

## White Paper

# Sustainable Competitive Advantage: Creating Business Value through Data Relationships

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FEBRUARY 2015

## White Paper

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# Sustainable Competitive Advantage: Creating Business Value through Data Relationships

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## What's Inside, At-A-Glance

Achieve Sustainable Competitive Advantage

Harvest new market opportunities by creating products and services that leverage data relationships	Reimagine existing applications to innovate with data relationships
	
<p>First to market, up and running in days, not weeks or months</p> <p>Reduced churn, increasing engagement and uncovering fraud</p>	<p>Kept the business running when data growth threatened to stop it</p> <p>Drastically reduced project complexity and risk</p>
	
<p>Achieved new company vision centered around Business Graph</p>	<p>Increased revenue and delighted customers by improving user experience</p>
	
<p>Leapfrogged the competition with a 360 degree view of the customer</p>	<p>Brought new offering to market to compete with Amazon Prime &amp; Fresh, and Google Express</p>

“Graph analysis is possibly the single most effective competitive differentiator for organizations pursuing data-driven operations and decisions after the design of data capture”

*Gartner Research<sup>1</sup>*

## Introduction

Where does **sustainable competitive advantage** come from? It's not from data volume or velocities, but from the knowledge of relationships in your data.

Even three years ago, you may not have given DBMS choice much thought, figuring you could create the right applications if you had a crack team of database professionals and developers. Today, however, while you still need great people, changes in application, market, and user requirements also necessitate that you unlock business value from data relationships.

Traditional databases were conceived to digitize paper forms and automate well-structured business processes, and still have their uses. That said, RDBMSs cannot model or store data and its relationships without complexity, and performance degrades with the number and levels of data relationships and data size. What's more, adding new types of data and data relationships requires schema redesign that increases time to market. For these reasons, RDBMSs are inappropriate when data relationships are valuable in real time.

NoSQL databases are also inappropriate when data relationships are valuable in real time; NoSQL databases have no data structures to model or store relationships, nor query constructs to support data relationships.

When you choose a relationship-based (or “graph”) database, you naturally store, manage, analyze, and use your data within the context of connections, like the circles and lines drawn on whiteboards. Companies that use a graph database in conjunction with (or in place of) relational and NoSQL database management systems, enjoy **sustainable competitive advantage**.

## Analysts Predict Graph Databases Will Reach 25 Percent of Enterprises by 2017

Forrester Research analysts recently reported that graph databases — the fastest-growing category in database management systems — will reach more than a quarter of enterprises by 2017.<sup>2</sup>

Additionally, Gartner Inc. named Neo Technology a Cool Vendor in DBMS, 2014, listed Neo4j among the ‘Who's Who in NoSQL DBMSs’, and included Neo4j in the 2014 Magic Quadrant for Operational Database Management Systems (DBMS).<sup>3</sup>

1. Gartner, ‘IT Market Clock for Database Management Systems, 2014,’ by Donald Feinberg and Nick Heudecker, September 22, 2014.

2. TechRadar™: Enterprise DBMS, Q1 2014. Forrester Research. February 13, 2014.

3. Gartner, ‘IT Market Clock for Database Management Systems, 2014,’ by Donald Feinberg and Nick Heudecker, September 22, 2014.

"Neo4j has enabled us to expand beyond our initial limited use cases to address a much broader set of problems."<sup>4</sup>

*Sven Junkergard*  
Chief Technology Officer  
Zephyr Health Inc

You can achieve **sustainable competitive advantage** in the following two ways:

1. Harvesting new market opportunities by creating products and services that leverage data relationships
2. Reimagining existing applications to innovate with data relationships, and in the process boost efficiency and performance, lower costs, and increase the value of your existing data

The only enterprise-grade graph database on the market is Neo4j; Neo4j customers consistently validate their ability to deliver faster performance, create new products and services, and better adapt to changing business needs, as indicated in the chart below.

