Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 12 Issue 09, September-2023

Digital Twinning - a Gimmick or Key to the Future -

An exploration of the benefits of implementing digital twins in current industry research and design processes.

Azaan Yaqub
STEM Department
Jebel Ali School
Dubai, UAE

I. INTRODUCTION

As we begin an era of Industry 4.0 and the increased digitisation of engineering and manufacturing, digital twinning is a powerful tool that can help advance the rate of innovative creations whilst making it more feasible to do so.

II. INDUSTRY BEFORE DIGITAL TWINS

As we begin an era of Industry 4.0 and the increased digitisation of engineering and manufacturing, digital twinning is a powerful tool that can help advance the rate of innovative creations whilst making it more feasible to do so.

Before the development of digital twins, the constraints posed by testing physical models of prototypes led to increased costs and risks for innovators. Last year, BMW announced that it invested 5.9bn USD in R & D [1] ahead of the expansion of their new electrical vehicles.

The development and testing of specific technologies like lithium-ion batteries' ability to power motors in a vehicle under extreme heat would require many costs; these would include:

- The construction of a scale model with the same mass and properties as the real car
- The erection of a temperature-controlled chamber near BMW's European testing facilities [2]
- The use of many lithium-ion batteries and motors to test the drivability and battery consumption of the car under high temperatures

And, most importantly, the time to carry out these tests over thousands of miles to ensure the usability of a model being sold to 2.1 million customers as of 2022. In particular, the neglect of rigorous repeats of testing has led to the recalling of hundreds of vehicles such as the Dodge Ram 1500 Plug-in Hybrid which the company had to recall the trucks due to the overheating of the 12.9 kWh battery packs.

So, this makes it apparent that the use of digital twins is needed in the industry.

III. CONSEQUENCES OF DIGITAL TWINS

By employing digital twin technology nowadays, BMW could drastically reduce the cost of testing for lithium-ion batteries and their vehicle motors. The magic of digital twins is that, as it is a computer simulation, you can run vastly more repeats over a much shorter time frame without implementing expensive capital and investment into physical testing centres.

Although BMW is a large multinational automotive juggernaut that you would assume has access to technologies, like this, years before they are made publicly available, digital twins can be created cheaply with little expertise from home PCs and laptops.

This sets digital twins apart from advancements in state-of-the-art testing centres as they can be used globally despite the size of a business or individual creator. An aspiring designer can come up with and test prototypes that would cost millions of dollars on a Windows computer, sacrificing very little amounts of functionality.

I see digital twins as a large leap forward in not only the improvement of testing for large businesses but also a tool that will accelerate growth in creativity for smaller independent designers.

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[2] Angel Sergeev, "BMW's 1,400-Acre Testing Facility For Automated Driving Is Open For Business"

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