

NTT DATA



**knowler**

Smart Knowledge Management  
by NTT DATA

# Smart Knowledge Management

A white paper by NTT DATA

# Index

1. Executive Summary	4
2. The Challenge	6
3. Background	9
4. What is Knowledge?	12
5. The Solution	16
5.1 Knowledge graphs	18
5.2 Natural Language Processing	19
5.3 Machine learning	19
5.4 Data to Knowledge & Text to Knowledge	20
5.5 Personalization	21
SUCCESS STORY	21
6. Conclusion	22

## 01 Executive Summary

As the volume of data created in organizations grows exponentially, so does the challenge of ensuring employees can quickly find the information they need to do their jobs better. knowler is an advanced knowledge management solution developed by **NTT DATA** to address this challenge. It leverages the latest advances in cognitive technologies to automatically understand structured and unstructured information, and uses ontologies to discover the relationships between content and users, so ensuring they get the most relevant information.





## 02 The Challenge

**In today's digital economy, competitive advantage hinges not so much on accumulating physical assets, but on leveraging the "know how", "know what" and "know who" of employees, so creating a culture that fosters knowledge sharing and innovation.**

**"Who would know most about this subject in our Singapore office?"**

If knowledge is not shared, productivity suffers because employees who do not have sufficient experience to do a task unaided or do not know where to find the information, must wait to ask an "expert" someone who does have that knowledge and can tell them how to do a task or where to find the information.

In 2020, enterprises will create and capture 6.4 petabytes of new data, according to IDC, with productivity data, which includes operational, customer and sales data, the fastest growing category.

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This tacit knowledge has traditionally been difficult to codify and share, but it is the lifeblood of business: "Who would know most about this subject in our Singapore office?", "there is a much quicker way to do that but it's not documented", "I usually add an extra week to the delivery date, as the dates the system generates are rarely accurate".

Even if the knowledge is explicit and contained in a document somewhere, locating it can be a frustrating and time-consuming process because many organizations are overwhelmed by the rapidly-growing sea of data.