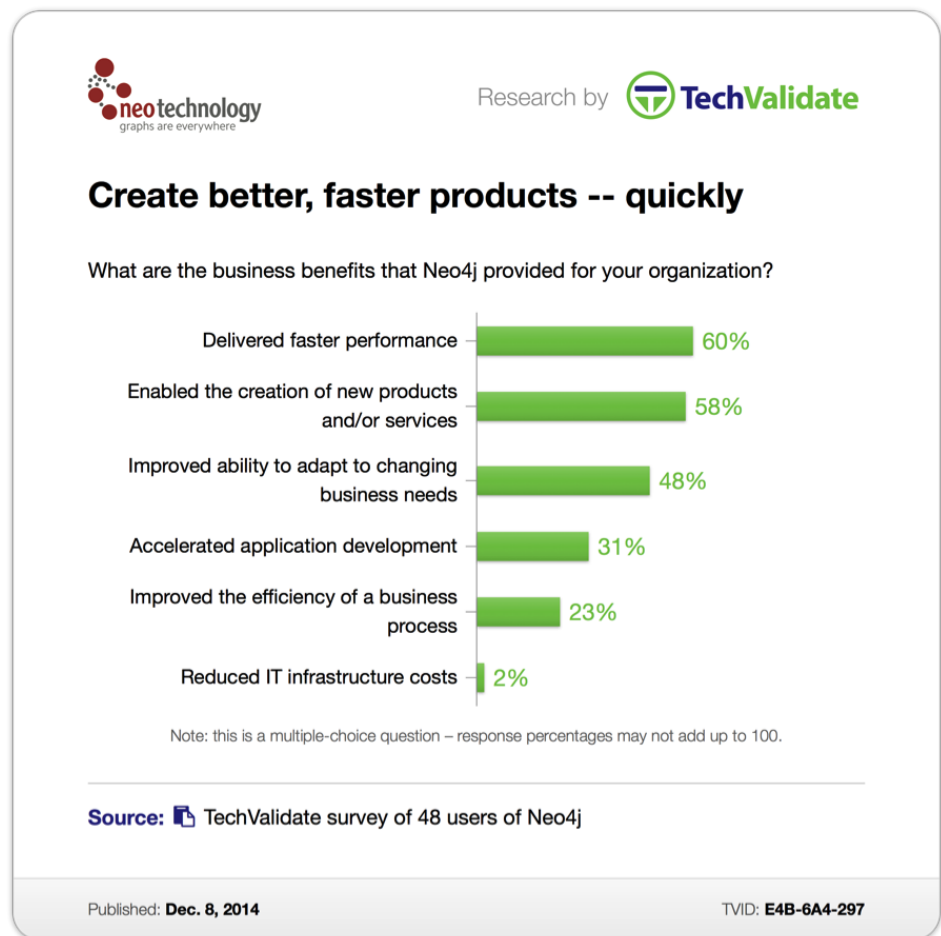


Figure 1 - Results of Customer Survey

4. TechValidate, TVID: 179-D9D-483, January 7, 2015  
5. <http://neo4j.com/users/zephyr-health/>

Zephyr Health<sup>5</sup>, one of the survey respondents reflected in the above chart, experienced both : “Neo4j has enabled us to expand beyond our initial limited use cases to address a much broader set of problems,” said Sven Junkergard, Chief Technology Officer, Zephyr Health Inc.

Zephyr runs a cloud-based big data analytics platform that, for example, helps pharmaceutical companies gain new insights into clinical trials, managed care, and sales and marketing.

### Data Relationships Provide Value for Many Use Cases

Global firms in healthcare, financial services, insurance, telecommunications, and government, leverage data relationships in their existing data to improve efforts in the following use cases:

- Master Data Management
- Network and IT Operations
- Graph-Based Search
- Identity and Access Management
- Fraud Detection
- Recommendations
- Social Capability

Additionally, the momentum in the burgeoning Internet of Things — which is perhaps more aptly called the Internet of (Connected) Things<sup>6</sup> — space proves increasingly staggering. In fact, IoT use cases reveal that graph databases are best suited for handling effectively the data relationships that arise when connected devices communicate with each other and incorporate external data, such as weather statistics, geo-spatial information, and maintenance records.

This paper explores how forward-thinking companies are adopting graph databases to extract maximum value from data relationships, and highlights six companies that have used Neo4j to achieve sustainable competitive advantage.

## Compete by Creating New Products and Services

Your business must adapt quickly to changing market conditions and to tightening customer expectations. You may have experienced a time when you simply couldn't undertake certain projects that would benefit your business, because doing so was prohibitively complicated or even impossible. It's increasingly common for new products and services to be grounded in related data, in which case the inability of relational and NoSQL technologies to handle data relationships well becomes an obstacle.

Understanding data relationships is also key to understanding dependencies, uncovering cascading impacts, and predicting behavior. Such insight allows businesses to execute opportunities for new services and products. To identify these opportunities, businesses need tools that show complex connections quickly and easily.

