client expressed dissatisfaction with their site's search engine visibility, Sullivan delved into the issue, leading him to publish his insights on optimizing websites for search engines in a 1996 web article. This publication spurred the creation of his widely acclaimed website, "Search Engine Watch." Sullivan's contributions, including highlighting the importance of elements like the title tag and webpage content, continue to resonate in the SEO landscape today. Sullivan's subsequent exploration and revelations revolutionized the SEO landscape, prompting him to disseminate his findings through articles and websites to a broader audience. Additionally, the inaugural conference on search engine marketing and optimization, dubbed "Search Engine Strategies," was initiated by Danny Sullivan in 1999. Held annually ever since, this event convenes industry experts and search engine representatives. Its debut on November 18, 1999, in San Francisco, marked the formal interaction between website owners and search engine officials (Sullivan, 2006).



Fig. 1. Historical Landmarks of SEO

Furthermore, John Audette, considered one of SEO's founding figures, is credited with coining the term "search engine optimization" (SEO) during a meeting with Danny Sullivan in 1997. Audette, an early SEO practitioner, established MMG (Multi-Media Marketing Group) in 1995, offering services for website registration on existing search engines and directories. MMG was among the pioneering firms in the emerging field of search engine marketing. Bruce Clay, another early SEO pioneer, is also attributed to potentially coining the term around the same time. SEO, in its contemporary form, has evolved significantly from its early stages when search engine algorithms were non-existent. As websites and e-commerce platforms proliferated, SEO practitioners devised methods to enhance web page visibility in search results. Over time, the discipline progressed, incorporating novel ranking signals driven by intricate algorithms, encompassing domain authority, links, social signals, site quality, and more (Bezovski, 2015). As hinted earlier also, initially, search engine optimization (SEO) was straightforward; webmasters merely needed to register their sites with search engines, and they would appear in search results after being crawled by automated indexing systems known as web spiders. However, with the exponential growth of web pages and sites, there arose a necessity to rank results based on specific criteria and display the most relevant ones, leading to the inception of the first search algorithms. These algorithms primarily relied on metadata, particularly meta-tags like Meta keywords and Meta description, to describe webpage content. Webmasters manually embedded these tags into HTML code, which indexing robots would read, thereby making search results heavily reliant on the information provided by webmasters. In 1994, the introduction of software packages for automatic site registration in search engines revolutionized the SEO landscape. During this era, the sorting of a limited number of web pages was based on categorization, where sites were registered into different categories and retrieved accordingly. However, as the internet expanded rapidly, the necessity to rank results based on specific criteria prompted developers to explore alternative approaches. Developers continually seek innovative methods to influence search results in their favour, leveraging new ranking factors such as site title tags, keyword density, and image naming. Search engines engage in an ongoing struggle against webmasters who embed

irrelevant data into HTML codes to attract more visitors to their pages. This longstanding battle between search engine optimizers and search engines has persisted over the years, with search engines striving to provide users with relevant content while webmasters endeavour to secure higher positions in search engine results pages. In response to this ongoing conflict, search engines have continuously enhanced their search algorithms, integrating additional ranking factors beyond Meta tags. These advancements have contributed to improvements in search results, albeit temporarily, as developers persist in discovering new strategies to circumvent the system (Bezovski, 2015). The Table below expresses the evolutionary journey so far of Search Engine and Search engine over the years.

Table 1 Evolution of Search Engine Optimization

SN	YEAR	TECHNOLOGY	USE CASE
1	1945	Hypertext	Conceptualized linking documents for information retrieval.
2	1990	Archie	Searched FTP servers for publicly accessible files. (Not SEO directly, but a precursor to web indexing.)
3	1993	World Wide Web Wanderer	The first web crawler, indexing websites and creating rudimentary search.
4	1994	Yahoo! Directory	Human-edited directory of websites categorized by topic, facilitating early web navigation.
5	1994	Web crawler	Automated software to discover and index web pages, forming the basis of modern search engines.
6	1996	BackRub	Analyzed backlinks to determine website importance, a foundational SEO principle.
7	1997	Ask.com	Question-and-answer search engine using natural language processing, influencing semantic SEO.
8	1998	Google	Search engine focused on relevancy based on backlinks and keyword analysis, marking a major shift in SEO practices.
9	1998	Meta Search Engine, Vertical Search	Combined results from multiple search engines or focused on specific niches, impacting SEO strategies for targeted audiences.
10	1999	All The Web	Another early web crawler indexing the entire web, contributing to the growth of SEO data and competition.
11	1999	AOL	Search engine integrated within the popular AOL platform, highlighting the importance of SEO for audience-specific platforms.
12	2005	RankBrain	Google's initial AI-powered ranking algorithm, considering user engagement and other factors beyond keywords.
13	2013	Hummingbird	Google's algorithm update emphasizing semantic understanding and natural language processing, impacting content optimization strategies.

