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**AN INTEGRATED APPROACH TO SCIENCE MODERNIZATION: METHODS, MODELS AND MULTIDISCIPLINARITY**

held on December 23th, 2022 by

NGO European Scientific Platform (Vinnytsia, Ukraine)
LLC International Centre Corporative Management (Vienna, Austria)

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ABSTRACT

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# RELATIONAL VS NON-RELATIONAL DATABASES

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In this paper we're going to talk about the difference between relational and non-relational databases. These are two different ways in which clients store the data that they have and operationalize it. And we know there is so much data that is coming into every single company today that it's important that customers have options for how they want to store that data.

So, let's start with relational databases. Relational databases are a very structured way to store your data. But to really understand a relational database, first we need to understand a table. So, all the data is stored in tables and those tables are connected to each other. That's why we have the name "relational", and we see a relation in the name because all these tables connect to each other. They all have relations with each other [1].

So, let's start with one table. We have our customer. And with our customer, there's a lot of different information that we would want to know about them, right? We'd want to know what their name is, their last name, maybe their date of birth, their email etc. But we might also have customers that have the same first name or the same last name and we need a way to uniquely identify each customer. So that's why we have our primary key, which is out customer ID. And this is a unique identifier for each record in this table. But with relational databases, we want to view each table as it connects to other tables.

So, let's think about what a customer does. A customer places an order, right? So, an order is actually a separate entity that would connect to our customer table. So, let's draw out our order table. We'd want to know maybe what time order was placed, what items are in it and whatever else you think is relevant to know here. But again, like with the customer ID, we need a unique way to identify each order. So, we have another primary key here called an order ID [2].

And if we look at each of these tables and we look at the data in them, we can really see how they connect to each other. We also need to know which customer places what order, right? In order to do that, we actually connect the customer ID to the other table. So, in the customer table, this is the primary key, but when we move it over, this becomes the foreign key.



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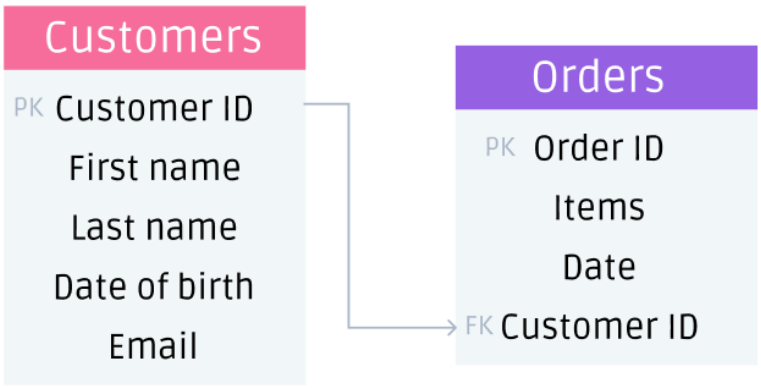
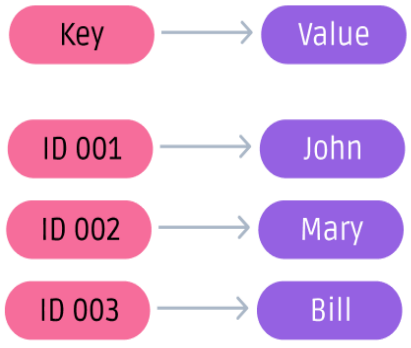


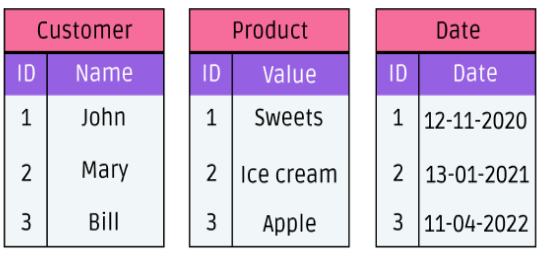

Fig. 1. Scheme of database from example

So, as we can see with relational databases, this is a very structured way to view the information that's coming into a company. But with that, there's a lot of benefits that come in. so one of them is that the structure really ensures data consistency. We can see that it's easy to manage that data and easy to get an overview of what is in your database. This also helps with security. So, let's say that you're in hospital and you have a lot of patients. You have information about their medical history, what medications are taking. That is all protected information. So, through using a relational database, you can encrypt certain tables, you can hide information and you can make sure the right people have access to the right data. And then finally, we have ease of backup and recovery. So, because this data is very consistent and always it remains consistent, it's easy to save the database at any point and easily recover from what you recently had. This gives us an idea of what a relational database looks like.

Now on the other hand, we have non-relational databases. So, this is a break from the very structured approach of a relational database. There are a few different types of relational databases. First, we have key-value databases. And this shows data as a key and a value, right? We have only one key that ties to one unique value. Another key that ties to another unique value. And you can retrieve these values through plugging in the keys and getting that information back. We also have column store databases. And this stores data in separate columns and is optimized for performance.




Key-value database




Column store database

Fig. 2. Examples of key-value and column store databases

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Then we have graph databases. So, this shows different entries in the database and how they connect to each other in a graphical way. And finally, we have our document store databases. So, this has data and documents, and a group of documents is called a collection, and you can essentially retrieve the information as it relates to a single collection.

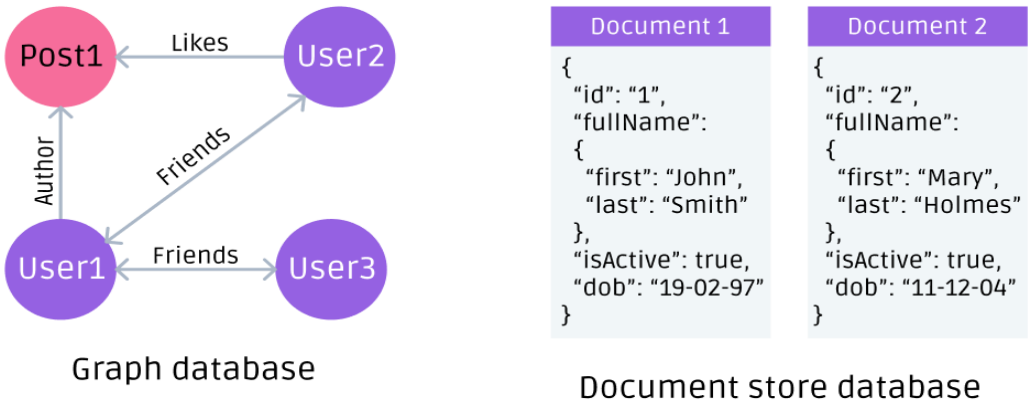


Fig. 3. Examples of graph and document store databases

So, you see that there are a lot more options here with the non-relational databases. And that's why customers might choose a non-relational option as opposed to a relational one. There's added flexibility in going with a non-relational database. So that's really one of the key differentiators and why customers choose non-relational over relational. And it also has high scalability. It's easy to scale non-relational databases out horizontally and this means that they can essentially scale out without adding more resources. And finally, cost effectiveness. And this ties back into the scalability, right, because you're not adding more resources, but you're able to scale out and add more data in [3].

So, we see that we have a lot of different ways in which customers can store their information and make sense of all the data that's coming inro the company. There are different ways that people can leverage both databases. There are different use cases. People might use relational databases for more traditional workloads. If you have a point-of-sale system, if you're tracing a large amount of records and you want to do so in a very structured way, then relational databases might be what you go for. But if you're developing a new application, you want added flexibility, then customers might defer to a non-relational database.

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