Because of their design, graph databases have become an essential tool for discovering, capturing, and making sense of complex interdependencies and relationships, both for running an IT organization and building next-generation functionality for businesses. They easily model and navigate networks of data, with extremely high performance.

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6. <http://dataconomy.com/how-the-internet-of-things-can-be-best-explored-using-graph-databases/>

The following image illustrates how performance holds steady in Neo4j, even as data size increases and becomes increasingly connected. Note how the opposite is true for relational and other database management systems.

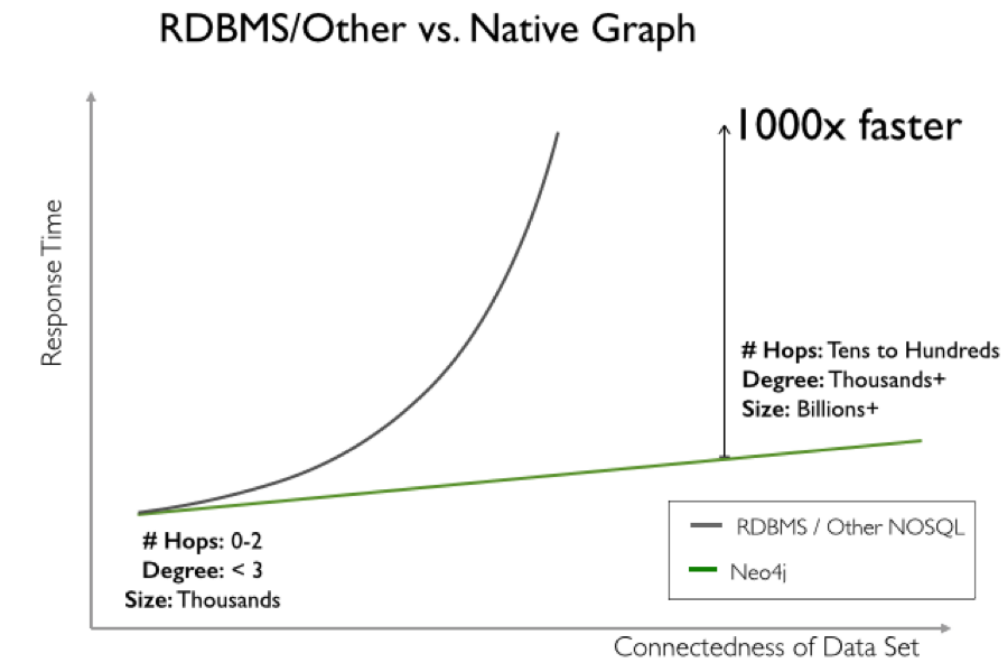


Figure 2 - Real-time Query Performance



First to market, ‘up and running in days, not weeks or months’

Gamesys, the largest cash and social gaming operator in UK and Europe, created the world’s first cash gaming application on Facebook. With games such as Jackpotjoy, Instant Slots, and Here Be Monsters, the company features online bingo, slots, and casino games. The site handles about 5 Billion wagers (financial transactions) per year — more than the number of stock trades that the London Stock Exchange completes per year) — and about 250,000 unique cash players per month. That’s up to 70,000 active players on any given day.

They built a new social network around online bingo with Neo4j, wherein people chat inside the game. In the highly competitive online gaming market, acquiring new players is expensive, and players acquired by referral are cheaper to acquire and of higher value. So, Gamesys wanted to incentivize existing members to refer their friends, and to derive business value from the project they needed to capture the social relationships between players in a new and reliable way.

Enter Neo4j.

"It's been very interesting to see how something we brought in for a very specific problem has slowly mushroomed and ballooned and become a cool technology in the company and something that people want to work on."

*Toby O'Rourke*  
*Head of Data Platform*  
*Gamesys*

### Reducing churn, increasing engagement, uncovering fraud

The chat in online bingo makes the experience "sticky" for gaming participants, helping Gamesys to reduce churn and maximize time on site, according to Toby O'Rourke, Head of Data Platform at Gamesys, who presented his team's graph adoption at GraphConnect London 2013.<sup>7</sup>

The Gamesys team realized that a graph database was essential for robust social capability because all of their data was already connected in relationships. They chose Neo4j as the leader in the space, and they found it easy to develop.