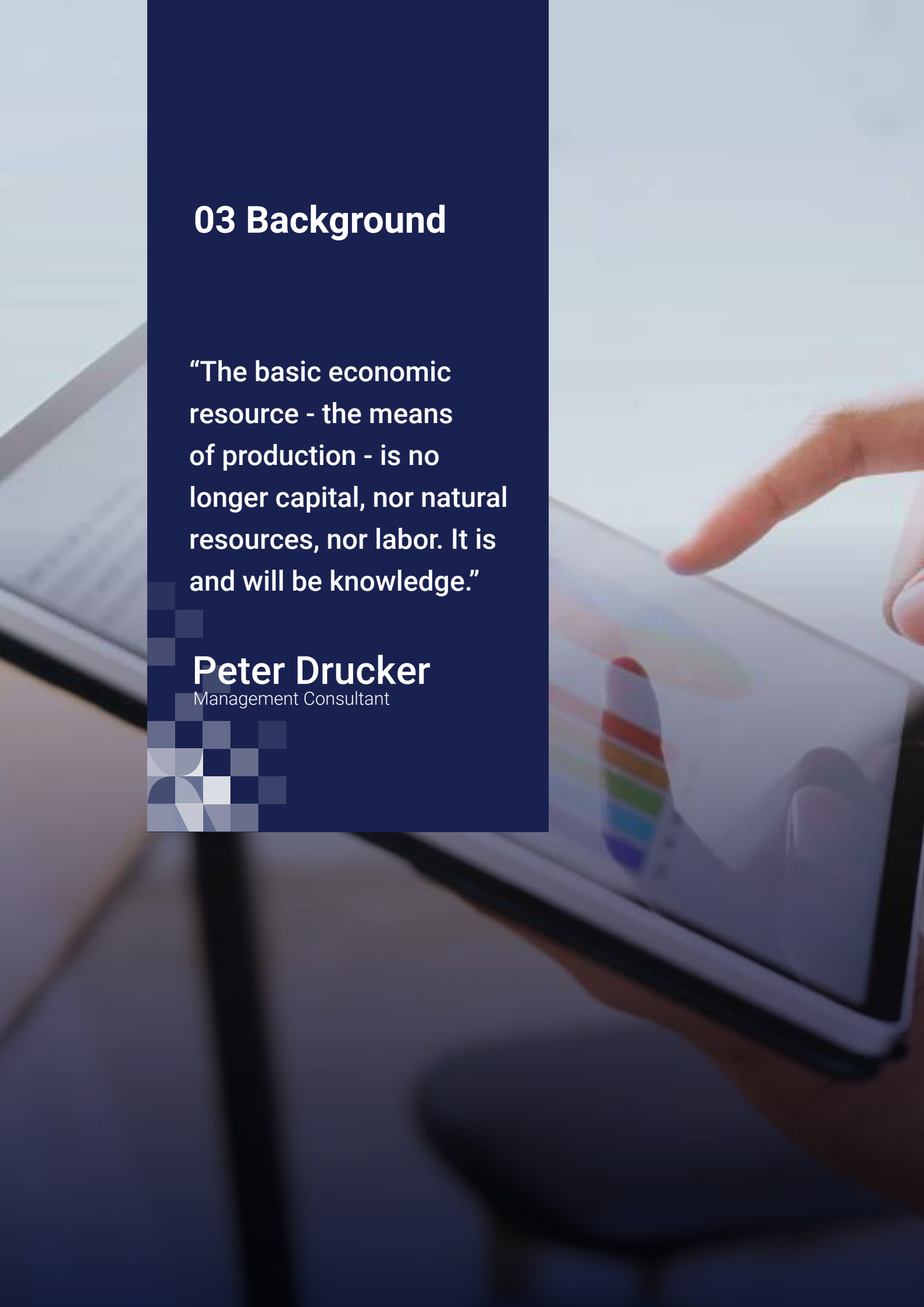
**The recent rapid growth in raw data stored in data lakes creates additional challenges, as non-expert users cannot easily search them. So what businesses need is a way to turn their data lakes into knowledge lakes.**

## 03 Background

“The basic economic resource - the means of production - is no longer capital, nor natural resources, nor labor. It is and will be knowledge.”

**Peter Drucker**

Management Consultant



## 03 Background

Classical economic theory ignores the value of knowledge, but its importance as a competitive asset started to become widely recognized in the 1980s and 1990s when management theorists such as Peter Drucker popularized the idea that in the post-industrial era, the creation and application of knowledge would drive the production of wealth.

Knowledge management became a “hot” theme for business conferences and seminars, and the IT industry responded to this demand with knowledge management systems that sought to help businesses capture and share knowledge.

But these early systems often failed to live up to the hype. Many companies became apprehensive at implementing KM programs and often abandoned those already in progress.

**So why did these early KM initiatives fail? These are the reasons most commonly cited by employees for not wanting to share their knowledge:**

- They do not have any incentive to do so.
- They distrust the company’s motives.
- Cultural mismatch.
- Time and workload pressures.
- Lack of leadership commitment.

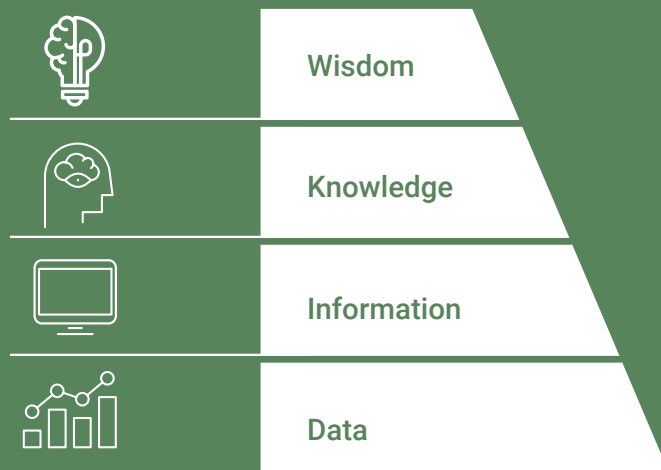
But there was a bigger problem that affected many KM initiatives. Cognitive technologies were in their infancy so, despite their name, early KM systems were basically information management systems – they didn’t really work with knowledge at all.