14	2015	RankBrain Refinement	Continued development of RankBrain with deeper learning capabilities, further emphasizing user intent and context.
15	2017	BERT (Bidirectional Encoder Representations from Transformers)	Pre-trained language model used by Google for various tasks, including understanding search queries and content better.
16	2018	MUM (Multimodal Understanding Model)	Google's AI model able to process and understand information across different modalities like text, images, and video, potentially impacting SEO for rich content.
17	2019	GPT-3 (Generative Pre-trained Transformer 3)	Large language model from OpenAI capable of generating human-quality text, potentially influencing content creation and optimization for search engines.
18	2023	LaMDA (Language Model for Dialogue Applications)	Google's factual language model able to engage in open-ended, informative conversations, potentially shaping future search interactions and SEO strategies.

3. The Rise of Keyword Optimization

Search engine optimization (SEO) has come a long way since its nascent stages. On this nascent stages of the internet, ranking websites on search engines was a straightforward affair, primarily reliant on keyword optimization. However, the landscape has since evolved dramatically, with search engine optimization (SEO) traversing a long and transformative journey. Thus, as search algorithms evolved, the emphasis shifted towards more sophisticated ranking factors beyond mere keyword density. As time went on, keyword optimization, once a legitimate strategy aimed at enhancing search engine understanding of website content, soon morphed into a battleground of manipulation tactics. Marketers, eager to exploit this tactic, engaged in keyword stuffing, saturating web pages with unnaturally placed keywords in a bid to game the system. This practice, known as "keyword stuffing," marred the integrity of search results, distorting the relevance of websites to users' queries. As the 2000s dawned, search engines realized the nefarious ease with which keyword stuffing could be employed. From the shadows of meta tags to the depths of hidden text, webmasters wielded keywords with abandon, heedless of relevance. However, Google wasn't about to let its search results be overrun by keyword-stuffed mediocrity. In a bold move, Google initiated a sweeping crackdown on keyword manipulation and spam content, ushering in a new era of algorithmic scrutiny. But the game wasn't over yet; it was just beginning (Stern, 2015). Google, the search giant, wasn't satisfied with merely combating keyword manipulation; it sought to revolutionize the landscape. Through relentless algorithm updates, like the infamous Panda and Penguin, Google unleashed its arsenal against black-hat SEO tactics, signalling a seismic shift in digital strategy. These updates weren't just patches; they were seismic shifts, aimed at reshaping the very fabric of online search. The

Panda update, which was delivered, tailored to target websites with thin, lacklustre content and those resorting to keyword stuffing techniques, was just one facet of Google's broader mission to enhance search quality. This surge in backlinks wasn't just a numbers game; it was a testament to the newfound emphasis on quality content. As webmasters and SEO experts saw that Google wasn't joking about the black-hat practices, adapted acceptable SEO strategies, thus navigating a landscape where informative, engaging content reigned supreme. This shift wasn't merely theoretical; it was palpable in the way users interacted with websites. The idea of quality content wasn't just a buzzword; it was a guiding principle, shaping the digital realm. It wasn't just about satisfying search engine algorithms; it was about captivating audiences and earning their trust. As the tides of SEO evolved, so too did the criteria for website ranking. Google's Penguin update wasn't just another algorithm tweak; it was a decisive blow against "bad linking practices" that threatened the integrity of search results. The repercussions were felt far and wide as websites scrambled to adapt or face the consequences. But Google's crackdown didn't stop there; it also took aim at sites teeming with ads and lacking in substantive content. This wasn't just about aesthetics; it was about user experience and relevance. And as the dust settled, a new paradigm emerged, one where content quality reigned supreme over keyword density. This isn't just about sprinkling keywords haphazardly; it's a strategic arrangement where every placement carries weight. Page titles, meta descriptions, and header tags aren't just incidental—they're crucial signposts for search engines navigating the vast expanse of the web. But this isn't merely a cosmetic change; it's a fundamental shift in the way SEO operates (Savannah Swanson, 2023; SearchEngineLand, 2024). Gone are the days of keyword stuffing; now, it's all about precision and relevance. Instead of drowning in a sea of keywords, websites now focus on a select few, carefully woven into the fabric of high-quality content. And while keyword optimization may have evolved, its importance in the realm of SEO remains as steadfast as ever. The shift from keyword stuffing to quality content creation is reflective of the evolution of SEO over the years. As search engines become more sophisticated, the practice of SEO has had to adapt and become more user-focused. The rise of AI-driven search algorithms further underscores this trend, forcing digital marketers to create top-quality content that is relevant and engaging for their target audience.