"You draw this data model up on the board, and you've got a player here, and he refers him, and there's another one there, and there," O'Rourke explained. "So how are you going to code that? Well, you code it like you just drew it. We had our core stuff up and running in days, not weeks or maybe months."

"There was great value for us in using a graph data store," he said. Eighteen months into the project, Neo4j is proving "really stable" and the mission-critical application has experienced no unplanned downtime. Added bonus: The data relationship information even provides fraud detection and prevention because possible referral abuse is discovered.

### Continuing to innovate, understanding dependencies

With the success of their first Neo4j project, the team realized they had experienced "the graph infection." They continued to innovate with their "Here Be Monsters" game on Facebook. This game features a complex economy with thousands of items, monsters, locations, and traps, and it is very difficult to understand the effect of changing, for example, the scarcity of any given item. The graph gives the team a way to model and calculate the value of things.

In a traditional business model, the game team would input changes and then do loads of play testing to measure effects. The social team took everything in the game (monsters, quests, resources, spells, traps, and potions) and those became the nodes in Neo4j. The links between them became the relationships. The team could weigh inputs and produce accurate predictive reports to reduce the amount of play testing.

With the measurable business value emerging from these two projects, the team of Gamesys engineers is looking for other types of problems they can solve with graphs.

"That's a really great place to be in," O'Rourke explained. "It's been very interesting to see how something we brought in for a very specific problem has slowly mushroomed and ballooned and become a cool technology in the company and something that people want to work on."

7. <http://neo4j.com/users/gamesys/>

"We can do it in code and reflect it almost instantaneously in the graph. Doing the same thing in a relational database or even in a NoSQL database would cost us a heck of a lot more time... Neo4j lends itself to the kinds of questions that businesses want to ask, but don't yet know that we want to ask. Graph databases are terribly, terribly valuable for that."

*Kurt Freytag*  
*Head of Product*  
*CrunchBase*

### CrunchBase

#### Achieved new company vision centered around Business Graph

Another successful company in a different industry also "sped to market" with a game-changing product. CrunchBase is a database of startup companies, venture firms, and venture fundings. Over several years, the database has captured the people, products, patents, companies, and investors that exist (mostly) in the technology vertical. It has grown organically over time as "a public good" to which people voluntarily contributed. It lived more or less happily in MySQL for a time, said Crunchbase Head of Product Kurt Freytag, during GraphConnect San Francisco 2014.<sup>8</sup>

The CrunchBase team realized, though, that it needed to leverage relationships between the data they'd been storing, and with that realization came a new vision: to build the world's most powerful startup community, adding the component of time to look at the connections with the lens of history, getting at the lifecycle of business within markets and geographies, including acquisitions, IPOs, job changes, product launches, and even successes and failures. The team rebuilt the entire CrunchBase on Neo4j, and then also added a new events calendar in three weeks.

"To iterate that quickly and produce something as robust as a global events calendar is a mammoth step up for us. In CrunchBase 1, that probably would have taken us two months," explained Freytag.

#### Adapting to changes with ease

The value doesn't stop at time-to-market.

"As our requirements change and we think about other things that need to exist in our data model because of either evolving product requirements or other ways we want to enhance the user experience, doing this in an older manner in a relational database would require some histrionics that are horrible," Freytag said.

<sup>8</sup>. <http://graphconnect.com/gc2014-sf/>



"Neo4j gives a competitive edge to this Zacks Rank #2 (Buy) company as its graph-based model provides fast and reliable information to the businesses. Further, ease of comprehension of the information is an additional perk for customers."<sup>9</sup>

*Zacks Investment Research*



### Leapfrogged the competition with a 360-degree view of the customer

Pitney Bowes, an established leader in direct marketing, is also a major player in digital marketing communications and is helping clients provide an omni-channel experience by delivering contextually relevant information. Pitney Bowes, a name synonymous with mailing systems worldwide, successfully diversified to sell a variety of digital tools and services its clients need. As a result, digital revenues are the fastest growing part of the business, up 23 percent in 2013 and comprising 19 percent of the business.

They leapfrogged their competition by building a leading-edge Master Data Management (MDM) system with Neo4j. Pitney Bowes deals with different customers who have portfolios of applications that incorporate newer, less predictable data sources such as mobile, social networks, customer experience measurements, and governance requirements. Pitney Bowes also manages multiple channels over which customers and companies communicate. With this complexity, the team realized that only a graph database could naturally store and process complex data relationships.

