SIMPLIFYING DATA COMPLEXITY

AN INTRODUCTION TO KNOWLEDGE GRAPHS



As data volumes continue to grow at an exponential rate, organisations might be expected to know more about their customers than ever before. The reality, however, is that Big Data can all too often be overwhelming for financial services companies. With an increasing amount of data come heightened risks for those financial institutions lacking a sound data management strategy – but there are also huge opportunities to enhance profits when data-savvy firms convert their data into a powerful asset through the use of knowledge graphs. In this article, we introduce the concept of knowledge graphs, outline how their adoption can address common data challenges at scale, and how they can help financial institutions in taking their data strategy to the next level.

BIG DATA: A FINE BALANCE BETWEEN VALUE AND BURDEN

The volume of data in the world continues to grow exponentially, and was estimated to have hit 120 zettabytes – or 120 trillion gigabytes – in 2023.¹ Big Data analytics and artificial intelligence have helped financial services derive some additional value from the vast pool of data available to them. However, a staggering 97% of global organisations believe they fail to leverage their data, and estimate they lose out on USD 2 million annually on missed revenue opportunities as a result of ineffective data management.²

The ultra-complex nature of large, modern organisations is to blame. As these firms have grown and embraced digitalisation to reduce manual effort and increase efficiency, their opportunities to capture and generate data increased – digital process are inherently more recordable. At the same time, firms' tech stacks expanded significantly, and currently a large organisation will on average use 367 different software applications or systems³, inevitably leading to a fractured technology landscape, siloed data, duplication of effort, and hefty additional costs.

KNOWLEDGE GRAPHS: A PARADIGM SHIFT

Knowledge graphs are a novel way of storing and querying data, designed to integrate data from multiple data sources under a single source of truth. Data is organised in a network of nodes and edges. Each pair of nodes connected by an edge is called a triple and follows a subject-object-predicate pattern easily recognisable from natural language.

Figure 1 below highlights the key benefits of knowledge graphs. Firms that store and query data in a knowledge graph will reap the benefits of having simpler, highly interconnected, and unsiloed data, all of which further data discoverability, and democratisation – making data accessible to a wider audience.

Furthermore, knowledge graphs can be a key element of a firm's Al strategy. For instance, recent research has shown that using a knowledge graph improves generative Al models' ability to answer questions by almost 40% when compared to a more traditional SQL database. ⁴ Gartner also identifies knowledge graphs as a critical enabler of Gen Al in a recent article, for instance, by providing additional context and semantic meaning to large language models.⁵

Triples: the building blocks of knowledge graphs

Take the following statement "Alice lives in London". This is a simple sentence that can be decomposed in the following way:

Alice	lives in	\rightarrow	London		

This diagram represents two nodes connected by an edge, or, in the context of knowledge graphs – a Triple. It is the fundamental element of data in a knowledge graph, and always follows the following generic structure, akin to natural languages, like English for instance:

Subject	predicate		piont
		1 UUJ	JECL

This seamless flexibility to represent natural language statements as pieces of data makes knowledge graphs accessible regardless of data or technology expertise. Figure 1: Unlocking the key to accessible data

Empowered Gen Al

Each data point is a concept with a meaning and a context, which means Gen Al applications interpret better the underlying data and provide more accurate answers. Benefits:

- Meaningful data under the hood
- Higher accuracy means higher process
 efficiency



Network Analytics

Querying across many hops over the graph network provides a holistic view of data. Advantages:

- Focus on detail while having a view of the whole
- Understanding cascading impact of decisions

Human-Intuitive Approach

Queries and data follow a natural language driven approach. Benefits:

Data democratisation

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Less reliance on technology experts

Data at Scale

Using standardised identifiers brings different enterprise and external data sources together under one single source of truth. Advantages:

- No data siloes
- Standardised infrastructure
- System interoperability



Simpler Data

A single concept duplicated many times across the data landscape is represented as a single element in a knowledge graph.

Benefits:

- Improved data governance
- Reduced data costs

Al-driven insights

Semantic reasoning allows to uncover hidden insights.

Benefits:

- Better decision making
- Data discoverability

GETTING STARTED WITH KNOWLEDGE GRAPHS

Firms are quickly realising the advantages of integrating knowledge graphs as part of their data strategy, with Gartner predicting that by 2025 graph technologies will be used in 80% of data and analytics innovations, up from 10% in 2021.⁶

By adopting the knowledge graph paradigm, firms are not necessarily foregoing legacy systems – rather, the end goal is to augment data that already exists by making it more interconnected, and accessible. As set out in Figure 2, there are three main components for a successful knowledge graph implementation:

- Data sources Systems and databases that already exists within the firm provide data in its original form.
- Graph database The engine of the firm's data pipeline. It acts as a single source of truth aggregating data ingested from the

different data sources. A complete knowledge graph makes use of an ontology (see box), providing the data model that describes concepts within the graph and how they relate to each other.

 User interfaces – The presentation layer, where users can interact with the graph in a low-code or no-code manner. Depending on the use cases, off-the-shelf graph visualisation tools can be used for high level applications, or custom-built front ends can be developed for specific use cases.

The ideal end goal is the widespread adoption of the knowledge graph paradigm across an organisation – the so-called Enterprise Knowledge Graph. However, in reality, most often we observe individual initiatives leading the path to innovation. This is not an issue per se, so long as the data model is consistent across the firm.



Figure 2: Three components for knowledge graph implementation

An ontology defines a common vocabulary for a given domain and establishes machine-interpretable definitions of basic concepts within that domain and relationships between them.

⁷Key to writing an ontology is domain expertise provided by subject matter experts. By integrating an ontology, we assure the data in the knowledge graph is well-structured and adheres to the data models used in the organisation.

However, perhaps the ontology's biggest strength is its ability to enable reasoning, an AI mechanism that makes use of both the existing data model and data elements to infer new knowledge and promote data discoverability

BEYOND THE HYPE: CHALLENGES OF A KNOWLEDGE GRAPH IMPLEMENTATION

While adopting the knowledge graph paradigm can be exciting and offer huge value when untangling data, most organisations are in a less-than-ideal starting point of their data journey.

Very bluntly put, if data is incomplete, incorrect, or disperse to the point it is difficult to gather, the knowledge graph won't be able to source it and provide all the answers. It would be like having a good engine running a car with a flat tyre!

The key lies in bringing good business processes, data practices, and knowledge graph expertise together. The underlying processes and methodologies behind a knowledge graph paradigm, enable iterative success through promoting good data practices in cleaning, organising, and categorizing your data, leading to long term benefits. Furthermore, this approach promotes data discoverability feeding back invaluable

insights to data officers in a positive symbiotic cycle. Deploying a knowledge graph simplifies the complexity of organisations, turning data into an asset rather than a burden.

Capco is at the forefront of the knowledge graph space having a team of experienced knowledge graph specialists. We have a track record of delivering end-to-end cross-capability projects, being able to provide expertise from data ingestion to data visualisation and analytics. We can also help you connect to selected vendors with whom we have partnered based on their proven ability to deliver cost effective, high performance, and scalable knowledge graph services and tools.

Contact us to find out how Capco can help you get ahead of the curve, and realise the value of data with knowledge graphs.

- 1. https://www.statista.com/statistics/871513/worldwide-data-created/
- 2. <u>https://www.prnewswire.com/news-releases/data-management-challenges-cost-organizations-2-million-a-year-reveals-veritas-research-300810060.html</u>
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