Many companies became apprehensive at implementing KM programs and often abandoned those already in progress.



## 04 What is Knowledge?

Terms such as information, data, knowledge, analysis and insight are often used in an imprecise way, but in the field of knowledge management, it is important to differentiate clearly between the concepts.



## 04 Background

One of the most popular ways to do that is using the Knowledge Hierarchy, or data-information-knowledge-wisdom (DIKW) pyramid.

At the bottom of the hierarchy we have data, which are simply symbols that represent properties of objects or events. Data has no intrinsic value unless it is transformed into information, which is data that is made meaningful. So if we are a retailer and we record the number "30" in the field "stock level" in the database record for a red summer dress, we have turned raw data into meaningful information – we have 30 dresses in stock.

The next level up is knowledge, meaning the know-how or ability to transform information into instructions. An employee with knowledge "knows how" to act on a piece of information.

In the retail example, the junior buyer knows how to react when she sees that the stock level has dropped to 30: she contacts the supplier and places an order for more dresses, as she knows 30 is below the optimum level.

Wisdom is more difficult to codify, as it involves humans adding value and judgment based on their experience. In the retail example, the senior buyer overrides the junior buyer's instruction to buy more summer dresses because the weather prediction is not good and, based on her experience, when it rains people don't buy so many dresses.

Information management systems work well at the lower levels of the pyramid, helping organizations better manage information, data, records and so on.

Examples include familiar corporate IT solutions such as databases, electronic document management systems, intranets and content management systems.

But if we want to make an impact higher up the pyramid, we need a knowledge management system, which helps manage the intellectual capital of the people who work for the organization.

That's a much vaguer concept but what it means in practice is a KMS, if it is to live up to its name, should support and enhance knowledge-intensive processes and tasks, facilitating human interactions with information and with other people.

Many companies became apprehensive at implementing KM programs and often abandoned those already in progress.

We need knowledge management system, which helps manage the intellectual capital of the people who work for the organization



## 05 The Solution

What businesses need is a rapid and cost-effective way to transform the rapidly growing amounts of structured and unstructured information stored in their data lakes and databases into knowledge that is relevant and useful to employees.

Knowledge is not just about what you know or knowing how to do something, it's also about who you know. So, an effective knowledge management solution needs to be able to not only find and attach meaning to information wherever it is stored, but also identify the relationships between employees and classify their skills and expertise, so ensures that the right knowledge gets to the right people at the right time.

To address this challenge, NTT DATA developed knowler, which leverages the latest cognitive technologies to discover content in variety of sources, analyze and understand the content, and automatically build a knowledge lake that can easily be searched by users.

Identify the relationships between employees and classify their skills and expertise.

### What's an ontology?

An ontology is simply a formal description of knowledge that allows an organization to make better sense of its data. Ontologies function much the human brain, working and reasoning with concepts and relationships to a rich and complex body of knowledge about the people and things in an organization.





## 5.1 Knowledge graphs

The knowledge graph is a relatively new type of cognitive technology and is made possible by recent advances in machine learning and big data technologies, including automated text analytics and graph engines.

A KG gathers information, relationships and insights and connects them together. It can infer the context and intent of questions, generate answers to those questions, make recommendations, and automatically expand its understanding by adding new content.

Knowler creates its knowledge models through the use of ontologies. These specifications, consisting of classes,

attributes and relationships, express the semantics necessary to link different resources, generating a visual representation called a knowledge graph.

In addition, ontologies allow new knowledge to be discovered through inference rules. This is how Knowler creates that knowledge base, using ontological models and inference rules.

