From a simulation model to a digital twin – part II

Definitions, applications and success factors

While the term 'digital twin' tends to be widely used and abused nowadays, there are still very few examples of the concept itself being put into practice. Rather than being a simulation model, a digital twin is actually a tool that automatically controls processes, systems or even complete warehouses. In the first article in this series of two, Dirk Becks (from Groenewout) and Dirk-Jan Moens and Steven Hamoen (both from Talumis) explained what exactly a digital twin is. In this second article, they highlight what to be aware of when setting up a digital twin.

At the heart of a digital twin is a digital object that is a representation of a physical object such as a system, process or complete warehouse. The digital object can be used to conduct analysis based on data from the physical object. It can be called a digital twin if the results are automatically linked back to the physical object, making it possible to control and fine-tune processes. An example of this could be a digital twin that continuously monitors whether the order picking process is running according to plan and which automatically deploys extra order pickers if it determines that the end-of-day deadline is otherwise unlikely to be met.

Example: allocating goods

Another possible application relates to goods allocation. If a slow-moving item becomes a fast-mover, it can make sense to move that item to a different pick location. While a modern WMS will signal that and make a suggestion, the suggestion is based solely on the inventory turnover. In contrast, a digital object additionally takes account of things like walking and driving distances inside the warehouse, congestion in the aisles and the complexity of the order picking process. These factors are used to precisely calculate whether the benefits of increased order picking efficiency outweigh the costs of moving the item.

Start by defining the problem

So if you want to set up a digital shadow or digital twin, where should you start? To find the answer, you need to ask yourself another question: which problem do you want to solve, and what is the best approach? For example, if you just want to calculate how many people you need tomorrow, a number of formulas in a spreadsheet program may suffice. A digital shadow goes a step further, such as by taking peaks in the daily workload into account, but takes more time – and therefore money – to set up.

Determine the right level of detail

We advise against setting up a digital shadow in order to identify the problems. If you want to investigate everything without missing a single operational bottleneck, you will need to build a digital object with a very high level of detail – and a higher level of detail means more effort and higher costs. If you already know which problem you want to tackle, you also know which level of detail is required.

Build the digital object

The next step is to start building the digital object. This requires data – not only about the layout of the warehouse, but also about the traffic management plan, for example. Think about the movement of vehicles around the warehouse; will there be one-way or two-way traffic? Information is also needed about the amount of time involved in processes. How long does it take to walk or drive from Location A to Location B?

And how long does it take to pick an order line? Needless to say, some operatives work faster than others. This can lead to deviations, which is why it is important to validate the digital object before use.

Feed with live data
The digital shadow or digital twin then has to be fed with live data, such as from the WMS or ERP system, for example, but this could also come from systems for workforce planning, maintenance planning, transport planning, dock planning and so on. In addition, you may wish to utilize historical data for information about seasonal patterns and suchlike.

Success factor: master data
The quality of the digital object and of the data used as input is an important success factor. That starts with ensuring that the master data is accurate and complete and that it is entered into the digital object correctly so that all the pieces fall into place. The same holds true for information about how long processes take, for example. If the picking time is entered as 12 seconds per order when the actual picking time is only 10 seconds, the difference may seem negligible. However, in the case of 50,000 orders per day, the difference can amount to 100,000 seconds (i.e., almost 28 hours). Reliable processing times are essential for accurate forecasting and planning.

Serious approach
Last but not least, just as with any digitalization project, it is important to take the implementation of a digital shadow or digital twin seriously and to be honest with yourself. In some cases, it may become apparent that the company is not yet ready for this type of digitalization, perhaps due to issues with data availability or data quality. In others, the digital shadow or digital twin may be so complex that it is difficult to extract the right insights as the basis for making the right decisions. Therefore, ensure that your digital object is as straightforward and user-friendly as possible. If you don't, there is a strong chance that no one will end up using it.

What many people refer to as a 'digital twin' is actually just a digital shadow or a digital model. What do these terms mean? Read the first article in this series on digital twins to find out.

About the authors

Steven Hamoen (l) and Dirk-Jan Moens

Dirk Becks
Senior Consultant

Dirk Becks is involved in optimizing logistics (e-fulfillment) operations on a daily basis. He is specialized in logistics feasibility studies and the implementation of highly mechanized warehouse operations.

Groenewout is a leading independent logistics consultancy firm. Groenewout is focussed on the development and implementation of logistics and supply chain operations based on data analysis, modeling and simulating logistics processes in a broad perspective. This includes warehouse design and optimization, structuring distribution networks, inventory and production planning, mechanization or manual processes. For complex simulations, Groenewout works together with Talumis. Talumis utilizes Flexsim simulation software to build models that form the basis for further analysis and optimization activities.

E: becks@groenewout.com
T: +31 6 2124 7702

Steven Hamoen
Co-owner

Steven Hamoen is focussed on simulation projects related to warehousing, manufacturing, AGVs and other types of automation.

Dirk-Jan Moens
Co-owner

Dirk-Jan Moens is primarily specialized in logistics optimization for ports, offshore projects, manufacturing and supply chains and is mainly focussed on planning, scheduling and digital twins.

Talumis offers innovative solutions for modeling, visualizing and optimizing complex logistics systems and processes using the world's best simulation software combined with a talented, knowledge-driven organization.

E: steven.hamoen@talumis.com
T: +31 6 4530 4022

E: dirk-jan.moens@talumis.com
T: +31 6 4560 4345