They selected Neo4j over other graph databases because it was the most established and mature product, it had demonstrated scale at major clients, and the learning curve was flat enough that the team got up and running quickly. Soon after the new MDM system was announced, a 3rd-party equity research firm affirmed Pitney Bowes as a "Buy."

## Compete by Reimagining Existing Products and Services

As evidenced in the examples above, savvy innovation resulting in new applications is almost always integral to beating your competition. But it's also important to reimagine existing mission-critical applications based on the value in data relationships. Processes are getting more related and it's possible to learn more about customers through various channels, once again providing the opportunity to relate things and derive more value. Existing applications were not written to take advantage of these things. This makes it necessary to reimagine them, as in the following examples: Fraud Detection with access to social data; Supply Chain with access to real-time route information; and MDM with access to the different channels that customers use to communicate.

9. <http://www.zacks.com/stock/news/157741/pitney-bowes-selects-neo4j-to-develop-graphbased-mdm>



## Kept the business running when data growth threatened to stop it

Telenor Norway, the largest supplier of that country's telecommunications and data services, had such a problem with provisioning resulting from growing customer bases and subscriptions that their older system couldn't handle it. They projected that unless they re-thought the existing solution, they would have to stop accepting new customers within one year. Behind Telenor's online self-service management portal lies the middleware responsible for managing customer organizational structures, agreements, subscriptions, and user access to business mobile subscriptions.

Their customers had to wait 20 minutes to gain access to new resources. Over time, mobile subscriptions greatly increased and customer portfolios grew dramatically — at the same time that users expected near-real-time response from online systems.

To deal with this mushrooming problem, the team tried a batch pre-compute process, but the batch window kept growing, data was as stale as 24 hours old at the time of retrieval, and the problems of adding new users or changing rights remained unsolved.

With Neo4j, they reimagined the authorization process that covers corporate and residential customers, their corporate structure, subscriptions containing phone number, price plan and owner/payer/user, billing accounts, and agreements including discounts.

## A simplified rendering of Telenor's resource access data structure

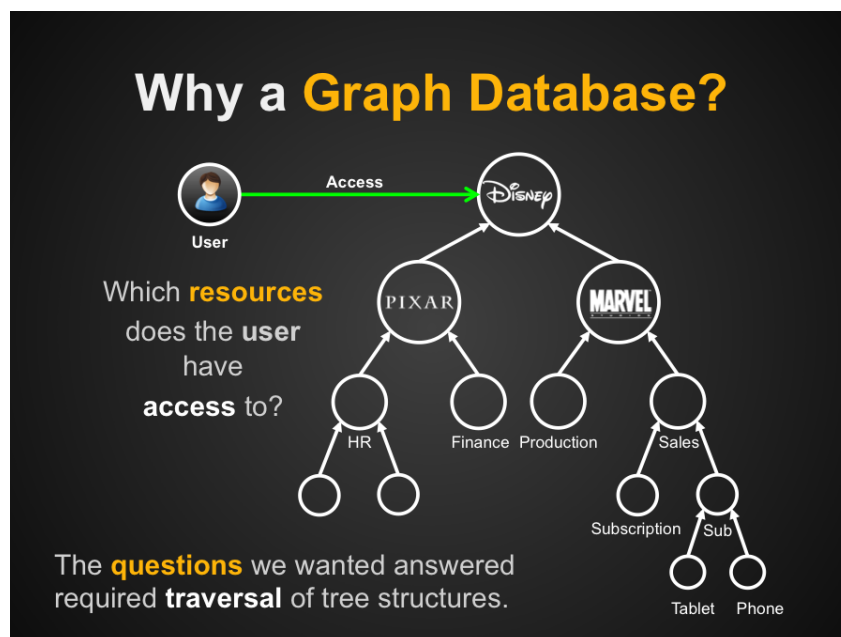


Figure 3 - Presented at GraphConnect 2013<sup>10</sup>

10. <http://graphconnect.com/gc2013/>

“With complex dependencies between accounts, products and companies, Neo4j’s high performance engine provides flexibility of data representations along with features that go beyond traditional relational databases.”<sup>11</sup>

*Sebastian Verheughe,  
Architekt & Developer,  
Mobile Middleware Services, Telenor*

When the team built an authorization engine using Neo4j integrated into the platform framework, Telenor’s 3M+ customers enjoyed millisecond speed when they accessed resources, thanks to dramatically simplified business traversal rules. For example, a traversal that once took 1500 lines of SQL needed just 10s of lines of native Java code to query Neo4j. Modeling the resource graph in Neo4j was natural because the data domain is a graph; so Telenor could get fast and secure answers to important questions, such as:

- Which subscriptions can a user access?
- Does the user have access to the given resource, and which agreements is a customer party to?

