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Original Article

Optimizing Digital Visibility - SEO Strategies in Modern E-Commerce

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Abstract - Search Engine Optimization (SEO) has become a cornerstone digital marketing strategy for e-commerce enterprises seeking sustainable visibility, traffic growth, and conversion optimization in competitive online markets. SEO's role in e-commerce extends beyond simple keyword insertion; it encompasses technical optimization, user experience (UX), semantic relevance, algorithmic adaptation, and increasingly data-driven and AI-based methodologies. E-commerce's rapid expansion has heightened the importance of digital discoverability. Search engines remain the primary gateway through which consumers discover products, making SEO a critical driver of customer acquisition and revenue performance. E-commerce SEO differs from generic SEO because it must optimize tens of thousands of product and category pages, handle complex site architectures, and ensure excellent UX in addition to relevance signals. This paper systematically reviews existing literature, synthesizes empirical findings, and proposes future research avenues to strengthen theoretical framing and practical deployment of SEO within e-commerce platforms.

Keywords - E-commerce, Search Engine Optimization (SEO), On-Page Optimization, Organic Search Ranking, E-commerce SEO, Semantic Search, Online Retail Optimization, Search Ranking Algorithms, SERP Optimization, Internet Marketing Strategies, Search Generative Experience (SGE).

1. Introduction

The e-commerce digital ecosystem is currently navigating its most significant transition since the advent of mobile-first indexing. The traditional search paradigm characterized by keyword-matching algorithms and a linear hierarchy of "blue links" has been fundamentally superseded by generative discovery and conversational commerce. This evolution, primarily driven by the integration of Large Language Models (LLMs) into the search experience, has necessitated a new discipline known as Generative Engine Optimization (GEO). While traditional SEO sought to maximize visibility within a search engine's index, GEO focuses on influencing the synthesized answers generated by AI assistants such as ChatGPT, Perplexity, and Google's Gemini. The objective is no longer merely to rank for a specific term but to become a cited, authoritative source within the real-time responses provided to consumers.

This shift is characterized by the "Zero-Click" phenomenon, where AI Overviews provide direct answers to informational and commercial queries, thereby reducing the necessity for users to visit a website to obtain basic product data. Industry data suggests that click-through rates (CTR) have declined by approximately 15.5% for queries triggering these AI Overviews, yet the value of the remaining clicks has increased substantially. This is because the traffic arriving at an e-commerce site from an AI summary represents a highly qualified segment of the audience that has already been pre-educated by the generative engine and is demonstrating high transactional intent. Furthermore, the rise of Agentic AI signifies a move toward autonomous software agents that can research, compare, and execute purchases on behalf of users without a human ever interacting with the retailer's traditional storefront. To survive in this environment, e-commerce brands must adopt the Agentic Commerce Protocol (ACP), ensuring that their product data is not just readable by humans but perfectly structured for machine agents to ingest and trust.

The nature of consumer inquiry has likewise evolved from fragmented keyword strings to natural language questions and conversational prompts. Voice search, once a secondary convenience, has become a default behaviour, forcing search engines to prioritize clarity, context, and immediate usefulness over traditional keyword density. Today search engines reward content that mirrors natural human dialogue and addresses the underlying intent of complex, multi-part questions. Successful e-commerce optimization now requires a deep understanding of "Perception Drift," a metric that tracks how consistently a brand is categorized as an authority within the latent space of major LLMs. If a brand's citation frequency fluctuates, it indicates that the brand has not adequately established its digital identity across the information environment that trains these models.

2. Technical Infracture and Scalable Information Architechture

2.1. Management of Faceted Navigation and Crawl Budgets

Faceted navigation represents perhaps the most persistent technical challenge for large-scale e-commerce platforms. While filters for color, size, brand, and material are essential for user experience, they can generate an

exponential number of unique URLs that lead to "spider traps" and the exhaustion of crawl budgets. Today, the industry standard for managing these systems involves a sophisticated application of canonicalization and access control. Sorting facets those that merely reorder content, such as price or alphabetical sorting should use dynamic parameters and be blocked from indexing via robots.txt or meta robots tags to conserve crawl equity.

Conversely, restrictive facets that specify unique content (e.g., "men's blue waterproof running shoes") often represent high-value long-tail search opportunities. These should be implemented as static, clean URLs with unique H1 tags and metadata. The strategic use of the isVariantOf schema property further assists search engines in understanding that multiple product variations exist on a single canonical page, thereby preventing the dilution of ranking signals across redundant URLs.

