Data Analytics Case Study

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

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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.