The speed and accuracy of these operations is critical, because system users cannot access data until authorization calculation is performed.

“As a premium Telco provider in Norway, we need a reliable system to cater to our large user base,” explains Sebastian Verheughe, architect and developer of the Telenor Mobile Middleware Services. “The Neo4j database delivers high performance services for our value chain.”<sup>12</sup>

By overcoming both performance and data currency limitations, Neo4j enabled high performance and reliable execution of authorization rules. The transition to Neo4j resulted not just in faster performance, but in more maintainable code, because access rules could be expressed much more easily.



Increased revenue and delighted customers  
by improving user experience

In its drive to provide the best customer web experience, Walmart, the world’s largest corporation (more than 2 million employees and \$470 billion in annual revenues) knew it needed to optimize online recommendations. After all, shoppers expect finely tuned, highly personalized recommendations and react coolly to one-size-fits-all suggestions. This new user experience requires data products that connect masses of complex buyer and product data to gain super-fast insight into customer needs and product trends.

Walmart’s team substituted a complex batch process with Neo4j, the perfect tool for real-time product recommendations.

“A relational database wasn’t satisfying our requirements about performance and simplicity, due to the complexity of our queries,” explained Walmart Software Developer Marcos Walda, of the eCommerce-Brazil group.<sup>13</sup> “Neo4j helps us understand our

11. [http://dev.assets.neo4j.com.s3.amazonaws.com/wp-content/uploads/Neo4j\\_CS\\_Telenor.pdf](http://dev.assets.neo4j.com.s3.amazonaws.com/wp-content/uploads/Neo4j_CS_Telenor.pdf)

12. Ibid.

13. <http://neo4j.com/users/walmart/>

"With Neo4j, we could substitute a heavy batch process that we used to prepare our relational database with a simple and real-time graph database. We could build a simple and real-time recommendation system with low latency queries. As the current market leader in graph databases, and with enterprise features for scalability and availability, Neo4j is the right choice to meet our demands."<sup>14</sup>

Marcos Walda  
Software Developer  
Walmart

online shoppers' behavior and the relationship between our customers and products, providing a perfect tool for real-time product recommendations."

By design, graph databases can quickly query customers' past purchases, as well as instantly capture any new interests shown in the customers' current online visit — essential for making real-time recommendations. Matching historical and session data in this way is trivial for graph databases like Neo4j, enabling them easily to outperform relational and NoSQL database management systems.



Brought new offering to market to compete with Amazon Prime and Fresh, and Google Express

When eBay looked to build an entirely new same-day delivery service, they turned to Neo4j because they knew the project would be impossible with any other database.

The reimagined platform behind "eBay Now," delivered on time within one year from inception, provides ultra-fast transactions with consistently reliable performance. The platform, with its easy and fast queries, seamlessly supports future expansion of the business so eBay can continue to innovate and achieve sustainable competitive advantage.

*"Our Neo4j solution is literally thousands of times faster than the prior MySQL solution, with queries that require 10-100 times less code. At the same time, Neo4j allowed us to add functionality that was previously not possible."*<sup>15</sup>

Volker Pacher, Senior Developer, eBay

Neo4j unlocks business value in many use cases and industries

We've demonstrated the business value that can be leveraged with Neo4j and you may be wondering what kinds of solutions can benefit from a graph-based approach. As you can see in the figure on the following page, a wide range of firms use Neo4j for surprisingly varying use cases.

