

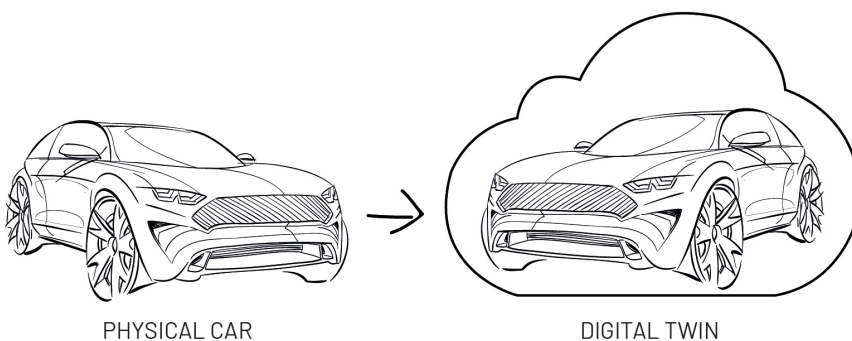
## Digital Twins

At the Minds + Machines 2016 Conference in San Francisco, the Vice President of Software Research of GE, Colin Parris, wore an augmented reality headset and used voice recognition to demonstrate how the concept of the ‘digital twin’ can be used to predict wear and tear in a steam turbine.<sup>1</sup> He went on to present several options to address the issue based on the turbine’s properties and historical maintenance record.

A digital twin is essentially a concept that blurs the line between the physical and digital world. “For every physical asset in the world, we have a virtual copy running in the cloud that gets richer with every second of operational data,” says Ganesh Bell, Chief Digital Officer and General Manager of Software & Analytics at GE Power & Water.<sup>2</sup> GE has 551,000 digital twins that were deployed as of 2016, with more created every day.<sup>3</sup>

Maserati, the luxury car manufacturer, reduced the production time of its Ghibli sports car from 30 months to just 16 months by experimenting on the digital twin in the virtual world without frequent costly and time-consuming changes in the physical world.<sup>4</sup>

Figure 4.1 shows the concept of Digital Twins.



**Figure 4.1** Digital Twins

Digital twins are created by integrating smart sensors with physical items to gather data about their real-time status. The components are connected

to a cloud-based system that receives and processes all the data the sensors monitor. Real-time inputs are analyzed against business and other contextual data to derive meaning and actionable insights.

The concept of digital twins was born in the research department of NASA, where they have the challenge of maintaining and repairing space systems that are physically present thousands of miles away. Interestingly, it was the innovation of digital twin systems that allowed engineers and astronauts to formulate ways to identify and fix issues on live missions. Today, NASA uses digital twins to develop new designs of aircrafts and maintain existing space shuttles. “The ultimate vision for the digital twin is to create, test, and build our equipment in a virtual environment,” says John Vickers, NASA’s leading manufacturing expert and manager of NASA’s National Center for Advanced Manufacturing. “Only when we get it to where it performs to our requirements do we physically manufacture it. We then want that physical build to tie back to its digital twin through sensors so that the digital twin contains all the information that we could have by inspecting the physical build.”<sup>5</sup>

It is quite evident that digital is becoming all-pervasive. In the last few decades, we have witnessed the evolution of this domain, from the Internet of Computers to Internet of Humans to the Internet of Things (IoT). In the future, everything will be ‘plugged in’. The immediate impact is that we will be living in an era of exponentially exploding data, information, and algorithms.

We will look at limitless digitization through two primary lenses: Internet of Humans and Internet of Things.