



# The Next Wave In Retail Innovation: Connections

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## Biography

Emil Eifrem is CEO and co-founder of Neo4j (<http://neo4j.com/>). Previously Chief Technology Officer of Sweden's Windh AB, where he headed up the development of highly complex information architectures for Enterprise Content Management Systems. Emil famously sketched out what today is known as the property graph model on a flight to Mumbai in 2000.

Emil is a frequent conference speaker and a well-known author and blogger on NoSQL and graph databases, as well as co-author of the agreed Bible on graph databases, O'Reilly's *Graph Databases* (<http://graphdatabases.com/>).

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**Paper type** Research

## Abstract

*Retail is becoming an increasingly data rich environment as more of the business goes digital, creating many more data capture opportunities. The challenge for retailers is to capture the right data, process at the right speed and take appropriate action. With retailers spending more on technology over the coming year, with websites and mobile, and new IT systems, the author of this article explains why understanding connected data relationships will be a crucial differentiator for retailers going forward.*

## Introduction

The world's top retailers are all looking to connect their supply chain, their CRM, their digital and physical assets, their customer journeys. This we all know, but the fight's getting more and more important for established brands as digital giants like Amazon move on to the High Street<sup>1</sup>.

The challenge, however, isn't just in emulating Amazon. It is making the value of data and data connections pay off. This has historically proven to be a major headache, given existing tools and techniques, but there may be an answer in the shape of graph databases – an approach based on the insight that when it comes to data, it's the relationships that matter, not just the data.

Graphs differ from traditional relational business databases by specializing in displaying and identifying the relationships between large numbers of data points in real-time.



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That enables household brands to work with data better – and the secret's out: Amazon's recommendations are built on graphs – and seven out of the ten world's largest retail firms use them to deliver real-time product recommendations to dynamic pricing and optimized delivery routing, and more.

The exciting news is that graph database tools are now widely available. While digital pioneers such as Amazon had to build their own in-house graphs, the technology is widely available off the shelf, for every size of retailer.

As a result, graph databases are becoming more of a factor in retail, proving their worth in recommendations, real-time pricing engines, personalization of the customer journey, aiding logistics and delivery, supply chain visibility and traceability, all the way to the retailer's own network and IT infrastructure monitoring and security.

### Real time? It's the only time

Delivering real-time recommendations to online shoppers is a proven way to maximize revenue. But now, all shoppers expect finely tuned recommendations based on their individual consumer's preferences, shopping history, interests and needs, in addition to what's already in their current shopping cart.

The consensus is that this cannot be easily achieved with relational database (RDBMS) technology, the database technology most businesses, including retail, work on now. Why? The bandwidth isn't there. SQL queries are too complex and don't really deliver what you want, in real time. The same applies to big data processing technologies like Hadoop and Spark, which handle data volume well but can't manage data connections either.

### Dynamic offers to persuade the undecided

At the same time, in order to counter dynamic pricing from the likes of Amazon, retailers need the ability to change pricing and promotions at any level of a product hierarchy. For example, mark down all 60-inch televisions by 10% for the next two hours if they spot an opportunity. Similarly, retailers must be able to implement competing promotions and reduce all smart phone prices except Apple iPhones<sup>2</sup>.

Real-time promotions rely on complex rules that, again, relational struggles with, but which are made simple when handled by a graph database.

### Personalized experiences

Retailers need to personalize the online customer experience by serving relevant content based on the customer's desires, interests, and needs. The good news is that they have plenty of data that can be used to determine the best paths and content to serve customers.

However, the less inspiring news is that this data too often sits stubbornly isolated in information silos. You could move the data into Hadoop or a data warehouse to pre-compute recommendations, but they will be out of date – plus, this is an inefficient process heavy way of proceeding.



Better, is a graph analysis overlay for a bigger picture of the customer relationship anytime a customer interacts with you.