Table 1. Faceted Navigation Seo Classification and Implementation Strategies

Facet Category	SEO Status	Implementation Strategy
Sorting Facets (Price, Newest)	Non-indexable	Use parameters (e.g., ?sort=price); block via robots.txt
High-Value Restrictive Facets	Indexable	Clean, static URLs (e.g., /mens/shoes/blue-running); unique content
Low-Intent Combinations	Non-indexable	Use canonical tags to point back to the parent category
Temporary/Seasonal Filters	Indexable (Short-term)	Create dedicated landing pages with internal links; 301 redirect after use
Multi-Select Filters	Non-indexable	Implement via AJAX/JavaScript or use no index for combinations

2.2. URL Engineering and Mobile-First Parity

The design of URL structures remains a critical component of both crawl efficiency and user trust. URLs should be human-readable, descriptive, and avoid unnecessary folders or dynamic strings that obscure the hierarchy of the site. Research indicates that shorter URLs consistently correlate with higher organic rankings, and e-commerce platforms are encouraged to remove stop words (e.g., "a," "the," "in") that add length without adding semantic value. Consistency is paramount; the decision to use or exclude trailing slashes must be applied globally, and the entire site must be served over the HTTPS protocol to meet the foundational security requirements of modern search engines.

As mobile traffic continues to dominate global retail, accounting for over 70% of sessions in many sectors, Google’s mobile-first indexing is the absolute baseline for visibility. This requires complete parity between desktop and mobile versions of the site, including content, structured data, and navigation menus. Technical errors, such as blocked resources or layout shifts on mobile devices, act as "invisible revenue killers" that can significantly degrade a site's ranking and conversion potential.

Table 2. Standardized Url Structuring Principles And Technical Rationale For Seo

URL Best Practice	Standard Requirement	Technical Rationale
Character Case	All Lowercase	Prevents duplicate content issues caused by case sensitivity in servers
Word Separators	Hyphens -	Search engines treat hyphens as spaces, underscores are treated as joiners
Folder Depth	Maximum 3 Levels	Improves crawl efficiency and ensures link equity reaches deeper pages
Static vs Dynamic	Static for Indexing	Dynamic parameters (e.g., ?id=123) can create infinite crawl loops
Analytics Labelling	Consistent Tags	Standardized paths (e.g., /products/) enable easier data segmentation

2.3. Core Web Vitals and Performance as Ranking Drivers

Today the performance metrics have evolved from minor ranking factors into critical signals of site quality and user satisfaction. The replacement of First Input Delay (FID) with Interaction to Next Paint (INP) has shifted the focus toward a page's continuous responsiveness throughout a user's session. For e-commerce sites, where interactions such as filtering, adding to cart, and image zooming are frequent, an INP score of 200 milliseconds or less is required to be considered "Good".

Technical optimization for speed now utilizes edge computing and advanced rendering strategies to minimize the Time to First Byte (TTFB). Deploying services like Cloudflare Workers or Vercel Edge Functions allows retailers to execute code at the network edge, reducing latency by 40% to 70% compared to traditional centralized servers. Furthermore, the adoption of next-generation image formats like AVIF and WebP, alongside lazy loading and image compression, is essential to maintaining a Largest Contentful Paint (LCP) of under 2.5 seconds.

Table 3. Core Web Vitals Thresholds and Primary Performance Bottlenecks in E-Commerce

Metric	2026 Threshold (Good)	Primary Bottlenecks in E-Commerce
Largest Contentful Paint (LCP)	$\leq$ Seconds	Slow server responses, large hero images, render-blocking CSS

Interaction to Next Paint (INP)	$\leq$	Milliseconds	Heavy JavaScript execution, complex DOM structures, third-party scripts
Time to First Byte (TTFB)	$\leq$	Milliseconds	Inefficient database queries, lack of edge caching, DNS delays

To eliminate Cumulative Layout Shift (CLS), developers must define media dimensions in the HTML and reserve space for dynamic content, such as promotional banners or product recommendation widgets. This ensures a stable visual experience that prevents accidental clicks and builds consumer trust during the high-stakes checkout process.

2.4. Semantic SEO and the Global Schema Ecosystem

In the era of AI-driven search, structured data acts as the primary bridge between a brand's inventory and the generative response systems of LLMs. Schema markup is no longer merely about achieving star ratings in search results; it is the fundamental mechanism by which machines understand the attributes, relationships, and availability of products.

2.5. Advanced Product and Offer Implementations

The Product and Offer schemas are the cornerstones of e-commerce structured data. For a product to be eligible for the full range of Google's shopping features including "Popular Products" and "Shopping Knowledge Panels" retailers must implement a comprehensive set of properties. This includes the is Variant Of property, which is used to link individual SKUs to a broader product group, such as different sizes of the same shoe model.

