ISO/IEC 30173

Edition 1.0 2023-11

INTERNATIONAL STANDARD

colour inside

Digital twin – Concepts and terminology



ISO/IEC 30173:2023-11(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.020

ISBN 978-2-8322-7680-8

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DIGITAL TWIN – CONCEPTS AND TERMINOLOGY

FOREWORD

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ISO/IEC 30173 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
JTC1-SC41/362/FDIS	JTC1-SC41/372/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

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INTRODUCTION

Digital transformation continues to reshape the world at multiple scales, from a city to a building, a factory, an automobile, a process and so on. The concept of a digital twin (DTw) is not new. The concept of twinning in aerospace has been in use for over 50 years. Advances in digitalization, for example those related to the industrial Internet of Things, have enabled the concept to develop and spread outside of capital-intensive industries.

Digital twin has the potential to be widely used in multiple domains such as smart manufacturing, smart cities, smart agriculture, smart energy, smart buildings, smart health care, smart mining and many other fields. However, different fields have developed in isolation, leading to different concepts and terminology. The benefits that can be derived from the use of a digital twin will depend on the use case or cases that it has been conceived to satisfy. The degree to which the benefits are realized is dependent on the implementation of the digital twin and the degree to which it can be trusted to represent the behaviour of the target entity it represents. For example, it can help:

a) simulate and predict products or production lines, resulting in production cycle reduction and cost reduction for manufacturing companies;

b) optimize city construction based on simulation models, and realize visualization, convenience and intelligent city management for city planners;

c) monitor and optimize production operations, and perform predictive diagnosis on machinery and equipment for agricultural producers;

d) achieve visual monitoring management of energy production and transmission processes, as well as fault analysis and remote operation and maintenance for energy managers;

e) monitor patients' real-time conditions, provide personalized medical solutions, dynamically optimize medical resources for doctors, and so on.

The essence of digital twin is a pairing of two things:

– something that provides a functional purpose in reality, for example, an automobile or a petrochemical platform, designated as a target entity in this document;

– a representation of that target entity as a digital entity for the purpose of connection, integration, analysis, simulation, visualization, optimization, collaboration or, when necessary, providing external management for that target entity.

In view of the increased interest in and potential applications of the digital twin technologies, there is a need to establish a common basis and terminology to enable collaboration and cooperation, and to promote a common understanding of the concept.

The purpose of this document is to:

1) provide a common basis for understanding the concept and composition of a digital twin through definitions of digital twin-related concepts;

2) provide an overview of the life cycle of a digital twin in relation to the target entity it represents;

3) provide a basis for the development of standards, specifications and use of digital twins.

This document provides generic digital twin concepts and terminology that can be applied in any domain or across domains.

DIGITAL TWIN – CONCEPTS AND TERMINOLOGY

1 Scope

This document establishes terminology for digital twin (DTw) and describes concepts in the field of digital twin, including the terms and definitions of digital twin, concepts of digital twin (e.g. digital twin system context, life cycle process for digital twin, types of digital twin), functional view of digital twin, and digital twin stakeholders.

This document can be used in the development of other standards and in support of communications among diverse, interested parties or stakeholders.

This document is applicable to all types of organizations (e.g., commercial enterprises, government agencies, and not-for-profit organizations).

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms

3.1.1
digital twin
DTw
digital representation (3.1.8) of a *target entity* (3.1.3) with data connections that enable convergence between the physical and digital states at an appropriate rate of synchronization

Note 1 to entry: Digital twin has some or all of the capabilities of connection, integration, analysis, simulation, visualization, optimization, collaboration, etc.

Note 2 to entry: Digital twin can provide an integrated view throughout the life cycle of the target entity.

3.1.2
entity
<digital twin> thing (physical or non-physical) having a distinct existence

EXAMPLE Person, object, event, idea, process, etc.

[SOURCE: ISO/IEC 20924:2021, 3.1.18, modified – The example has been added.]