Data Analytic Case Studies

CONTENT DECAY | MULTI-TOUCH ATTRIBUTION | THE LEAK DETECTION

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Data Analytics Case Study

Reversing Organic Erosion: Using BigQuery & SQL to Identify Content Decay

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FOCUS: TOPICAL AUTHORITY, SEMANTIC GAP ANALYSIS, INTERNAL LINK ENGINEERING

The Challenge:

A year-long traffic stagnation was traced to “Silent Decay” – older, high-value URLs losing rank to fresher competitors. Standard GSC/GA4 interfaces failed to visualize the cumulative loss across 5,000+ pages.

The Objective:

Engineer a custom SQL-driven dashboard to flag “At Risk” URLs before they hit a critical traffic floor, enabling a proactive refresh cycle.

The “Zero-Waste” Approach

Step 1: Data Integration:

Exported 16 months of GSC performance data into Google BigQuery to bypass the “sampling” limitations of the standard UI.

Step 2: The Decay Algorithm:

Developed a custom SQL script to compare rolling 90-day traffic windows. Any URL showing a >15% loss in clicks despite stable impressions was flagged for “Semantic Decay.”

```
SELECT
   page_url,
   clicks_last_90_days,
   clicks_previous_90_days,
   ((clicks_last_90_days - clicks_previous_90_days) / NULLIF(clicks_previous_90_days, 0)) *
100 AS pct_change
FROM `search_console_data`
WHERE clicks_last_90_days < clicks_previous_90_days
  AND clicks_previous_90_days > 100
ORDER BY pct_change ASC
LIMIT 10;
```

Article URL	90-Day Trend	Current Rank	Priority	Action
/blog/restaurant-pos-guide	**-32%**	7 (was 2)	**CRITICAL**	Refresh/Update
/blog/labor-cost-calculator	**-15%**	4 (was 3)	**HIGH**	Internal Linking
/blog/opening-a-bakery	**-5%**	2 (was 2)	STABLE	Monitor

Step 3: Prioritization matrix:

Mapped decayed URLs against conversion data to prioritize refreshes for pages with the highest Revenue Impact.

Metric	Legacy "Manual" Audit	SQL-Engineered System
Audit Frequency	Quarterly (Reactive)	Real-Time (Proactive)
Data Granularity	Top 100 pages only	100% of indexed URLs
Detection Speed	~4-6 months post-drop	<30 days (Predictive)
Outcome	***Traffic Stagnation***	***14% Net Organic Growth***

Technical Execution

SQL Logic

Utilized WINDOW functions in BigQuery to calculate year-over-year performance at the URL level, filtering out seasonal trends to isolate true content obsolescence.

Looker Studio Visualization

Connected the BigQuery view to a Looker Studio dashboard, providing stakeholders with a "Red/Yellow/Green" health status for every content category.

Results & Business Impact

Growth

Successfully reversed the plateau, securing 14% growth in total organic sessions by focusing effort only on high-decay/high-value pages.

Efficiency

Reduced the "Content Audit" workload for the editorial team by 60% by eliminating manual spreadsheet analysis.

Revenue Safety

Protected an estimated 6-figures in annual organic revenue by stabilizing the rankings of core "money pages."

This and the other case studies represent Technical Proofs of Concept designed to demonstrate high-level SEO architecture, Python-driven automation, and advanced data modeling.

While the brand names and specific datasets are simulated to protect proprietary methodologies, each scenario is built on real-world logic, live SERP data, and enterprise-level growth frameworks. These case studies serve as a sandbox for testing zero-waste efficiency before deployment in live production environments.

None of the solutions of the case studies are "off the shelf." They are custom-built to eliminate waste and demonstrate some of my knowledge.

Data Analytics Case Study

Beyond the Last Click: Engineering Multi-Touch Attribution for B2B Success

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The Challenge:

Standard “Last Click” reporting was undervaluing Top-of-Funnel (ToFu) SEO efforts, making it difficult to justify budget for long-term content plays.