14. <http://neo4j.com/users/walmart/>  
15. <http://neo4j.com/users/eBay/>

# Sustainable Competitive Advantage: Creating Business Value through Data Relationships

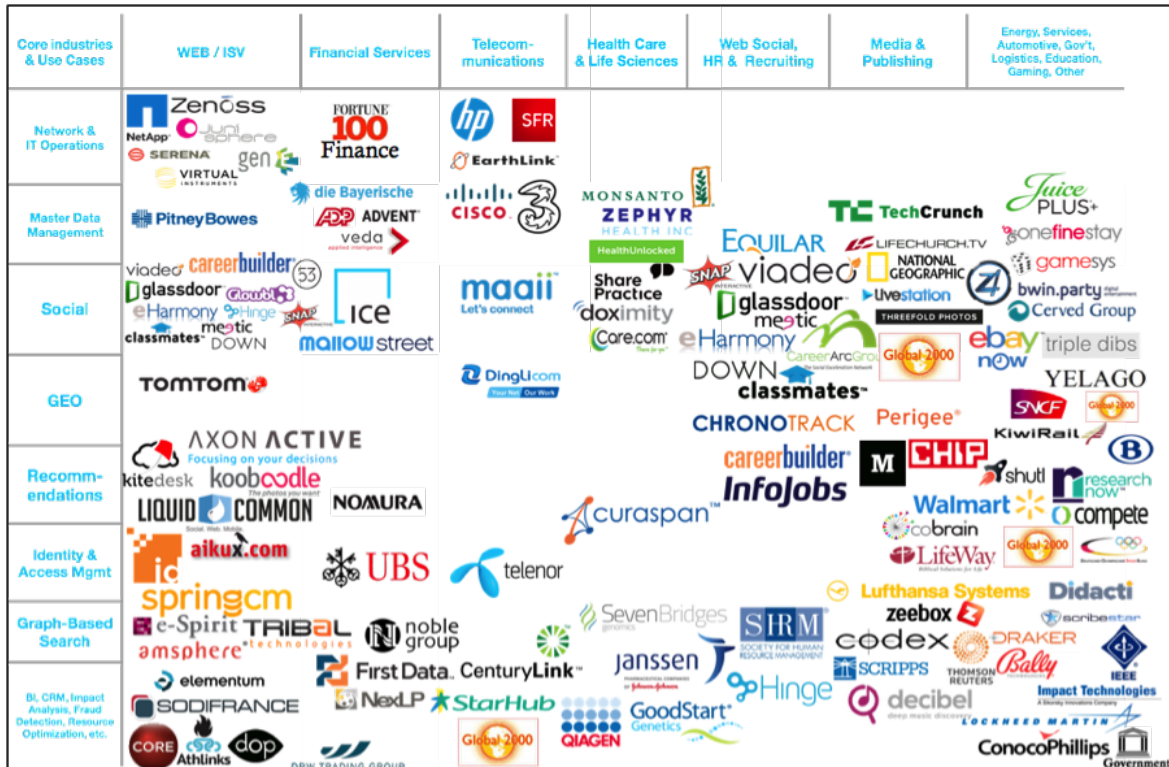


Figure 4 - Matrix of Neo4j Adoption, as of January 2015

## Conclusions

As data sizes and customer expectations grow at lightning speed, how can your business, whether in banking, energy, health care, media, government, or gaming, achieve sustainable competitive advantage? By unlocking the value of data relationships, in new online products and services and in reimagined applications, so you can easily improve performance, simplify development cycles, and innovate in surprising ways.

Choosing a graph database can help you in a variety of use cases, including: Master Data Management, Network and IT Operations, Graph-Based Search, Identity and Access Management, Fraud Detection, Recommendations and Social Capability.

Companies with varying use cases in numerous industries enjoy the flexibility and performance possible with Neo4j, the only enterprise-grade graph database, that brings data relationships to the fore.

Neo Technology is the creator of Neo4j, the world's leading graph database, that brings data relationships to the fore. From companies offering personalized product and service recommendations; to websites adding social capabilities; to telcos diagnosing network issues; to enterprises reimagining master data, identity, and access models; organizations adopt graph databases as the best way to model, store and query both data and its relationships. Neo Technology researchers pioneered the modern graph database and have been instrumental in bringing the power of the graph to numerous organizations worldwide. Large enterprises like Walmart, eBay, UBS, Nomura, The InterContinental Exchange, Cisco, CenturyLink, HP, Pitney Bowes, Telenor, TomTom, Lufthansa, and The National Geographic Society, as well as startups like CrunchBase, Medium, Polyvore, Zephyr Health, and Elementum use Neo4j to unlock business value from data relationships.

Neo Technology is a privately-held company funded by Fidelity Growth Partners Europe, Sunstone Capital, Conor Venture Partners, Creandum and Dawn Capital, and is headquartered in San Mateo, CA, with offices in Sweden, UK, Germany, France, and Malaysia. For more information, please visit Neo4j.com.

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