

MODERNIZING "18 MILES OF BOOKS" FOR A 4.7 MILLION PRODUCT DIGITAL MARKETPLACE

The Strand Books Scalable Commerce Transformation

Scaling a massive catalog into a high-performance commerce engine, we transformed "18 Miles of Books" into a resilient, Hyvä-ready architecture. The store struggled with **deadlocks, indexing issues, fragmented inventory, and technical SEO gaps**. We stabilized Magento and delivered end-to-end SEO (pre, during, and post migration) to drive performance and growth.

Magento Architecture

Hyvä Migration

Technical SEO

System Scalability

Queue Optimization

Data Integation

Performance Engineering

eCommerce Infrastructure



Key Highlights



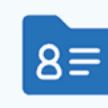
4.7M+

Products Managed at Scale



200K+

Daily Data Sync Operations Stabilized



100+ → 0

Database Deadlocks Post Migration



100%

Post-Migration Platform Uptime

The Strategic “Pain Point” Map



The Challenge

- ✓ **Database deadlocks and silent order failures** during peak traffic
- ✓ **Platform instability, traffic spike vulnerability,** and lack of **edge security (DDoS, bots)**
- ✓ **Infrastructure gaps** including **single points of failure** and **inconsistent deployments**
- ✓ **Monolithic queues, delayed data flow,** and lack of **real-time processing**
- ✓ **Inefficient search and indexing** impacting **catalog performance at scale**
- ✓ **Scaling multi-million catalogs, media bloat & lack of centralized storage**
- ✓ **Fragmented multi-source inventory** and **disconnected system integrations**
- ✓ **Complex checkout logic, mixed carts,** and **payment/tax inconsistencies**
- ✓ **High operational overhead** due to **manual processes** and reactive workflows
- ✓ **Technical SEO issues at scale** and **migration-related ranking risks**
- ✓ **Legacy frontend (PWA)** limiting performance and scalability



The Objective

- ✓ Ensure transaction reliability with **deadlock prevention, monitoring & sync**
- ✓ Build a **resilient, secure infrastructure** with **WAF, scaling, and traffic protection**
- ✓ Establish **high-availability architecture** with failover and synced deployments
- ✓ Implement **decoupled queue architecture** and **event-driven data synchronization**
- ✓ Optimize **search infrastructure (Elasticsearch/OpenSearch)** and **high-speed indexing**
- ✓ Optimize **catalog processing, media management & centralized storage (NFS)**
- ✓ Build **real-time inventory** and **integrate operational & marketing systems**
- ✓ Streamline **checkout workflows** and **payment/tax integrations** for accuracy
- ✓ Automate **backend processes** to improve efficiency and reduce costs
- ✓ Execute **end-to-end technical SEO** and an **SEO-safe migration strategy**
- ✓ Transition to **Hyvä architecture** for improved performance and experience