4. The Era of Link Building

The concept of link building wasn't just a passing trend; it was a strategic shift in the digital landscape. But, as the importance of link building grew, so did the tactics employed to acquire backlinks. From guest blogging to directory submissions, digital marketers explored various avenues to boost their website's authority. But amidst this flurry of activity, one truth remained constant: the value of high-authority backlinks from authentic sources (Wordstream, 2022). Today, as search engines continued to refine their algorithms, the focus has shifted from quantity to quality. No longer was it enough to amass a multitude of backlinks; now, the emphasis was on securing links from reputable sources that added genuine value to the user experience (Kaitie Frank, 2022). But this evolution didn't happen overnight; it was the culmination of years of trial and error in the ever-evolving field of SEO. But this evolution isn't just about keeping up with the latest trends; it's about staying ahead of the curve in an ever-changing digital ecosystem. As the era of AI-driven search algorithms dawned, the focus sharpened on crafting top-tier content and forging authentic connections through link building. This wasn't merely a shift in strategy; it was a fundamental reimagining of the SEO landscape. And at the heart of this transformation lies a simple truth: quality reigns supreme. Today, SEO practitioners and Web masters aren't just chasing backlinks; they're cultivating relationships with authoritative sources and producing content that resonates with users on a deeper level.

This focus on quality over quantity ensures that backlinks serve as genuine indicators of a website's credibility and relevance.

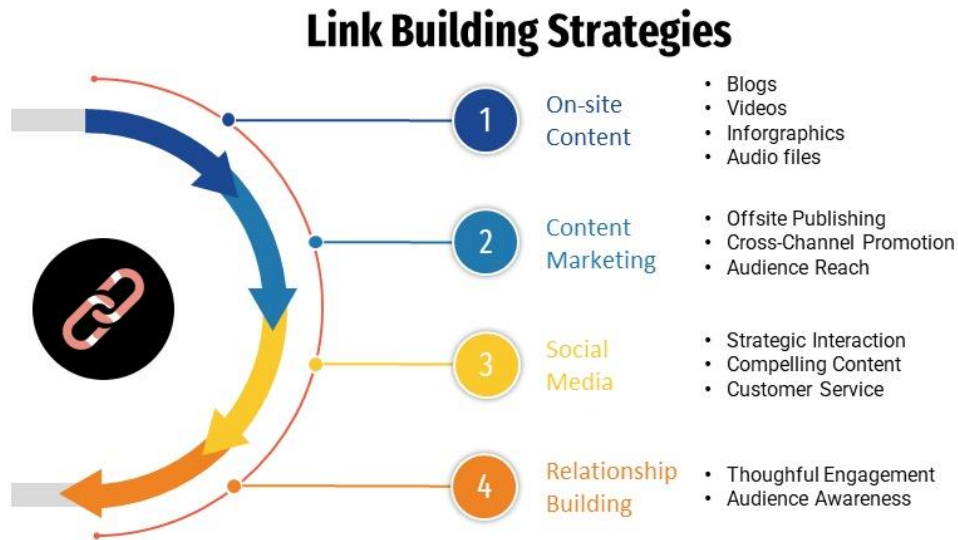


Fig. 2. Link Building Strategies of SEO

5. Content is King: The Shift Towards Quality

As search engine algorithms continued to evolve, it was obvious that while initial emphasis was on keyword optimization and link building to drive traffic, there was a salient need to transition towards prioritizing the creation of top-notch content that delivers authentic value to users. This growing importance of content was further accentuated by the cameo of Google's Panda update, which represented a pivotal juncture, marking a significant shift in the landscape of SEO strategies. With the current state of things, the development and promotion of valuable content have become indispensable elements of SEO, enabling websites to achieve higher organic rankings (Maheshwari & Ali, 2013). The evolution towards content marketing significantly altered traditional SEO strategies, driven by Google's Panda and Penguin updates. Launched in 2011, Panda targeted websites that relied on subpar content, duplicated material, and excessive keyword usage to boost rankings. Following suit, the Penguin update, introduced a year later, penalized manipulative link-building practices, such as automated link generation and purchasing links from other sites (Bezovski, 2015). These updates aimed to promote high-quality content and authentic backlinks, catalyzing the emergence of content marketing. By definition, content marketing involves the strategic creation of premium, pertinent, and captivating content to captivate and retain an audience, ultimately leading to profitable customer actions and revenue generation. Presently, websites and digital marketers prioritize the production of exceptional content, resulting in optimized search engine rankings. Additionally, from its humble origins to the era of artificial intelligence, the mantra "Content is King" remains an indispensable facet of SEO. Content creation methodologies have evolved in tandem with the progression of search algorithms, placing a premium on the development of top-tier content using refined SEO techniques. This paradigm shift towards quality content has spurred the emergence of innovative marketing strategies aimed at crafting content that resonates with target audiences, thereby driving heightened engagement and website traffic (Jackson, 2016). The clamour for superior content

continues to escalate, with users increasingly seeking informative, pertinent, and captivating content that is solution driven. This goes to show that, as the significance of content marketing continue to be vital in the evolution of SEO, businesses and digital marketers must prioritize the production of exceptional content that satisfies the ever-expanding requisites of both search engines and users.



