# The rise of digital twins in optimising modern systems



As businesses and societies evolve in their approach to technology, a notable trend is emerging in the realm of artificial intelligence: the utilisation of digital twins. Informing the discussion are various sectors exploring how this technology can optimise operations, enhance decision-making, and propel innovation.

A digital twin is defined as a computational model that mirrors a complex system in real-time, integrating real-world data for continuous updates and simulations. These models can represent a diverse range of systems, from urban spaces to manufacturing processes and even biological functions. By employing digital twins, businesses can conduct experimental simulations to assess potential enhancements, thereby understanding synergistic interactions within systems that may have previously gone unnoticed. This capability extends to predicting failures and facilitating the development of new products and medicines.

The application of digital twins is exemplified in the ambitious project known as Virtual Singapore. This highly detailed 3D model of the city-state employs numerous data sources, including mobile data and environmental sensors, to create an accurate and continually updated representation of urban dynamics. The model serves multiple functions, from testing infrastructure proposals to simulating disaster responses for enhanced resilience against floods or earthquakes. Such initiatives illustrate the transformative potential of digital twins in the realm of urban planning and management.

Moreover, digital twins are also transforming various sectors by uniting disparate data sets. Traditionally, valuable information has been siloed, limiting the effectiveness of analyses. Digital twins can consolidate visual data, geographical information, and other analytics into a cohesive model, enabling more comprehensive understanding of environments. In urban settings, crowd simulation technologies integrated with digital twins can facilitate optimised management of public spaces, predicting emergency scenarios or improving public transport logistics during peak events.

The medical field is also witnessing groundbreaking applications of digital twin technology. Researchers at the University of Nebraska-Lincoln are constructing a digital twin of the human immune system, aiming to predict patients' responses to treatments and improve drug development processes. Additionally, athletes, such as marathon runner Des Linden, are leveraging digital twin technology to analyse their physiological responses under stress, optimising training regimens and exploring treatment avenues for potential health issues like heart failure.

Looking ahead, a 2023 survey conducted by Tata Consultancy Services highlights that experts anticipate digital twins will become integral to everyday life by 2035, with the healthcare sector predicted to broadly adopt the technology within the next three years. Furthermore, digital twins of residential properties are likely to emerge, providing insights into energy efficiency and predictive maintenance measures, ultimately enhancing the living experience and accommodating the needs of aging populations.

The continued refinement of digital twin technology signifies a substantial leap forward in harnessing the complexities of modern systems. As these technologies become more entrenched in various sectors, they promise to facilitate advanced problem-solving and innovation, creating a virtual safety net that allows for exploration and optimisation without the immediate risks typically associated with real-world implementations.

Source: [Noah Wire Services](https://www.noahwire.com)

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