Chapter 1
Digital Twin and Healthcare Research Agenda and Bibliometric Analysis

Loveleen Gaur

 https://orcid.org/0000-0002-0885-1550

Amity University, India & Taylor's University, Malaysia & University of the South Pacific, Fiji

Jyoti Rana

 https://orcid.org/0000-0001-7474-3702

Amity University, India

Noor Zaman Jhanjhi

 https://orcid.org/0000-0001-8116-4733

Taylor's University, Malaysia

ABSTRACT

A digital twin (DT) is a virtual representation of a physical object or activity that acts as its real-time digital equivalent. The authors evaluated the structure of research in the same field, and to do so, the authors used the techniques of bibliometric analysis using VOSviewer. This study scrutinizes the dynamics of scientific publications devoted to understanding DT application in the healthcare sector all over the world over the years. The documents were extracted from the database of Scopus. The evolution of the concept of DT is studied from documents, including research articles, conference papers, and book chapters, which helped forecast future research trends.

INTRODUCTION

Integrating Internet connectivity into everyday objects and technologies has substantially impacted human relationships and communications (Ramu et al., 2020). Devices may now communicate and interact via the internet and handle data remotely. IoT (Gaur et al., 2017; Gaur et al., 2021)is a term used to de-

scribe a phenomenon that is transforming how people interact with physical items and the environment. Home, health, transportation, and environmental monitoring devices are among the most recent Internet of Things innovations. Health and wellness apps that use wearable devices, in particular, have emerged as a rapidly growing sector of intelligent apps that are becoming increasingly popular. This emerging trend is expected to act as a quick and valuable resource for obtaining consumer data, which will then be used to provide healthy lifestyle recommendations. The rationale of the study is to determine the use of digital technologies like DT in their emergence and application in healthcare.

Additionally, the synergistic effect of ubiquitous connectivity, widespread sensor technologies, advances in AI, cloud computing, etc., has accelerated the spread of industrially diffused DT technology to aviation, manufacturing, and healthcare (Maddikunta et al., 2020). The DT begins the digital prototype and continues to live alongside its physical twin (PT). The DT is continually monitoring and analysing the state of its physical counterpart to optimise performance through the activation of self-optimization and self-healing processes possible through AI. The interaction between DT and PT is based on a "closed-loop," based on data flow between the cyber and physical worlds. In healthcare, DT gets data from its PT, synchronises itself with it, employs AI algorithms to detect anomalies, and then provides the PT self-healing or optimization activities. The goal of extending DT technology to humans through the development of human DTs, which are digital models (Liu et al., 2022) of humans customised for every patient, enables clinicians to monitor the patient's health. Human DTs differ from the industry DTs generated and used in Industry 4.0; specialists are expected to update the DT regularly with PT's health status.

DT In Sports

According to research, having a healthy coach-athlete relationship improves the athlete's ability to respond to stress and improves their overall performance. A negative coaching experience, for the same reason, can have a detrimental impact on an athlete's motivation and ability to perform well. Work is being done to teach professional coaches, but it is also being done to help these experts understand how to communicate more effectively with those not involved in sports. However, not everyone has the luxury of working with a skilled professional who can assist them in improving their physical condition or overcoming specific physical limits. People who cannot attend a coaching session due to financial constraints might benefit from Smart Coaching, which can serve as a helpful tool, if not a substitute for qualified specialists, in this situation (Thiong et al., 2022). Innovative coaching is beneficial not just to athletes but also to the elderly. Several organisations, including the World Health Organization, have designated 2020–2030 as the decade of healthy aging (Mozumder et al., 2022). One of the main recommendations in their report on aging and health is to "guarantee a sustainable and appropriately trained health workforce," with "supply a sustainable and appropriately trained health workforce" being one of the principal recommendations.

Smart Coaching is derived from other domains such as e-learning. E-learning is described as "learning supported by digital electronic tools and media" or "learning aided by digital electronic tools and media." In other words, the DT's Smart Coaching component can be viewed as a subset of e-learning. Students are increasingly acclimating to learning in a digital environment (Xing et al., 2022). They are enthusiastic about e-learning, and it is projected that by 2025, online education will be widely available, particularly following the COVID-19 phase. The extensive usage of digital learning in today's population will contribute to the acceptance of DT Coaching as a technology. Sports leagues, teams, and player

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