Fig. 3. Quality Content is Key in SEO Strategy

6. Mobile Optimization and Local SEO

Mobile optimization has emerged as a cornerstone of SEO strategy. This trend was propelled by the proliferation of smartphones and mobile internet usage. In light of this, prioritizing mobile optimization and local SEO has become imperative for businesses aiming to connect with their target audience on-the-go. Mobile optimization entails the development of websites that are mobile-responsive, featuring swift loading times, adaptable layouts for various screen sizes, and user-friendly interfaces. This shift in focus towards mobile optimization gained traction in the early 2010s with the surge in mobile internet usage, prompting search engines to integrate mobile-friendliness into their search algorithms. This marked a pivotal moment in SEO history, as mobile websites began to eclipse their desktop counterparts in search engine rankings. With the exponential growth of mobile device adoption, mobile optimization has become indispensable for businesses seeking to engage their target audience effectively (Backlinko, 2024).

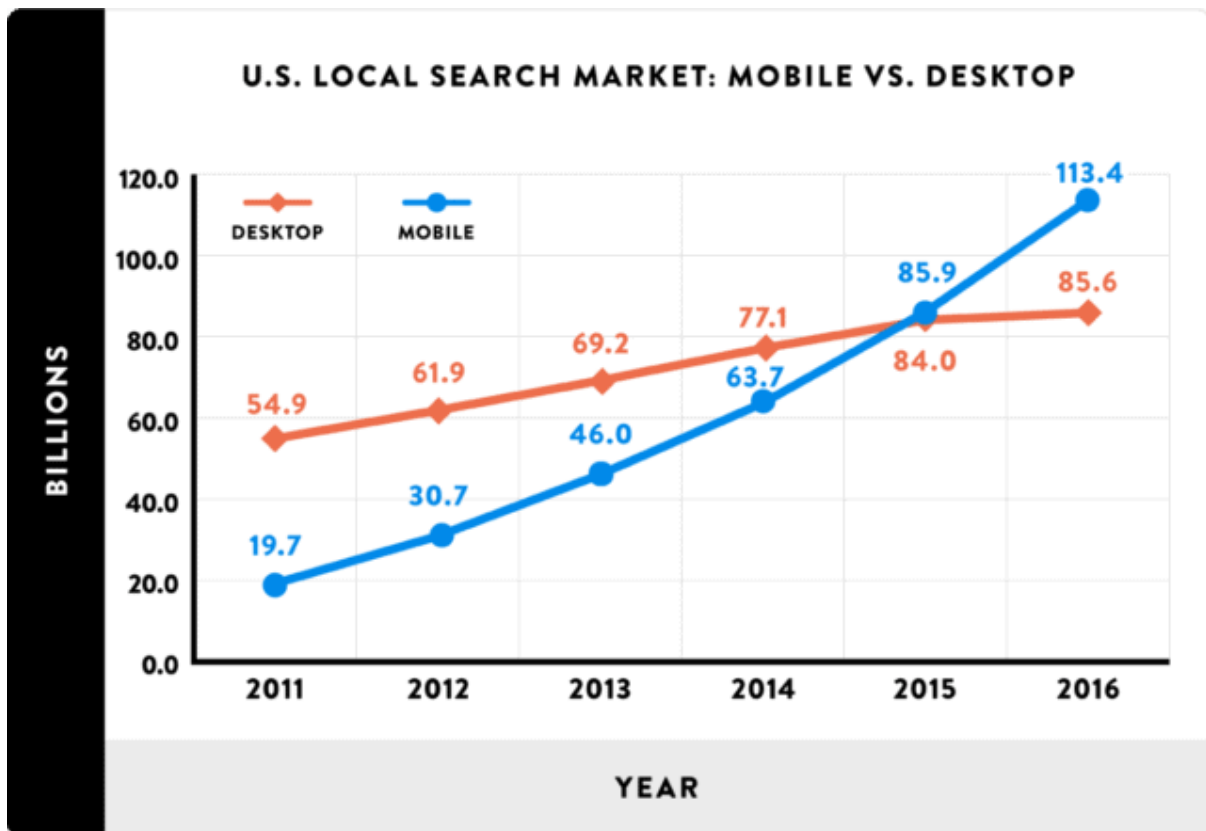


Fig. 4. Search Market Result for Mobile and Desktop in US

Today, integrating mobile optimization into SEO strategy is more critical than ever, hence showcasing the necessity for businesses to optimize their websites to cater to the needs of mobile users. Google's successful integration of mobile-first indexing in 2018 marked a major milestone in the pursuit of improved search engine optimization, prioritizing the mobile version of a website for indexing and higher rank placement. The latest algorithm upgrade aims to enhance mobile search experience, leading to a significant decrease in search engine visibility and ranking for non-optimized mobile websites, prompting increased focus on mobile SEO to maximize search engine performance and reputation. Furthermore, more evolution of search engine functionalities, for example, the initiation of Google My Business (GMB), highlights the need for local SEO and the significance of optimizing for mobile devices. GMB is an