The Solution: Re-Architecting for Scalability & Stability

Pillar 1 Edge, Caching & Traffic Optimization	Pillar 2 High Availability & Failover Systems	Pillar 3 Deployment & Code Synchronization	Pillar 4 Indexing & Catalog Processing
Optimize traffic handling and reduce origin load during peak demand	Build a resilient infrastructure with zero single points of failure	Ensure consistent deployments across all application nodes	Improve catalog processing efficiency for large-scale data updates
<ul style="list-style-type: none"> Cloudflare Edge (WAF, CDN, traffic routing, bot mgmt., DDoS protection) 	<ul style="list-style-type: none"> Redis Master + Backup with Sentinel failover 	<ul style="list-style-type: none"> LsyncD-based code synchronization 	<ul style="list-style-type: none"> Reduced indexing batch sizes (100K-30K)
<ul style="list-style-type: none"> HAProxy load balancing and request distribution 	<ul style="list-style-type: none"> Internal hostname routing for seamless switching 	<ul style="list-style-type: none"> Automated deployment validation across nodes 	<ul style="list-style-type: none"> Intelligent indexing with Elasticsearch/OpenSearch
<ul style="list-style-type: none"> Varnish full-page caching for faster delivery 	<ul style="list-style-type: none"> Redundant cache & NFS-based shared storage with failover 	<ul style="list-style-type: none"> Symlink and version consistency checks 	<ul style="list-style-type: none"> Streamlined batch processing workflow
<ul style="list-style-type: none"> Traffic surge handling and request prioritization 	<ul style="list-style-type: none"> Automated failover and health monitoring 	<ul style="list-style-type: none"> Controlled release and rollback mechanisms 	<ul style="list-style-type: none"> Controlled reindex triggers for stability
<ul style="list-style-type: none"> Reduced origin load and latency Faster page response times Stable traffic handling at scale 	<ul style="list-style-type: none"> Zero downtime across systems Seamless failover in events High availability across nodes 	<ul style="list-style-type: none"> No version mismatch issues Consistent deployments everywhere Consistent app behavior always 	<ul style="list-style-type: none"> Faster indexing cycles overall Lower backend processing load Scalable catalog performance
Pillar 5 Media & Storage Optimization	Pillar 6 Queue Architecture & Data Isolation	Pillar 7 Real-Time Data Integration & Sync	Pillar 8 Technical SEO & Commerce Strategy
Reduce system load caused by excessive and unused media assets	Prevent data conflicts by isolating high-volume processing workflows	Enable real-time communication across integrated systems	Strengthen technical SEO and core commerce logic at massive scale
<ul style="list-style-type: none"> Cleanup of duplicate and orphan media (~900GB) 	<ul style="list-style-type: none"> Decoupled queues for product and inventory updates 	<ul style="list-style-type: none"> Event-driven architecture using RabbitMQ 	<ul style="list-style-type: none"> Fixed crawl issues & redirects for dual frontend (PWA-Hyvä)
<ul style="list-style-type: none"> Optimized centralized storage and backup processes 	<ul style="list-style-type: none"> Product updates handling (~30K-40K messages/day) 	<ul style="list-style-type: none"> Bridge integration (Magento, Basil, Ingram, Mailchimp, OMS workflows) 	<ul style="list-style-type: none"> Optimized canonicals, meta tags, and structured data
<ul style="list-style-type: none"> Removal of unused catalog media assets 	<ul style="list-style-type: none"> Inventory updates handling (~100K-200K messages/day) 	<ul style="list-style-type: none"> Multi-source inventory routing and synchronization 	<ul style="list-style-type: none"> Enhanced internal linking, indexation, and SEO across 4.7M+ pages
<ul style="list-style-type: none"> Improved file system efficiency and access 	<ul style="list-style-type: none"> Retry and Dead Letter Queue (DLQ) handling 	<ul style="list-style-type: none"> Replay and recovery for failed data syncs 	<ul style="list-style-type: none"> Integrated payment and tax systems (Braintree, Avalara, Valutec)
<ul style="list-style-type: none"> Reduced storage and media load Faster backup and recovery time Improved system efficiency 	<ul style="list-style-type: none"> Eliminated deadlocks at scale Faster queue processing Stable high-volume operations 	<ul style="list-style-type: none"> Real-time inventory sync Accurate cross-system data flow Consistent product data state 	<ul style="list-style-type: none"> Improved organic visibility Better UX and conversions Reliable commerce operations

Key Capabilities Delivered for This High-Scale Bookstore



Flexible Buying Experiences

- **Book by Foot (Bulk Purchasing)** – Enabled large-volume and curated book buying
- **Pre-Order Campaigns** – Implemented high-demand product release workflows
- **Product Badges & Highlights** – Introduced labels like Best Choice for guidance



Subscription & Recurring Revenue

- **Book Hookup & Pick of the Month** – Enabled recurring subscription programs
- **Flexible Subscription Logic** – Configured billing cycles, offers, and pricing rules
- **Automated Recurring Orders** – Ensured seamless repeat purchases at scale



Events & Community Engagement

- **Event Ticketing System** – Implemented author events and in-store experiences
- **Event Promotions** – Enabled campaigns and featured event listings
- **Event Discovery Experience** – Improved visibility and engagement with events



