Smart Blog

Reimagine Cities & Industries

Let The World See

Digital Twin

The Future is Now!

The concept of the digital twin offers a robust framework that effectively integrates digital technology innovation and operational mechanisms to foster sustainable development in industrial planning and construction. It provides a viable pathway for industrial upgrading by precisely mapping physical and digital industries and seamlessly combining virtual reality with intelligent feedback. This integration, in turn, facilitates safer and more efficient industrial activities and enhances convenience and inclusivity in daily services. Moreover, it plays a pivotal role in contributing to a lower-carbon and more sustainable environment.

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Reimagine Industries
Digital Twins Connecting the Future
Let the World See

Digital Twins: A Catalyst for ESG and Sustainability Goals

The global landscape has witnessed profound changes due to the impact of COVID-19, offering us an opportunity to transition from one world to another. The choices we make in response to emerging challenges hold paramount importance. While we cannot fully control the future, we can proactively prepare for it. Considering new challenges, adhering to the principles of Environmental, Social, and Governance (ESG), achieving net-zero carbon emissions, meeting the United Nations Sustainable Development Goals (SDGs), and fostering a sustainable smart industry are critical objectives.

Leveraging the existing advantages of digital technology and the Internet of Things, we aim to create a smart, low-carbon, innovative, and sustainable industry. The foundation for this lies in Taiwan's exceptional achievements in the high-tech sector. Our vision includes a leap forward and the establishment of a digital twin that will have a global impact. The journey begins with digital transformation – reimagining business in the digital age and adding value for customers. Digitization, the initial step, involves transitioning from analog or paper-based systems to digital platforms. Digitalization, the subsequent phase, entails optimizing processes for increased efficiency, reduced costs, and improved profits. Finally, Digital Transformation propels the creation of entirely new business categories and fundamentally changes the way we conduct business, enhancing customer experience, decision-making, and personalized solutions.

To achieve future industry success, we must prioritize agile, flexible, and resilient operations, minimizing waste and enhancing efficiency. Here, the benefits of a digital twin become evident. Recognized by Gartner, a leading international consulting firm, as one of the top ten global technology trends for three consecutive years, the digital twin provides a model that seamlessly combines digital technology innovation with operational mechanisms for sustainable industrial planning and development. By precisely mapping physical and digital industries and integrating virtual reality and intelligent feedback, the digital twin drives safer and more efficient urban activities, industrial operations, and convenient, inclusive daily services, ultimately fostering a lower-carbon and more sustainable environment. While the concept may still be relatively new to many countries, it is expected to become mainstream within the next five to ten years.

These 3-D models, which have been used extensively to design, build, and operate physical and digital products, are further refined using a digital twin by seamlessly running a series of tests, enabling an understanding of how all the components interact and how internal changes and external factors affect the whole performance. As the world prepares for climate change, we need tools like this more than ever to help us better understand, plan, predict, and execute our social and economic goals for sustainable development, while reacting in real time to the ever-changing climate around us.

Utilizing sensors such as AIoT and CCTV, the digital twin establishes real-time connections between physical and digital models. By processing, analyzing, and interpreting the data, the digital twin

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reflects the status of urban buildings and infrastructure promptly, thus enabling evidence-based policymaking, optimizing industry construction and services, and adding value.

Throughout the stages of industrial planning, design, and construction, the digital twin facilitates in-depth visual testing and analysis to ensure optimal performance, effectively resolving bottlenecks that are challenging to inspect and analyze systematically and addressing conflicts in engineering facility configurations. During the maintenance and operation phase, the integration of virtual and real information enables rapid response management decision-making in the event of accidents.

The value brought forth by the digital twin manifests in shortened planning, design, and development times, as well as more efficient deployment and implementation. Through user digital twins, stakeholders can fully interact and immerse themselves in the planning, design, construction, and management of industrial park plants, fostering understanding, interaction, collaboration, and immersive customer experiences. Moreover, digital twins play a crucial role in achieving sustainable development, effectively reducing material and carbon emissions in planning, design, and construction, leading to cost reductions and a reduction in environmental waste. With digital twins, industry can effectively analyze what data can do to improve living and working environments, create economic opportunity, and revitalize closer communities.

As the world grapples with climate change, tools like the digital twin have become indispensable, aiding us in comprehending, planning, predicting, and executing our social and economic goals for sustainable development, while adapting in real-time to the ever-changing global environment.

The journey towards sustainability and environmental responsibility demands a relentless commitment to innovation and the adoption of transformative solutions like the digital twin. Together, we can shape a more sustainable and prosperous future for generations to come.

Digital twin cities: Enhancing Urban and Business needs.

- Digital twin cities play a pivotal role in addressing the evolving requirements of cities and businesses. The utilization of digital twins encompasses various aspects, including appropriate urban and factory planning to create inclusive, safe, resilient, and sustainable living and working environments in alignment with the UN Sustainable Development Goal 11. These twins aid in visualization during plant and building development, planning, design, construction, and management, fostering efficient and environmentally conscious practices.