efficient tool for managing online brand presence in Google's search results and Maps database. This tool helps to simplify the search process for potential customers to discover a business. In addition, local SEO emphasizes optimizing website visibility to attain ranking for location-based searches, crucial for organizations with a physical premise, service providers and entrepreneurs seeking to increase foot traffic and leads. Local SEO's emergence is a consequence of increased mobile internet usage, prompting the need to redirect search engine focus from desktop to mobile devices. Achieving optimal local SEO demands consistency in the use of structured metadata, brand mentions and links in online business directories, press releases and customer reviews (Ziakis et al., 2019). Overall, the effective coordination of these SEO elements (Mobile Optimization and Local SEO) will improve search engine performance and brand visibility, increased customer engagement and revenue generation.

PREVIOUS SEARCH RESULTS MODEL

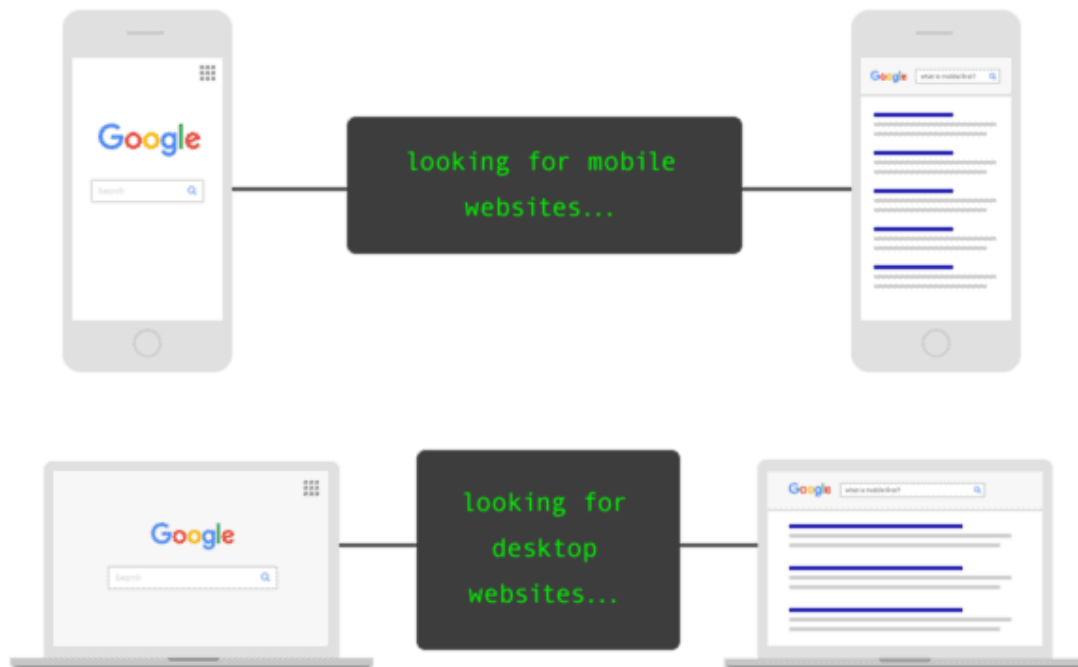


Fig. 5. Diagram showing how Google's mobile-first indexing operates

To add, mobile optimization and local SEO represent critical pillars of SEO success for online enterprises. In today's digital landscape, ensuring accurate local business information and mobile-friendly interfaces has become imperative. Local SEO relies heavily on consistent local citations across various online directories and review platforms, bolstering credibility and elevating local search engine rankings through business details like name, address, and phone number. Moreover, customer reviews and ratings on platforms such as Google My Business (GMB) exert significant influence on company rankings, necessitating proactive online reputation management, including soliciting and responding to customer feedback. The ongoing surge in mobile internet usage showcases the enormous importance of mobile optimization and local SEO. Even further, it reinforces the need for businesses to instantaneously employ these strategies to bolster search engine rankings and sustain a thriving online presence.