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## 5.2 Natural Language Processing

Knowler uses NLP technology to extract information from documents using the following processes:

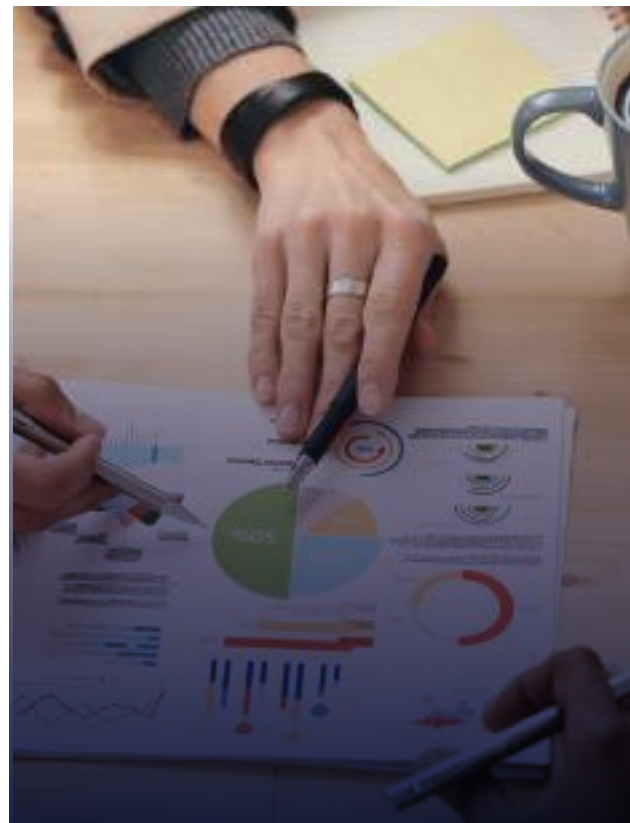
- **Unstructured text:** Starting with text documents in different formats, various processes are performed to divide the whole document into different syntactic units.
- **Entity Extraction:** Named entities are detected in the sentence, recognizing "USA" as a geographic entity, "two" as a cardinal number, and so on.

- **POS Tagging:** The parts of speech in the sentence are then identified.
- **Syntactic analysis:** The relations and dependencies of each of the actors involved in the sentence are determined.
- **Semantic Role Labeling:** This process detects the semantic role – agent, goal, result – that the words or phrases play in a sentence.

## 5.3 Machine learning

ML algorithms are used by Knowler to understand the data and its meaning in the context of the knowledge base. Techniques include:

- **Topic Modeling:** This is an unsupervised ML technique, so it doesn't require training. By detecting patterns such as word frequency and distance between words, topic modeling allows Knowler to quickly and automatically deduce what a text is talking about.
- **Matrix Factorization:** This technique exploits similarities in users' preferences and interactions to provide them with recommendations of texts that they are likely to find useful.



## 5.4 Data to Knowledge & Text to Knowledge

knowler provides several components for extracting data, transforming it and generating new knowledge using various techniques of artificial intelligence.

Knowler defines different workflows depending on its origin and type:

- **Data to Knowledge Flow:** For structured information stored in relational databases, information systems and other stores, this technique is applied to turn the information into subject-predicate-object triples, which are stored in a RDF store and can then be queried, much like the way a relational database is queried.

- **Text to Knowledge Flow:** For unstructured information, text mining techniques are used to extract as triples the structured information implicitly contained in unstructured elements such as e-mails, actions of users, which can then be loaded into the ontology.

The quantity of unstructured information in an organization dwarfs that the amount of structured information and it will be stored in many different formats and across many different systems. So it is important to be able to easily access this unstructured information.

In the case of knowler, the extraction of unstructured data is done via a connector to Microsoft 365 or any other data source that allows access to all content stored on the platform such as e-mails, documents stored in OneDrive or SharePoint, communities, MS Teams, etc.