Seamless Shopping Experience

- **Mixed Cart Checkout** – Enabled pickup and shipping in a single order flow
- **Real-Time Availability** – Ensured accurate stock during checkout flow
- **Improved Product Discovery** – Enhanced navigation across millions of products



Payments, Gift Cards & Offers

- **Omnichannel Gift Cards (Valutec)** – Integrated unified balance across channels
- **Accurate Checkout Processing** – Fixed totals, tax calculations, and invoicing
- **Flexible Payment Integrations** – Implemented payment and real-time tax systems



Automation & Operational Efficiency

- **Automated Inventory & Order Sync** – Enabled real-time updates across systems
- **Proactive Alerts & Monitoring** – Implemented issue detection before customer impact
- **Reduced Manual Workflows** – Eliminated dependency on manual backend processes



Inventory & Fulfillment Intelligence

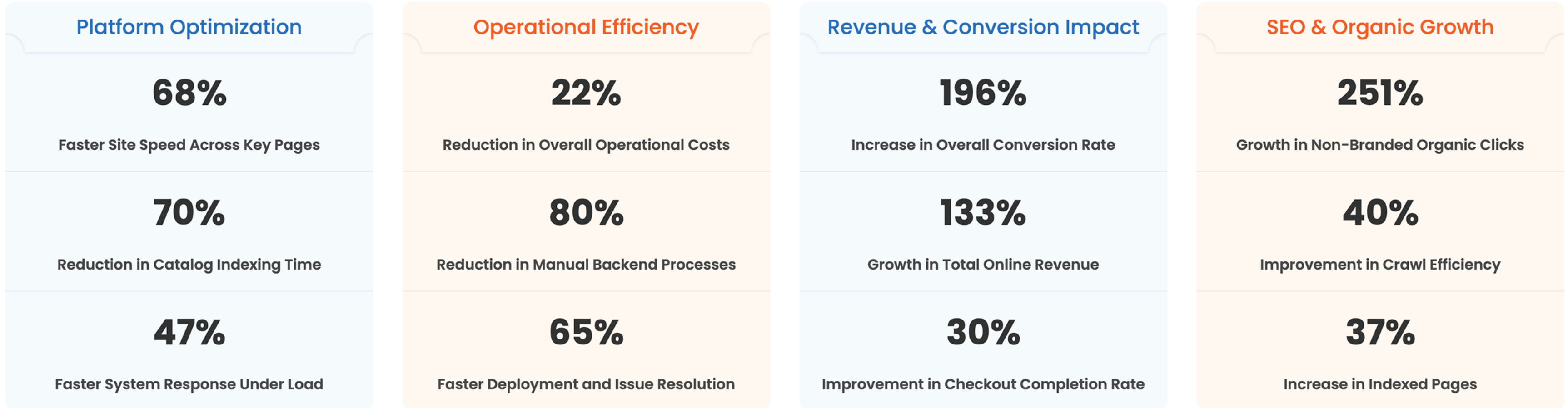
- **Unified Multi-Source Inventory** – Synced Basil, Ingram, and in-store inventory
- **Accurate Salable Quantity Logic** – Ensured correct stock across all systems
- **Smart Fulfillment Routing** – Optimized pickup and shipping combinations



Data Reliability & Recovery Systems

- **Replay & Recovery Mechanism** – Enabled product and data restoration on failure
- **Automated Data Sync Validation** – Ensured consistency across integrated systems
- **Fail-Safe Data Integrity Checks** – Prevented order and inventory mismatches

Performance Drivers Behind the Growth



Turning a Store into a High-Performance Growth Engine

By resolving deep-rooted monolithic bottlenecks, isolating queues, and paving the way for the Hyvä frontend, Strand Books successfully modernized an inventory of 4.7 million products.

The result is a **resilient, scalable digital marketplace capable of handling massive concurrency, automated fulfillment, and sustained organic growth with 100% uptime.**

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