Case Study

Boston Scientific

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## Boston Scientific

# Graph Data Science Streamlines Complex Medical Supply Chain Analysis

**INDUSTRY**
Life Sciences

**USE CASE**
Supply Chain

**GOAL**
Efficiently determine supply chain components that contributed to a testing issue

**CHALLENGE**
Difficulty finding at-fault components via ad hoc analytics on a vertically integrated supply chain

**SOLUTION**
Use Neo4j to model and analyze their complex products

**RESULTS**
- Quickly pinpoint root causes of problems
- Reduced query times from two minutes to seconds
- Fully managed cloud database frees up time for high-value analytics

*Boston Scientific needed a more efficient method for finding the root causes of quality control problems. Using Neo4j Aura Enterprise, the company can now identify the source of the issue and extract valuable insights from an extremely complex supply chain.*

## The Company

Boston Scientific is a global medical device company that develops and manufactures a wide range of innovative diagnostic and treatment medical products including pacemakers, stents and artificial heart valves. Their products are designed to make procedures less invasive and enhance patient outcomes. The company, which has produced over 13,000 products and has commercial representation in almost 130 countries, reported sales of $10.7 billion in 2019. Providers have helped over 30 million patients around the world with the company's products.

## The Challenge

Boston Scientific is highly vertically integrated in the development, design, manufacturing and sales of its medical products. This means that the company manufactures its complex devices, starting with raw materials such as resin and metal. Starting with raw materials requires a significant amount of batch processing in addition to discrete manufacturing of finished products.

With its complex manufacturing supply chains, Boston Scientific has numerous engineering teams aligned based on the process technology they're using.

Many devices use multiple technologies, so multiple teams are involved. With multiple teams, often in different countries, working on the same problems in parallel, engineers resort to analyzing their data in spreadsheets.

Decentralized ad-hoc analytics led to inconsistencies and, most importantly, an inability to find root causes of defects.

Boston Scientific needed a far more effective method for analyzing, coordinating and improving their manufacturing processes across all its locations.

## The Solution

Eric Wespi, Data Scientist at Boston Scientific, and his team understood the complexity of their business problem and their inability to address it using traditional tools. Boston Scientific moved from considering graphs to vetting the technology.

The heart of Boston Scientific's graph data model consists of three nodes representing a finished product, a part and an issue, with relationships that trace problems to parts and connect those to finished products. This simple model effectively represents a complex medical device composed of dozens of parts, manufactured from raw materials.

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*– Eric Wespi, Data Scientist, Boston Scientific*

The data model is simple, but Boston Scientific's graph is massive. Using Neo4j graph algorithms from the Graph Data Science Library, the Boston Scientific team analyzes its graph and computes scores that rank nodes based on their proximity to failures, enriching its models with insights derived from the graph.

"We're using Neo4j not as just a data store, but as a place to analyze data and store those new characteristics of the data back in the graph and then extract it for traditional analysis," said Wespi.

## The Results

Neo4j enabled Boston Scientific to analyze all relationships between their supply chain components and issues found during testing. Using Neo4j, they could quickly pinpoint components that were more likely to fail. Analytical query times dropped from two minutes to 10 to 55 seconds, helping to increase overall efficiency and streamline the entire analytical process.

Rapidly pinpointing faulty components in the supply chain was the key goal, but Boston Scientific identifies an even greater business value from using Neo4j – increased accessibility and understanding across the business.

Because the graph data model is so simple, it's easy to explain to others. "Everyone involved with the project, from business stakeholders to technical implementers, is able to understand one another, because they're all speaking a common language," said Wespi.

Boston Scientific uses the Shortest Path algorithm to uncover direct links between faulty components. Using Cypher, they conduct variable length queries, expanding or constraining the scope of the data they are analyzing. These two powerful capabilities are very difficult to implement without a graph database. Using simple Cypher statements, Boston Scientific is able to easily execute these processes.

Boston Scientific has gained visibility it could not have achieved using other techniques. "We've used Neo4j to track and analyze our manufacturing data for several years," said Wespi. "The schema flexibility and analytical capabilities of Neo4j allow us to see relationships between manufacturing batches that simply would not be possible with other tools."

The project has been so successful that the team needed to scale their deployment. Wespi and his team opted for Neo4j's fully managed cloud database.

"Deploying this project on Neo4j Aura Enterprise will allow us to focus our efforts on optimizing our models and staying focused on quality control analytics, knowing that the management of our graph database is under control," said Wespi.