

Review

Digital Twin and 3D Digital Twin: Concepts, Applications, and Challenges in Industry 4.0 for Digital Twin

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Abstract: The rapid development of digitalization, the Internet of Things (IoT), and Industry 4.0 has led to the emergence of the digital twin concept. IoT is an important pillar of the digital twin. The digital twin serves as a crucial link, merging the physical and digital territories of Industry 4.0. Digital twins are beneficial to numerous industries, providing the capability to perform advanced analytics, create detailed simulations, and facilitate informed decision-making that IoT supports. This paper presents a review of the literature on digital twins, discussing its concepts, definitions, frameworks, application methods, and challenges. The review spans various domains, including manufacturing, energy, agriculture, maintenance, construction, transportation, and smart cities in Industry 4.0. The present study suggests that the terminology “3 dimensional (3D) digital twin” is a more fitting descriptor for digital twin technology assisted by IoT. The aforementioned statement serves as the central argument of the study. This article advocates for a shift in terminology, replacing “digital twin” with “3D digital twin” to more accurately depict the technology’s innate potential and capabilities in Industry 4.0. We aim to establish that “3D digital twin” offers a more precise and holistic representation of the technology. By doing so, we underline the digital twin’s analytical ability and capacity to offer an intuitive understanding of systems, which can significantly streamline decision-making processes using the digital twin.

Keywords: digital twin; 3D digital twin; Industry 4.0; IoT digital twin; advanced analytics for digital twin



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1. Introduction: Origins of Digital Twin and Its Development

The history of the digital twin is relatively brief, primarily due to technological constraints during its early stages. The evolution of digital twins is divided into three different stages: (1) formation, (2) incubation, and (3) growth. This advancement and the significant key events are depicted in Figure 1.

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Core Concepts of Accounting Information, 1995-1996 Edition. Theme 1 Karen Pincus,1995 *Research Anthology on Business Continuity and Navigating Times of Crisis* Management Association, Information Resources,2022-01-07 When the COVID 19 pandemic caused a halt in global society many business leaders found themselves unprepared for the unprecedented change that swept across industry Whether the need to shift to remote work or the inability to safely conduct business during a global pandemic many businesses struggled in the transition to the new normal In the wake of the pandemic these struggles have created opportunities to study how businesses navigate these times of crisis The Research Anthology on Business Continuity and Navigating Times of Crisis discusses the strategies cases and research surrounding business continuity throughout crises such as pandemics This book analyzes business operations and the state of the economy during times of crisis and the leadership involved in recovery Covering topics such as crisis management entrepreneurship and business sustainability this four volume comprehensive major reference work is a valuable resource for managers CEOs business leaders entrepreneurs professors and students of higher education researchers and academicians **Ethics and Innovation in Public Administration** Gilles Rouet,Stela Raytcheva,Thierry Côme,2024-09-12 This edited volume analyzes the ethics of innovations in the public sector in Europe The book presents a theoretical analysis of empirical cases deepening the understanding of innovation in public administration by identifying common processes across various local contexts It also delves into the study of the European Union s ethics and values exploring their impact on innovation at both European and local levels Additionally the book features comprehensive case studies encompassing different sectors professions and statuses within public administration providing a multifaceted examination of innovation s complexities By considering multiple perspectives including those of citizens politicians managers trade unions NGOs and political leaders the book offers a holistic understanding of the ethical challenges associated with innovation in public administration It also addresses intrapreneurship successful initiatives struggles and resistance to change training for elected representatives and the integration of an ethical approach into local authority communications As such this volume will be an essential resource for scholars practitioners policymakers and anyone navigating the intricate landscape of ethical decision making in European public administration Technology and Higher Education Linda K. Enghagen,1997 *Harvard Business School ... Catalog of Teaching Materials* ,1998 *Information Industry Directory* ,2001 Comprehensive directory of databases as well as services involved in the production and distribution of information in electronic form There is a detailed subject index and function service classification as well as name keyword and geographical location indexes **Awards, Honors & Prizes** ,1978 **The Standard Periodical Directory** ,2003 Brandweek ,2005-10 *Scientific and Technical Organizations and Agencies Directory* Peter D. Dresser,1994 Mediaweek ,2003-04 *Newsweek* ,1980 **Awards, Honors, and Prizes** ,1969 Listing and description

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