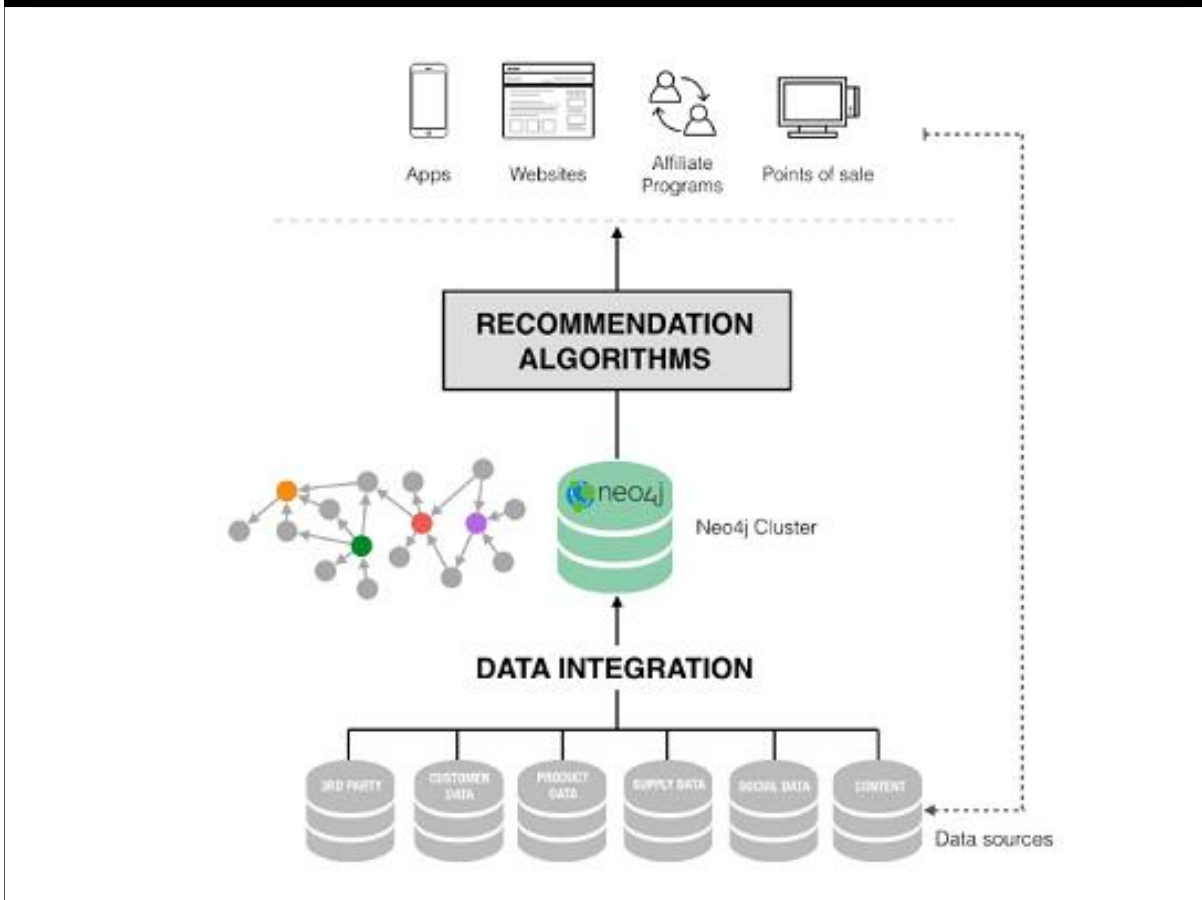
### Amazon Prime for your brand, too?

Thanks to Amazon Prime's short delivery promise, retailers also must meet or beat the standard to remain competitive. Again, ecommerce delivery service routing is a natural fit for graphs given the highly connected nature of the data. It's not just that it requires a lot of "hops" across data points, but that there can be many permutations. Those permutations may be deemed the best path at different times of the year and for different products, even within a single order. A graph database can take all these factors into account and support complex routing queries.

### Supply chain integrity

Retailers need transparency across the entire supply chain to detect fraud, contamination, high-risk sites, and unknown product sources. Think food scares such as the horse meat scandal, for instance, where a specific raw material is compromised in some way and companies must be able to rapidly identify every product impacted. This requires managing and searching large volumes of data without delay, lest the public and regulators turn on your brand for good.

Figure 1: Example of how a graph database could be incorporated into an existing architecture, Integrating data from several different sources





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A relational database is simply not built to handle a lot of recursive queries required, and as a result performance suffers. A graph database enables retailers and manufacturers to manage and search large volumes of data with no performance issues and achieve the supply chain visibility they need.

### **Graphs are beyond compare**

It is never been easier for customers to comparison shop. Thus, prices need to be competitive, literally 24x7. The more you can understand their micro-markets and optimize product pricing to match availability, the more options there are to improve margins and sales in the right proportion.

However, a relational database can't keep up with these data points. That is why more companies are turning to a graph database to address revenue management while delivering the scale and performance necessary for a real-time pricing engine.

### **IT admin and security**

The retail IT organization itself, finally, also benefits from a graph database. Internally, you can have very complex networks, and it can be difficult to represent every IT asset and understand how they are interconnected.

System administrators can use a graph database to map all the network assets to better secure the network and to detect vulnerabilities or to limit the spread of an intrusion – yet another great use case.

### **The verdict**

It is clear that graph technology is coming through as an intuitive way of meeting market, internal and customer issues for today's retail leader – be you Amazon or not.

Given that company's relentless rise, isn't it time you started taking data connections as seriously as Jeff Bezos does?

#### **Reference**

- <sup>1</sup> <http://uk.businessinsider.com/whole-foods-amazon-like-walmart-2017-8?r=US&IR=T>
- <sup>2</sup> <http://www.telegraph.co.uk/news/2017/06/24/exclusive-end-fixed-prices-within-five-years-supermarkets-adopt/>