Beyond basic identification, today's e-commerce requires the use of the Offer Shipping Details and Merchant Return Policy schemas. These properties provide instant answers to user concerns regarding total cost and post-purchase support, allowing AI assistants to confirm whether a store offers free shipping or a 30-day return window directly within the search interface.

Table 4. Product Schema Mark-up Properties and Their Functional Role in Modern Search

Schema Property	Required/Recommended	Function in 2026 Search
name	Required	Definitive identification of the product entity
offers	Required	Specifies price, currency, and availability for transactional intent
aggregateRating	Recommended	Displays social proof via star ratings; increases CTR by up to 30%
isVariantOf	Recommended	Distinguishes between product versions (size/color) on a single URL
shippingDetails	Recommended	Feeds into "Free Shipping" labels and total price calculations
hasMerchantReturnPolicy	Recommended	Allows AI to answer specific policy questions instantly

2.6. The Impact of Reviews and Aggregate Ratings

Google's review schema allows customer feedback to be transformed into "rich snippets," which are eye-catching visual elements in the search results. The Aggregate Rating property, which displays the average score and total count of reviews, is a critical driver of trust and organic CTR. It is essential that these reviews are hosted directly on the retailer's site. Google does not allow the aggregation of third-party reviews (e.g., from Facebook or Yelp) for the purpose of generating rich snippets on a product page.

Manual implementation of review schema is often complex due to strict accuracy requirements. If the schema code reports a rating that differs from what is visible to the user on the page, the site may face a manual action for "misleading structured data". Consequently, many retailers utilize automated review platforms that dynamically update JSON-LD blocks as new customer feedback is approved, ensuring compliance and data freshness.

3. on-Page Optimization and Search Intent Mapping

E-commerce on-page strategy has moved beyond simple keyword placement toward a comprehensive "Search Experience Optimization" (SXO) model. Every page on a retail site must be mapped to a specific stage of the buyer's journey, addressing informational, commercial, or transactional intent.

3.1. Category Page Strategy: The Volume Pillars

Category pages frequently represent the highest-volume traffic drivers for e-commerce sites, as they target broad, competitive commercial terms. To rank effectively, these pages must serve as more than mere product grids; they should function as authoritative hubs that guide the user's purchasing decision. Successful category pages now include:

- Unique Introductory Content: 300 to 500 words of high-quality copy that defines the category, discusses use cases, and uses strategic long-tail keywords.
- Semantic Enrichment: The use of "LSI" (Latent Semantic Indexing) keywords and related terms to signal topical authority to search engines.
- Visual and Interactive Elements: High-resolution imagery and, increasingly, comparison tools that allow users to filter by attributes that matter to their specific needs.
- Strategic Metadata: Title tags and meta descriptions that emphasize unique value propositions (UVPs) such as "Free Shipping," "Sustainability Ratings," or "Exclusive Brands".

3.2. Product Detail Page (Pdp) Optimization: The Conversion Engines

The primary goal of a Product Detail Page is to transform a visitor into a customer by providing all the information necessary to resolve objections and build

confidence. Today search engines rewards PDPs that provide "Human-Verified" expertise and detailed, original descriptions that differ from the manufacturer-provided text used by competitors.

Table 5. Product Detail Page (Pdp) Optimization Standards and Seo/Cro Impact

PDP Element	Optimization Standard	Impact on SEO/CRO
Product Title	Primary keyword + Brand + Key attribute	Matches specific transactional search intent
Description	1,000+ words for top products; unique copy	Builds topical authority; reduces duplicate content risk
Images	High-resolution, zoomable, descriptive alt text	Drives traffic from Google Images and visual search
Reviews	Substantive, unedited customer comments	Feeds rich snippets; builds consumer trust
CTAs	Clear, prominent, and above the fold	Reduces friction; improves session-to-conversion rate
Stock/Urgency	Real-time inventory updates	Encourages immediate action via the scarcity principle

A significant trend in PDP design is the integration of multimodal content, including short explainer videos and 360-degree views. These elements not only improve the user experience but also increase "dwell time" a signal that search engines interpret as evidence of a page's relevance and value.

4. Content Marketing and the Strategic Funnel

E-commerce content marketing is a revenue-driven system that bridges the gap between initial discovery and final purchase. By producing content that addresses users at different stages of the marketing funnel, brands can capture broad awareness while simultaneously nurturing intent.