7. The Integration of Social Media

For businesses looking to boost their online presence, no doubt, social media platforms have been a major throw of the dice in doing so. In fact, to skyrocket search engine rankings, a presence on social media can be employed to establish authority. This is done through engagement (likes and comments with shares) on social media platforms like Facebook, Twitter, and LinkedIn. These platforms in no small way helps very effectively to drive traffic to websites. The blend resulting from the integration of social media interactions and website visits has prompted search engine algorithms to recognize social signals such as likes, shares, and comments as influential ranking factors. Hence, the incorporation of social signals into their algorithms, has made search engines 100% in agreement on the significance of social media in SEO strategies (Handley, 2023). This clearly shows and increases the relevance and need for businesses and

individuals to leverage social media platforms to super-mount a robust online presence. Also keep in mind, social media platforms are consistently experiencing a surge in popularity, boasting millions of active users who represent an enormous number of potential organic traffic for businesses. So, as the impact of social signals on search rankings continues to evolve, social media remains an invaluable component of a comprehensive SEO strategy. Furthermore, with artificial intelligence (AI) being incorporated in to social platform systems, there is an expectation for continued drive in establishing how much of an integration can happen between social media and SEO in digital marketing. Social media platforms act as a distribution channel to drive traffic, generate backlinks, and boost online authority, all critical for SEO success. Additionally, backlink generation, an integral aspect of building online authority, is increasingly achieved through social media shares and mentions. The value of social media in SEO is further emphasized by search engine features that incorporate social media profiles and activities in search results. Among these profile is Google My Business listings. This tool displays social media profile links, while tweets are featured in search result pages, highlighting the importance of social media in search engine rankings. Its system of operation is such that, the more likes, shares, and comments a page receives, the higher its chances of increased visibility and traffic, leading to more engagement with users. As user behavior continues to evolve, there seem to be no stopping the potential and ability of social media to become increasingly vital for businesses and individuals looking to increase engagement with their audiences, making the integration of social media into SEO an essential part of digital marketing.

8. Artificial Intelligence and SEO

Artificial Intelligence (AI) is swarming across the world, and SEO has definitely not escaped its grasps. This means search engine has given room to AI to fast-track its system of operation. This AI's integration into search algorithms is exemplified by Google's RankBrain, which has revolutionized the way search engines function. By analysing language nuances, contextual information, and user behaviour, AI algorithms deliver precise and contextually relevant results. This transformation extends across various domains of life, with SEO being no exception. In recent years, AI's influence now cut across numerous aspects of daily existence, ushering in a new era of technological integration, so that the transition from keyword-based optimization to intent-based optimization is facilitated by Artificial Intelligence (AI) (Bider, 2023). This shift is not merely theoretical; it's a tangible evolution in the landscape of SEO. AI's role extends beyond predictive and personalized search, penetrating every facet of search engine operations. Personalized search results utilize data points like search history and demographics to tailor results for individual users. This approach, driven by AI, aims to enhance the user experience by delivering more relevant and personalized search outcomes. Furthermore, predictive search employs machine learning algorithms to anticipate user search intentions, offering suggestions even before queries are fully typed. Furthermore, marketers and web users now have access to powerful AI-driven SEO tools, granting them a significant competitive edge. With the vast volumes of data generated daily, AI excels at processing, interpreting, and segmenting similarities across a vast quantity of data that would otherwise require extensive human effort. This new feature makes it possible for marketers to swiftly make intelligent decisions on market and website data, as such, each search engines is optimized for with unprecedented efficiency. The shift towards an intent-based approach in SEO reflects the evolving landscape shaped by AI algorithms. No longer solely reliant on keyword optimization, SEO strategies now revolve around understanding user intent and context. AI algorithms can decipher search queries and

webpage content, allowing for a more user-friendly and contextually relevant approach to optimization (Rathore, 2016).