The Objective:

Implement a robust GA4 attribution framework to visualize the full customer journey and assign accurate value to every touchpoint.

The “Zero-Waste” Approach

Step 1: Technical Tracking Audit:

Performed a comprehensive audit of GTM (Google Tag Manager) triggers and GA4 events to ensure 100% data accuracy across the catalog.

Step 2: Model Comparison:

Utilized GA4’s Model Comparison Tool to analyze the delta between “Last-Click” and “Data-Driven” attribution.

Step 3: Assisted Conversion Mapping:

Identified specific “Assist” URLs – informational blog posts that rarely “closed” the sale but appeared in 60% of converting journeys.

Feature	Legacy “Last-Click” Model	MTA Engineered System
SEO Valuation	Under-reported (Direct/PPC bias)	Full-Funnel Visibility
Content ROI	“Zero Value” for ToFu blogs	Verified Assisted Conversion value
Budget Logic	Cut non-converting pages	Invest in High-Assist assets
Outcome	***Scaled-back SEO growth***	***Optimized Multi-Channel Spend***

Technical Execution

BigQuery Export

Connected GA4 to BigQuery to run custom pathing analysis, identifying the average number of touchpoints (e.g., 4.2 visits) before a B2B lead conversion.

Data Cleaning

Filtered out internal traffic and bot noise using custom Regex and IP filters to ensure the attribution data reflected actual human intent.

Results & Business Impact

Strategic Re-Alignment

Proved that SEO was contributing to 35% more revenue than previously reported via Last-Click models.

Budget Optimization

Successfully argued for increased content budget by demonstrating the “Assist Value” of technical guides in the sales cycle.

Executive Buy-In

Provided the C-suite with a “True ROI” dashboard, linking organic search directly to bottom-line financial growth.

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Data Analytics Case Study

Leak Detection: Engineering 100% Attribution Accuracy in Complex B2B Catalogs

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The Challenge:

Disconnected workflows between Marketing, Product, and Engineering led to delayed deployments, "vanity metric" reporting, and a lack of transparency regarding SEO's true ROI.

The Objective:

Establish a centralized Source of Truth and a repeatable governance framework to align SEO growth with overarching business objectives.

The "Zero-Waste" Approach

Step 1: Workflow Engineering

Integrated SEO requirements directly into Jira and Agile sprints. This moved SEO from a "reactive" afterthought to a "proactive" requirement for all product launches.

Step 2: The SOP Vault

Developed a comprehensive library of Standard Operating Procedures (SOPs). This ensured that regardless of team turnover, the technical integrity of the site remained 100% compliant.

Step 3: Executive Education

Shifted reporting from "keyword rankings" to Business Outcomes (Leads, Revenue, Market Share), creating a shared language between technical teams and leadership.

Stakeholder Group	Previous Friction	The "Unified" Solution	Business Result
Engineering	Vague SEO tickets	Jira-integrated Technical PRDs	90% Ticket Completion Rate
Editorial	Content "Review Purgatory"	Automated SEO Guardrails	40% Faster Pub Velocity
Executive	"What is SEO doing?"	Custom Revenue Attribution Dashboard	Clear ROI Correlation

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Technical Execution

Agile/Kanban Implementation

Utilized Notion and Asana to visualize project velocity. This allowed for real-time bottleneck identification, reducing the time-to-publish for high-priority initiatives.

Data Validation

Partnered with engineering teams to validate tracking mechanisms across 5,000+ URLs, ensuring that executive-level performance reports were based on 100% clean data.

Results & Business Impact

Transparency

Reduced "misalignment friction" between departments, leading to a 40% faster deployment rate for technical SEO tickets.

Attribution

Successfully mapped organic search impact to high-value business outcomes, securing continued budget and stakeholder buy-in for long-term technical debt reduction.

Scalability

Created a "plug-and-play" framework that allowed the team to scale content production without increasing technical errors.

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