4.1. Top-Of-Funnel (TOFU): Awareness and Discovery

TOFU content is not designed to sell but to provide insight, inspiration, and value to users who are just beginning to explore a problem or interest. High-quality blog content remains the most reliable TOFU channel, focusing on "how-to" guides, "what is" explainers, and trend reports. This content serves as a "link magnet," earning high-authority backlinks and social shares that boost the overall domain authority of the site.

4.2. Middle-Of-Funnel (MOFU): Consideration and Education

MOFU content targets users who are aware of their needs and are evaluating various solutions. Buying guides (e.g., "Best Running Shoes for Flat Feet") and product comparison pages are critical at this stage. These assets help users narrow their choices while positioning the retailer as a helpful expert.

4.3. Bottom-Of-Funnel (BOFU): Action and Conversion

BOFU content is focused on the final moments of the decision-making process. This includes detailed product pages, customer success stories, and trust-building information such as clear return policies and secure checkout badges. To maximize the impact of this stage, e-commerce merchants should utilize urgency-driven messaging ("Only 2 left in stock") and personalized recommendations based on the user's browsing history.

Table 6. Content Strategy across E-Commerce Funnel Stages and Associated KPIS

Funnel Stage	Content Objective	Example Formats	Key KPI
TOFU	Problem awareness	"How-to" blogs, Infographics, Trend reports	Organic reach, Social shares
MOFU	Solution comparison	Buying guides, Comparison charts, Tutorials	Time on site, Add-to-cart rate
BOFU	Purchase conviction	Detailed PDPs, Customer reviews, FAQs	Conversion rate, RPV
Retention	Loyalty building	User guides, Loyalty program details, AMAs	Repeat purchase rate, LTV

5. Off-Page Seo: Entity Recognition and Brand Recognition

Off-page optimization has transitioned from simple link acquisition to "Entity Authority Building". Search engines and AI assistants prioritize brands that are consistently mentioned and cited by authoritative sources across the internet.

5.1. The Evolution of Link Building for Retail

Traditional link-building tactics, such as low-quality directory submissions, are no longer effective and may even attract penalties. Modern e-commerce link building focuses on relevance, authority, and brand credibility. Key strategies include:

- Digital PR: Earning mentions and features in high-authority media outlets through original research, trend reports, and thought leadership.
- Influencer and Creator Collaborations: Partnerships with influencers whose loyal audiences provide "trust transfer," leading to motivated referral traffic and natural backlink acquisition.
- Product Seeding and Reviews: Sending products to expert reviewers and YouTubers to generate authentic mentions and video content that AI engines can ingest.
- UGC and Community Presence: Maintaining an active, authentic presence in communities like Reddit and Quora, where real-world consumer discussions shape the training data of LLMs.

5.2. Influencing AI Citations and Training Data

A critical component of off-page strategy is managing the "citation footprint". AI answer engines derive their knowledge from reviews, articles, forums, and reputable publications. Therefore, a brand's visibility in an AI

Overview is a direct result of its off-site reputation. To influence this, retailers must:

- Seed Positive Sentiment: Actively manage reviews on platforms like Google Business Profile, Trustpilot, and niche industry forums, as these shape the AI's "confidence score" in the brand.
- Explicitly Cite Authoritative Sources: When publishing content, explicitly mention reputable data sources (e.g., "According to a Gartner report...") rather than just hyperlinking, as LLMs are better at recognizing text-based entity associations.
- Build Co-Occurrence Networks: Ensure that the brand name is frequently mentioned in close proximity to relevant product categories and high-authority entities in the same niche.

6. Analytics, Attribution and Performance Benchmarks

In the current e-commerce environment, reporting has moved beyond basic traffic metrics toward a nuanced understanding of revenue attribution and user behaviour.

6.1. Data-Driven Attribution (Dda)

Traditional single-touch models like "First-Click" or "Last-Click" are increasingly viewed as flawed, as they fail to account for the multi-touch complexity of the modern consumer journey. Data-Driven Attribution (DDA), now the default in GA4, utilizes machine learning to distribute credit across all touchpoints, from discovery to retention. This allows retailers to identify the "hidden" value of top-of-funnel channels, such as social discovery or informational blogs, which may not close the sale but are essential for building the initial trust.