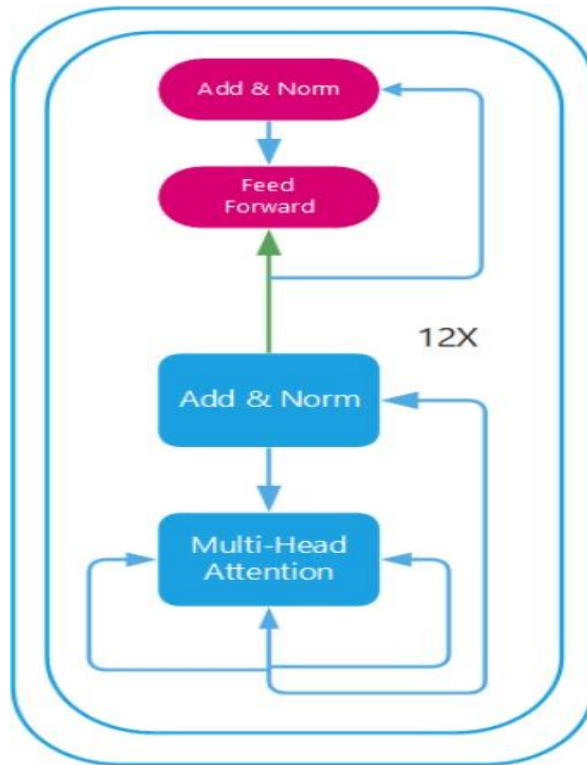


Fig. 6. BERT 101M Parameters

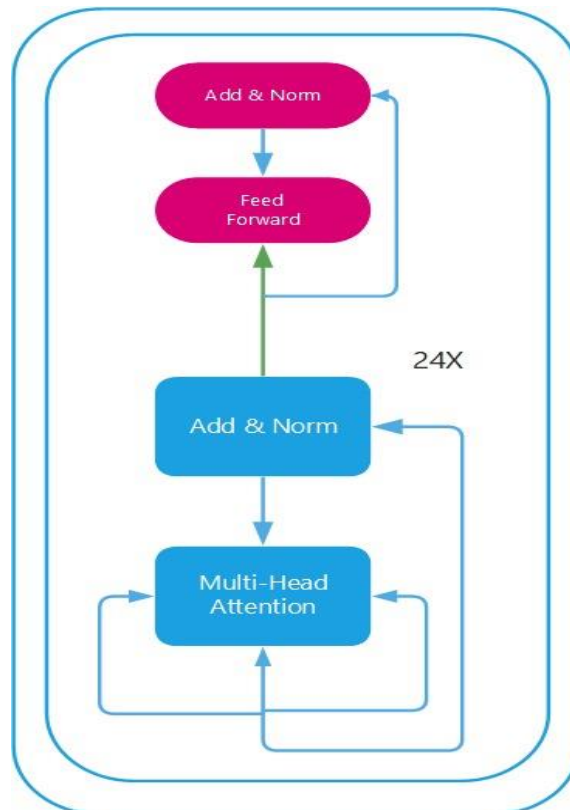


Fig. 7. BERT 340M Parameters

Before now, traditionally, SEO efforts focused on identifying and optimizing keywords most likely used by users. However, with the advent of AI, the emphasis has shifted towards understanding user intent directly from search queries and webpage content. This transition marks a fundamental change in SEO strategy, prioritizing a more user-centric and context-driven approach. The intertwining of AI and SEO heralds both new opportunities and formidable challenges for the online realm, shaping the future of digital marketing strategies. It's undeniable: future SEO endeavours must embrace AI integration to maintain relevance and competitiveness in search engine rankings. While the full extent of AI's impact on SEO remains uncertain, one thing is clear: SEO without AI is ineffective in today's landscape. Enterprises leveraging AI-powered SEO strategies stand poised to gain a decisive edge in their respective markets, tailoring content to individual customer needs with unparalleled precision. This synchrony between AI and SEO defines the digital era, laying the groundwork for a future where SEO thrives on AI-driven technologies (Yuniarthe, 2017). Now, with AI-driven algorithms leading the charge, website optimization evolves into a sphere of intent-based strategies, personalized experiences, and predictive insights. The integration of AI continues to reshape the SEO landscape, promising more efficient, effective, and user-friendly search engines that cater to individual preferences with unparalleled accuracy.

9. Challenges and Ethical Considerations

The integration of artificial intelligence (AI) has introduced new challenges and ethical dilemmas into the discuss on search engine optimization (SEO). From grappling with the delicate balance between optimization and manipulation to discerning ethical SEO practices from black-hat techniques, these considerations are pivotal in ensuring the sustainability and responsibility of SEO's growth in the digital marketing landscape. Tactics like keyword stuffing, link schemes, and over-optimization risk not only harming user experience but also violating search engine guidelines. To ensure the sustainable and responsible growth of SEO, it's imperative to address the ethical considerations and challenges posed by the integration of artificial intelligence (AI). These include navigating the delicate balance between optimization and manipulation, as well as discerning ethical SEO practices from black-hat techniques. Such considerations are crucial in maintaining the integrity and effectiveness of SEO in the digital marketing landscape. Higher search rankings are not just a matter of pleasing search engines; they're about ensuring user satisfaction. To facilitate this notion, engaging only the actions that involves adhering to ethical SEO practices over black-hat techniques, prioritizing industry best practices and relevant, high-quality content creation is key (Kumar, 2023).

Another challenge on the horizon for AI and SEO lies in the risk of over-reliance on AI tools. Despite their ability to provide valuable data insights, blind trust in AI results can be detrimental. SEO professionals must remain critical and adept at interpreting data to make informed decisions. Also, in an AI-driven future, ethical considerations regarding data privacy and customer trust loom large. As AI tools evolve, the risk of compromising personal data and violating customer trust increases. This necessitates a greater level of responsibility from businesses, demanding adherence to ethical practices and transparency in operations. Finally, while AI holds promise for improving efficiency in SEO and enhancing user experiences, concerns persist about losing the human touch. AI's logical decision-making based on data lacks the emotional intelligence and empathy crucial in effective marketing. This underscores the need to strike a balance between AI-driven automation and human creativity in SEO strategies (Bider, 2023; Gkikas & Theodoridis, 2019).