- Education and training also benefit from digital twins, aligning with industry demands to provide real-time remote expert support, efficient global training, and resource sharing from a first-person perspective. This approach improves productivity, frontline worker safety, communication, decision-making capabilities, skills, knowledge, and customer satisfaction, while simultaneously reducing travel costs, time, manpower requirements, and carbon footprint.

- Furthermore, digital twins contribute to the provision of adequate healthcare and emergency services, ensuring their availability and effectiveness. They also facilitate infrastructure development and proper maintenance by enabling predictive maintenance of critical components such as roads or production lines. Additionally, digital twins facilitate visual simulation and analysis of various systems, including traffic, energy, water, waste, and telecommunications, optimizing their efficiency and functionality.

- During natural disasters, real-time exploration through realistic digital twin scenarios empowers decision-makers and experts from various fields to rapidly identify and comprehend problems, enabling focused discussions and prompt decision-making within an intuitive and familiar world. This capability proves invaluable in post-disaster rescue efforts, where every second counts, fostering seamless coordination among all units on the digital twin platform.

- The adoption of digital twins yields significant benefits, notably in cost and carbon footprint reduction while simultaneously enhancing efficiency and safety across multiple activities. Through data analysis, cities and industries can effectively harness the power of information to improve living and working environments, create economic opportunities, and foster stronger and more resilient communities.

In conclusion, digital twin cities offer a transformative approach to address the evolving needs of urban settings and businesses alike. By leveraging the capabilities of digital twins, we can pave the way for a more sustainable and prosperous future, driving positive change and facilitating economic growth while preserving our environment and enhancing quality of life.

The Benefits of Digital Twins for Cities and Enterprises

A data-rich digital model that accurately replicates the physical characteristics and real-time processes of cities and enterprises offers unprecedented advantages. Digital twins enable the aggregation of complex data from multiple sources and the simulation of future outcomes, encompassing aspects such as carbon emissions, temperature, energy use, production line improvements, waste management, safety monitoring, traffic enhancements, infrastructure management, and fiscal revenues. This comprehensive visualization within the digital twin empowers optimized capital expenditures, regulation of usage patterns, identification of potential failure points, and the initiation of digital interventions based on unique network insights. As organizations increasingly leverage AI-driven use cases and data-driven decision-making, digital twins are projected to have a cumulative financial impact amounting to billions over the next decade.

Given the real-time monitoring of the present and simulation of the future, along with the relatively low costs associated with digital twins, cities and enterprises are increasingly adopting them as standard tools for urban and industrial planning and design. This revolutionizes the way industries and governments operate and maintain their systems, ultimately enhancing the quality of life and working environments. Moreover, digital twins play a crucial role in low-carbon initiatives and climate adaptation efforts by guiding energy efficiency endeavors and simulating the impacts of climate events or disasters.

Digital twins will certainly play a vital role in the long-term resilience strategies of cities and industries. Investing in this technology in conjunction with existing practices will also enable government and industry to recover money wasted on inefficient systems. These extra savings can then be invested elsewhere as needed.

In the pursuit of long-term resilience strategies, digital twins are set to play a vital role for cities and industries. Combining investments in this technology with existing practices will enable governments and industries to reclaim funds wasted on inefficient systems, which can then be redirected to other strategic areas.

Imagining the future of the industrial metaverse, we envision a digital representation of the end-to-end supply chain, constantly replicated in real time, from raw materials to delivery. This

interconnected system, linked to supplier information, offers early warnings of potential disruptions in supplier productivity. Real-time reports provide insights into existing inventory buffers, alternate suppliers, and alternative parts, empowering the simulation of supplier transition plans to minimize impacts during switching. As a new source is selected, the digital twin facilitates automatic initiation of the supplier onboarding and purchase order process. The R&D department receives the 3D replica of the chosen component, simulating its impact on customers and existing processes.

Subsequently, the digital virtual factory simulates any disruptions in production and advises leaders on how to maintain high production quality through optimized labor and logistics schedules during changeovers. The virtual retail store proactively sends suggestions to store managers for updating layouts and product mixes to fill temporary gaps on shelves while training staff to handle customer inquiries about product changes. The result: shorter stockouts, close to zero financial costs, minimal employee disruption, and increased customer satisfaction.

The global digital twin market is experiencing significant growth, with projections indicating its expansion from $3.1 billion in 2022 to $48.2 billion by 2026. More than 500 cities are expected to incorporate digital twins into their daily operations, saving a remarkable $280 billion in design and development costs over the next five years.

As we embrace the post-epidemic era, we need a fresh perspective and innovative approaches to usher in the next era of city and industry. Digital twins offer a powerful means to reimagine and reshape cities and industries, linking the future and showcasing the world's potential.

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