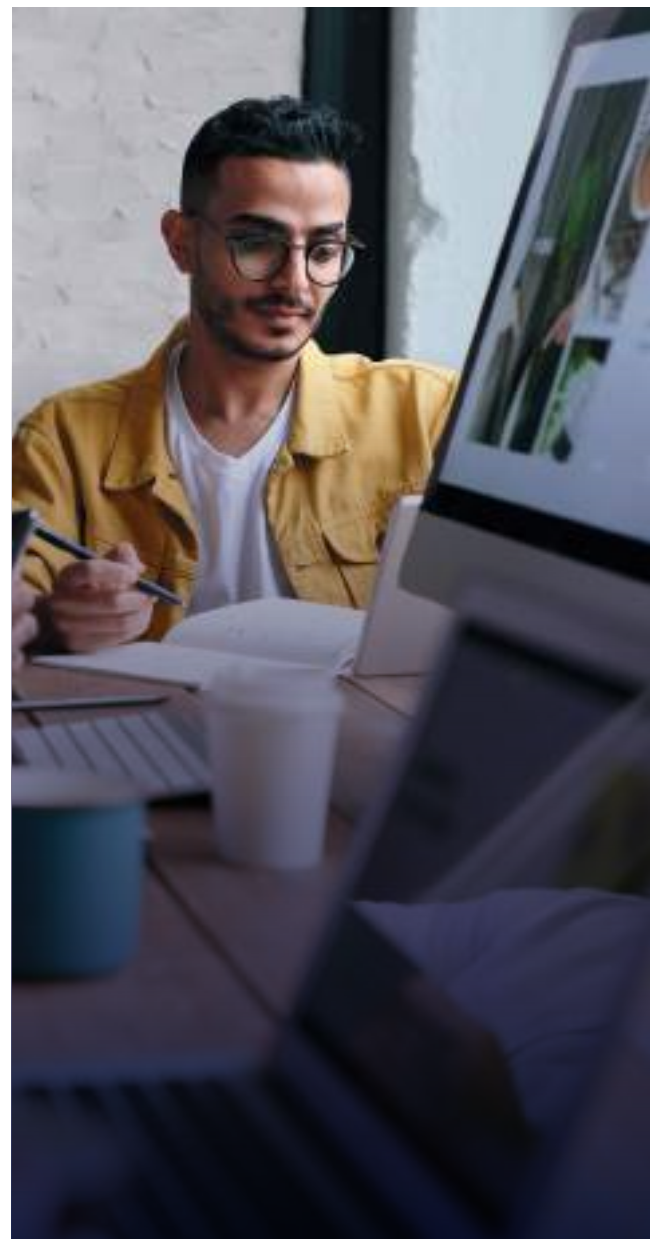
In addition, ontologies allow new knowledge to be discovered through inference rules.

## 5.5 Personalization

Every employee has different interests and responsibilities, so to avoid swamping people with irrelevant information, knowler personalizes content for each user using different techniques:

- The first method of matchmaking uses the attributes of the profiles of users, documents or other entities.
- As explained above, recommendation algorithms model users' likes and preferences to offer them the most relevant items.
- T2K collaborative algorithms identify users who are similar to a given user, in order to offer them more suitable results.

Knowler personalizes content for each user using different techniques.



# Success Story

## Customer

A leading multinational IT services company uses knowler as its Smart Knowledge Management solution, focused on improving know-who and know-how.

## Project

The project went live in the company's technology and innovation headquarters, and the deployment has been progressively extended to different departments of the company. Currently there are more than 7,800 active users and almost 12,000 items of curated content available in the system.

## Benefits

Significant time savings have been achieved in the preparation of commercial proposals and other routine tasks, thanks to knowler's ability to make the right connections between documents and people, and the speed and ease in locating needed information.



## 06 Conclusion

Businesses have long sought to better exploit tacit and explicit knowledge as a way to achieve competitive advantage, but early knowledge management systems often failed to achieve this goal. Recent advances in cognitive technologies now make it feasible to **discover, classify and find meaning** in the large quantities of information inside businesses.

**knowler** takes this idea further using knowledge graphs to automatically make the **connections** between the different types of content that make up the knowledge lake and the users who will benefit from receiving it. In this way, knowler helps businesses turn data into valuable knowledge and actionable insight.



### For More Information



To find out more about how knowler can help your organization contact your NTT DATA representative or visit: **knowler.cloud** and **nttdata.com**