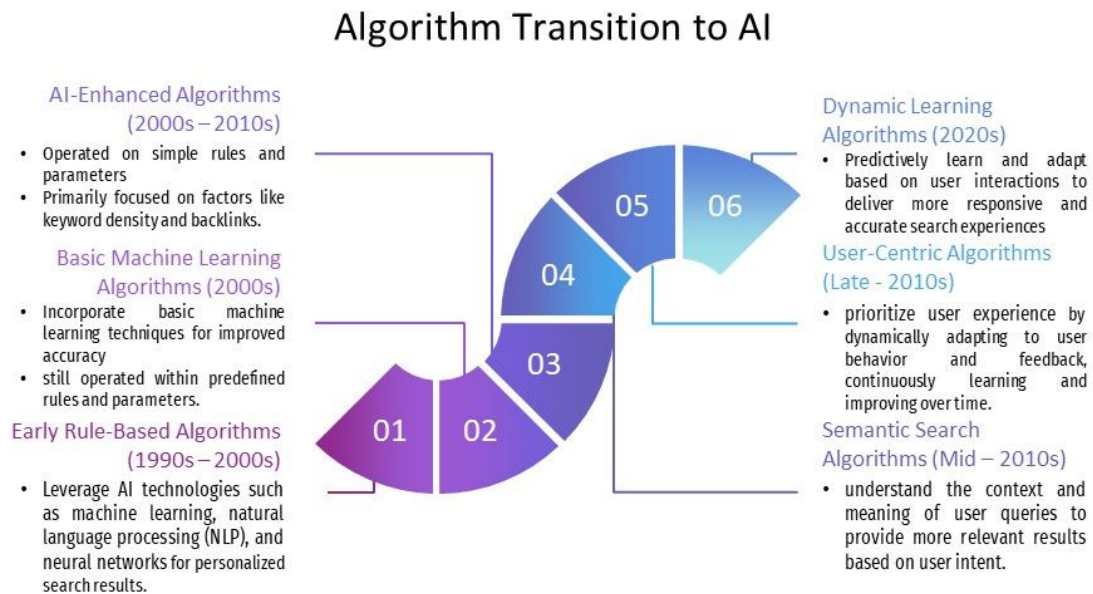


Fig. 9. Algorithm Transition to AI

10. Conclusion

The evolution of search engine optimization (SEO) has been extraordinary within on internet marketing. Emerging alongside the proliferation of search engines in the early 2000s, SEO swiftly became an indispensable tool for businesses and marketers striving to enhance their online visibility, attract traffic, and improve rankings. However, as search algorithms advanced, SEO professionals encountered a dynamic landscape marked by new obstacles and evolving trends. For this reason, over time, the factors influencing website ranking have undergone a significant expansion, evolving from a limited set to a multifaceted array. Specific components, such as high-quality backlinks, mobile optimization, local SEO strategies, integration with social media platforms, and the optimization of user experience, have emerged as pivotal determinants of SEO success. These elements assume a critical role in achieving elevated rankings and heightened visibility across search engines, thereby shaping the contemporary landscape of SEO practices. In summary, the journey of SEO from its inception to its current state is reflective of the continuous evolution within the digital marketing domain. As search engines evolve in sophistication, SEO strategies demand adaptability to maintain efficacy in driving visibility, traffic, and revenue. Yet, amidst the benefits AI brings, it's crucial to strike a balance between data-driven decision-making and empathetic marketing. Businesses mustn't solely rely on AI, preserving the human touch in their marketing endeavours. Now it is quite glaring that, as marketers and SEO experts navigate through this ever-changing terrain, it becomes imperative to remain attuned to emerging trends and adept at adapting strategies to meet evolving challenges. By leveraging the diverse array of factors influencing SEO success, businesses can enhance their online presence and effectively engage with their target audience in the competitive digital landscape. Furthermore, ethical considerations, including data privacy and customer trust, mustn't be side-lined in favour of optimization. Prioritizing ethical practices over all else safeguards the integrity of SEO efforts amidst AI integration. In summary, the journey of SEO from its infancy to its present state has been nothing short of remarkable. Evolving into a cornerstone of digital marketing practices, SEO demands constant vigilance from experts to navigate its dynamic landscape. Staying in tune with the

evolution and challenges of SEO strategies is imperative for maintaining a competitive edge in the online space. Moreover, in anticipation of future technological shifts, preserving the value of SEO strategies requires unwavering vigilance.

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