Table 7. Marketing Attribution Models, Credit Logic, and Primary Use Cases

Attribution Model	Credit Logic	Primary Use Case
Last-Click	100% to the final touch	Direct response with short cycles; simple but flawed
First-Click	100% to the entry point	Awareness-focused growth; ignores nurturing
Linear	Equal credit to all touches	Multi-touch journeys where all steps are valued equally
Position-Based	40% First/Last; 20% Middle	Balanced view of discovery and conversion
Data-Driven (DDA)	Algorithmic (ML-based)	Complex journeys; reflects actual probability of conversion

6.2. Global E-Commerce Benchmarks and Conversion Logic

Successful retailers report Conversion Rate (CVR) alongside Average Order Value (AOV) and Revenue Per Visit (RPV) to get a true picture of store performance. While the all-industry average conversion rate sits at approximately 1.9%, this figure is highly dependent on the vertical and the ticket price of the items sold.

Table 8. E-Commerce Conversion Rate (Cvr) Benchmarks by Vertical and Key Performance Drivers

Vertical	Average CVR	Top 10% CVR	Key Performance Driver
Food & Beverage	4.5% - 6.1%	7.0%+	Impulse buys, repeat subscription models
Beauty & Wellness	3.3% - 4.5%	6.8%	High brand loyalty, consumable nature
Fashion & Apparel	2.0% - 3.0%	3.5%+	Trend cycles, mobile-first optimization
Home & Furniture	1.2% - 2.2%	3.0%	Long consideration cycles, high-ticket AOV
Luxury & Jewellery	0.8% - 1.2%	1.8%	Research intensity, high trust barrier

6.3. Advanced Toolsets for AI Visibility

To monitor and optimize for the new era of search, e-commerce teams are adopting specialized toolkits that go beyond traditional keyword tracking. Platforms like Cometly offer sophisticated server-side tracking and multi-touch attribution, while tools like Profound and ZipTie focus on "LLM visibility," tracking how frequently a brand is cited in generative answers compared to its competitors.

Table 9. Seo Tool Categories, Example Platforms, and Core Functional Capabilities

Tool Category	Example Platforms	Core SEO Function
AI Visibility	Profound, Zip Tie, Otterly.AI	Tracking citations and brand sentiment in AI engines
Content Ops	Surfer SEO, Clearscope, Writesonic	NLP-driven optimization for semantic relevance
Attribution	Cometly, Spinta, GA4	Mapping the path to purchase and calculating true ROI
Technical Audit	Search Atlas (OTTO), Indexly	Automating technical fixes and indexing large catalogues

6.4. Strategic Synthesis and Future-Proofing

The optimization of e-commerce is a multi-dimensional challenge that requires a synthesis of technical precision, semantic depth, and broad-based authority. The transition from tactical SEO to "Strategic Authority Building" signifies that brands must be optimized for selection by AI systems, not just placement in a list. This is achieved by:

- Ensuring Crawlability and Scalability: Maintaining a fast, lightweight technical foundation that adheres to the latest Core Web Vitals and utilizes edge computing for global speed.

- Adopting Semantic Standards: Implementing the full ecosystem of schema markup to provide factual grounding for AI-driven "Answer Engines".
- Building Authoritative Entities: Utilizing Digital PR, influencer collaborations, and authentic community engagement to establish the brand as a trustworthy source within the training data of LLMs.
- Optimizing for Multimodal Intent: Preparing for a world where text is becoming optional, and visual, voice, and agentic search drive the majority of retail discovery.

As generative AI continues to reshape the digital marketplace, the retailers who will dominate are those who view search visibility as a "reputation infrastructure," prioritizing long-term trust and information clarity over short-term algorithm exploits. The shift from keyword-focused tactics to generative intent mapping ensures that a brand remains discoverable not only to human shoppers but to the machines that now guide their decisions.

7. Conclusion

The optimization of modern e-commerce is a multi-dimensional challenge that requires a synthesis of technical precision, semantic depth, and broad-based authority. As search matures into a landscape defined by generative discovery and conversational commerce, the traditional reliance on "blue link" rankings has been superseded by the need to become a cited, authoritative source within AI-synthesized responses. Successful B2B merchants and retailers in today's world must prioritize a "reputation infrastructure," leveraging advanced schema implementations such as is Variant Of and Merchant Return Policy to ensure product data is perfectly structured for ingestion by both humans and machine agents. Furthermore, the shift toward Search Experience Optimization (SXO) necessitates mapping every digital asset to specific buyer intents, from top-of-funnel awareness to bottom-of-funnel conviction. Ultimately, as text becomes optional and visual, voice, and agentic search drive most of the retail discovery, the brands that dominate will be those that transition from tactical exploits to long-term trust and information clarity. This strategic alignment ensures that e-commerce enterprises remain resilient in an era where AI assistants serve as the primary gateway to the global digital storefront.

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