



### PRECISE SURGICAL TREATMENTS ENSURED WITH DIGITAL TWIN MODELS

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#### Abstract

The goal of each medical practitioner is to enhance medicine and offer precise cures to the sick. Considering each individual patient's conditions and providing accurate treatments suited to them is now enabled by the expeditious increase in technology. Artificial intelligence and computational modelling have initiated the creation of digital twins of a patient's ill organs. Digital twins enable the studying and discovery of new knowledge, the formation and evaluation of new hypotheses, and are anticipated to play a vital role in the development of personalised therapeutic interventions in the long term. This paper highlights the advancement of digital twin technology and enhanced surgical curation.

**Keywords:** *enhance medicine, accurate treatments, creation of digital twins, discovery of new knowledge, development of personalized therapeutic interventions*

#### Introduction

A digital twin is a virtual duplicate or representation of a tangible object or process, although it is something more. It is a virtual model (statistics and as well as algorithms) with unique characteristics not offered by traditional models and simulations, one that adaptively couples the real and virtual worlds and utilises modern technologies such as smart sensor technology, data analytics, and artificial intelligence (AI) to detect and prevent system failures, improve system performance, and explore new opportunities. The ultimate purpose of digital twins is to model, evaluate, and improve a physical thing in virtual space repeatedly until that model matches predicted performance, at which time it is ready to be created or modified (if already created) in the actual world. [1]

Unlike physical products and processes in design and construction, one of the foundational element variables to be computationally replicated in the medical field human body itself—is significantly more complicated. Fortunately, with today's sophisticated scientific understanding and comprehensive simulation powers, it is possible to build digital twins for modelling many elements or functions of the human body, such as bio-physical systems or protein structures. This would allow researchers to analyse study questions more effectively such as drug interactions, therapy efficiency, treatment safety, and so on. Digital twin technology can potentially enable personalised medicine research by leveraging medical data of patient characteristics and patient-generated data. [2]



### Interview with Medical Practitioners

Upon taking an interview with 5 medical practitioners on whether they feel Digital Twin technology is the future of medicine and why, various possibilities were brought forward and analysed thoroughly. The interview questions include whether the experts know about the recent employment of digital twin technology in their fields of medicine, do they themselves use the computational simulation, their opinion on whether it they feel it is a beneficial innovation and lastly, their reasons for using or not using the technology.

### Result

As a result of the interview conducted on a highly brainstormed topic, 3 out of 5 healthcare experts suggest that the advanced technology of Digital Twin should be used to be advantageous to patients and strengthen the growth of precision medicine. William Blake quoted, "Hindsight is a wonderful thing, but foresight is better, when it comes to saving life, or some pain", therefore, for making sure that safety is the priority, the progressive invention of Digital Twins is a must in today's field of medicine.

### Discussion

The interviewees commented upon the various merits of this technology and some of the drawbacks and challenges faced by them while using Digital Twins. The most common advantage was the ability to provide 'Personalized Diagnosis'. Predictions on reactions of a patient to a particular drug or treatment, suitable method of surgery and management of surgical risks is now easier for the doctors all due to Digital Twins. Collection and usage of crucial data at an individual level which helps in tracking persistent conditions and providing accurate care to patient's needs. Moreover, 'Resource Optimization' has become unchallenging for hospital management staff. Leveraging chronicled and real-time information of hospital operations and encompassing environment (e.g., COVID-19 cases, car crashes, etc.) To make digital twins empowers clinic administration to distinguish bed deficiencies, optimize staff plans, and help work rooms. Such data increments the effectiveness of assets and optimized the hospitals and staff's execution, whereas diminishing costs. Digital twins also impart a secure condition to test the changes in framework execution (staff count, operation room openings, devices, and instrument management, etc.) Which permits actualizing data-driven strategic decisions in a complex and delicate environment.

A digital twin of a therapeutic device empowers engineers to test the characteristics or employments of a gadget, make modifications in plans or materials, and test the success or failure of the alterations in a virtual environment before fabricating. This altogether decreases the costs of founders and improves the execution and security of the ultimate item.

On the other hand, although the healthcare framework employments digital twins' increment, it is contended that it'll stay costly and not available for everybody. Digital twin innovation will end up an advantage saved for individuals with higher money-related capabilities, which would generate disparity within the healthcare framework. Furthermore, public interest in the new technology is also required to achieve a favourable outcome.

Either way, the need for promising results has risen hence this method is surely going to become a prevalent method of treatment.



### Conclusion

“Life is a never-ending stream of problems that must be confronted, surmounted and solved” by Mark Manson. Digital Twin technology will surely be a perfect solution for a person’s medical issues due to all of the advantages discussed fruitfully in the above paper.

Due to the rise for the need of personalized precision medicine in today’s ever-changing world, creating Digital Twins has become more of a necessity than a fascinating indulgence. It will prove to be a revolutionary innovation and will enhance medicine by leaps and bounds. It will supersede all physical analysis and will dominate medicine in the future.

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### References

1. Kamel Boulos, M. & Zhang, P. Digital Twins: From Personalised Medicine to Precision Public Health. Journal of Personalized Medicine. [https://www.researchgate.net/publication/353513336\\_Digital\\_Twins\\_From\\_Personalised\\_Medicine\\_to\\_Precision\\_Public\\_Health](https://www.researchgate.net/publication/353513336_Digital_Twins_From_Personalised_Medicine_to_Precision_Public_Health) (Accessed on 10th May 2022)
2. Marr, B. What is Digital Twin Technology and Why Is It so Important? Forbes
3. 2017 <https://www.forbes.com/sites/bernardmarr/2017/03/06/what-is-digital-twin-technology-and-why-is-it-so-important/> (accessed on 12th May 2022)