It is hard to think and talk about digital twins without feeling like living a sci-fi novel.

Consider this, a digital twin of yours showing you what the consequences of your current lifestyle will lead to and how you will look like in ten years if you stick to your current unhealthy eating habits.

Or this – a digital twin of an entire city being used by the public and private sector as a three-dimensional model that can be analyzed, controlled and tested in real time. Such a twin can provide as many "what if" scenarios as needed for analysts to decide what will be the next best route in the city's transportation infrastructure.

If both these sound like cyberpunk, it is because they are. But they are real. Both are real life examples of digital twin technology. The one helping you see the consequences of your behavior (behavioral data to be exact) is built by Accenture, expanding on the concept of captology. The other example is a project in progress for building Virtual Singapore.

Accenture's digital twin (although not labeled as such) is called "The Persuasive Mirror" and aims to provide a daily motivation aid to individuals willing to have a healthier lifestyle. The

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technology uses sensor data about a person's behavior and analyses it with relation to their goals. Then it rewards good and exposes bad behavior, showing feedback on recent actions, e.g., a silhouette that is slimmer and younger for a balanced meal, and bigger and older for no meal or junk food.

The digital twin of the city is the story of Virtual Singapore, a $73 million, data-rich, live digital replica of Singapore – currently a work in progress. There, again the cyber replica of the city is fed not only with sensor but also all kinds of other data such as location of traffic lights and bus stops, environmental data, behavioral data, etc. The model is built in order to test various scenarios, strategies, monitor performance and detect failures, thus improving the productivity and the efficiency of the complex system a city is.

Both of these examples are only a quick glimpse into the world of digital twins – a world that, according to recent estimates will grow at a quick pace with the digital twin market estimated to grow from $3.8 billion in 2019 to $35.8 billion by 2025.

What Are Digital Twins and What Is So Attractive About Building One?

In a world of 2.5 quintillion bytes of data created daily, capturing the dynamics of any given process, person or asset is both a challenge and a great opportunity.

And this is where the value-proposition of a digital twin technology, listed among the top 10 strategic technologies since 2017, comes into play. What makes it so attractive is the fact that it allows the building of "digital replicas of assets, using 3D modelling and sensors to create digital representations" (cit. Building an organizational digital twin).

Simply put, digital twins are a living model, ingesting operational, environmental and other data. They enable organizations to design, simulate and validate various scenarios virtually. And serving as a cyber replica of a process, a thing or a system, they allow the monitoring, analysis and control of physical entities to be executed entirely in a digital space.

Merging the physical and digital world, these data-rich models are already reshaping the manufacturing, construction, health care, aerospace and transportation industries.

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Examples of digital twins include:

- Elevators from Otis
- Vacuums from iRobot
- Turbines from GE
- Race car digital twins by British Grand Prix
- Big Bend Power Station in Apollo Beach by Bentley Systems

A Knowledge Graph Or a Business Digital Twin?

As the wide-spread IoT adoption and the proliferation of data points increase, digital twins, according to Gartner, are what technology innovation leaders leverage to improve enterprise architecture and optimize business transformation.

Take for example the case of Radio Frequency Systems (RFS), a microwave cables manufacturer. When Chris Brockmann, the CEO of Eccenca, met them, they hadn’t made a profit for 20 years in a row, yet the management had a vision for digital transformation. They wanted to go from old school to digital by integrating the entire supply system chain through

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data.

And this is where Chris Brockman and his colleagues were able to make a difference. They introduced RFS to technologies that could help them ingest and integrate critical data in one platform to optimize processes and thus save costs. As Chris Brockmann explains in his presentation Knowledge Graph for Digital Transformation in the Supply-Chain,

knowledge graph technology was what made it possible for the company to employ such a data-centric perspective. However, when talking to their client, it was easier to use the term business digital twin as their engineering dept already had some understanding of it.

In summary, it turned out that 70% of the company's product output was scrap, because they didn't understand their processes. So, they started their digital transformation by building a virtual view of what their product was, including its dimensions and properties. Regardless of whether we call it a digital twin or a knowledge graph, the approach helped RFS reduce their inventory significantly. As a result, they did not only gain a deep insight into their production processes and downsides, but were also able to spare nearly 10 million of free cash.

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Can Semantic Technology Be A Digital Twin Enabler?

There is a wide range of technologies that enable the creation of a digital twin, as Gartner research shows. And it is true that digital twins span a wide range of industries and applications and are a multi-faceted concept, including many different operational layers. Yet, at their very essence of being a digital representation of an entity, their design and deployment hinges on three mission-critical technological solutions:

- normalization of heterogeneous data;
- building or reusing ontologies for modelling complex systems of components, sensors and environmental conditions;
- representing data in an interoperable format so that it can be used or fed into multiple devices and machine applications.

And all of the above are what semantic technology, and more specifically semantic data modeling are geared towards.

Given their proven benefits when it comes to capturing the meaning of data and all its inherent relationships, semantic technology is a natural fit for the digital twin technology. The reasons it can substantially improve the design and deployment of a digital twin are:

- Semantic technology provides the needed technical framework for data interoperability.
- Semantic technology allows the efficient management of large amounts of data coming from diverse data sources.
- Semantic technology opens the possibility of data modelling that allows the data model to evolve.

Epilogue: The World of Digital Twins Is Full of Data-points, One Needs Only To Map Them Well

As we saw, at their core, digital twins are replica models of systems, processes and physical objects serving as a platform where virtual simulations of various activities, interactions and prognostications can be run. The opportunities digital twin technology opens for enterprises are as big as the quality of data fed into these models.

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In other words, the world of digital twins is full of data-points, one needs only to map and connect them meaningfully. And this is where semantic technology can help.

Interested in the ways semantic technology can help you model and deploy a digital twin?

Book a Discovery Call

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