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TECHNICAL REPORT

colour inside

**Industrial-process measurement, control and automation – Smart manufacturing –
Part 2: Use cases**

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FOREWORD

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The text of this Technical Report is based on the following documents:

Draft	Report on voting
65/864/DTR	65/905/RVDTR

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 Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63283 series, published under the general title *Industrial-process measurement, control and automation – Smart Manufacturing*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- replaced by a revised edition, or
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INTRODUCTION

In recent years, one observes that an increasing number of “buzzwords” are in discussion in the manufacturing area. The scope of the various “buzzwords” is not clearly defined, moreover, the scope addressed by the “buzzwords” is not congruent but overlapping. Each stakeholder involved in these discussions has another perspective to the various topics and the discussions address very different levels of detail and consider different contexts. This is illustrated in Figure 1.

“Smart Manufacturing is one of the buzzwords that addresses multiple stakeholders. The overall community is convinced that “Smart Manufacturing” will significantly affect the manufacturing industries and, therefore, standardization will consolidate the vision of “Smart Manufacturing” from different manufacturing industries sectors viewpoints. The discussions within standardization are sufficiently formal or precise in order to later have any claim regarding compliance to standards. Thus, standardization will consolidate the definitions and understanding of the “buzzwords” for its own usage.

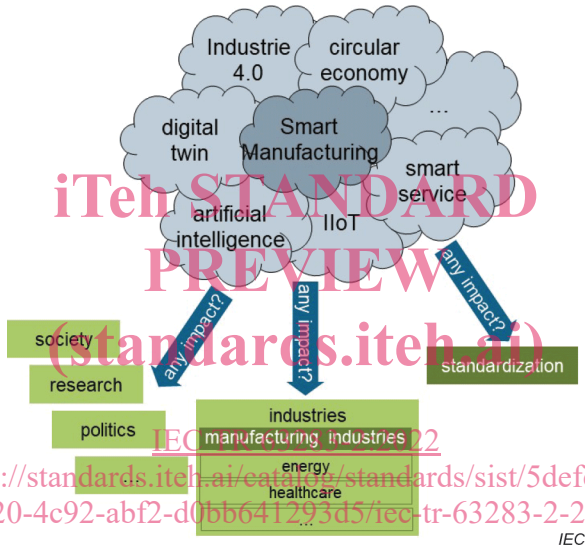

Figure 1 – Related subjects to Smart Manufacturing

In order to analyze the impact of “Smart Manufacturing” on standardization, the approach chosen is the collection and evaluation of use cases to obtain a sufficiently representative description of “Smart Manufacturing”. These use cases are described from the perspective of the manufacturing value chains. They illustrate what could be conceivable in the future in the context of “Smart Manufacturing”. Thus, a use case itself is explainable[1] to a manufacturing company. Experts in standardization will afterwards analyze these use cases to decide whether

- a specific use case provides no (new) input for standardization;
- a specific use case provides needs to maintain existing standards (this can be related to the content or the application areas);
- a specific use case provides input for additional measures to be elaborated in by standardization projects.

[1] A typical employee of a manufacturing company is not familiar with formal methods used to describe use cases as accurately as possible or even uses different terms, for example plant versus factory versus production system. Thus an explanation of the use cases is necessary.

Based on this approach the use cases will contribute to the following topics:

- Consolidation of the vision “Smart Manufacturing”: The use cases will describe the basic principles of traditional and future manufacturing value chains and will work out the additional, new opportunities enabled by digitalization.
- Consolidation of terms and concepts: The use cases will facilitate to come to agreements on basic terms and concepts. The description of terms and concepts will be in an application context and not here in a terms and definitions section.
- Justification of a general need for standardization: Based on the use cases, the fundamental gaps will be identified. It is intended to close the gaps that have not yet been filled up. Possibly, however, it is effective to first suitably upgrade the installed base based on already established standards.
- Elaboration of recommendations for standardization on an abstract level: Based on the use cases, the requirements – and not solution concepts – for standardization will be extracted to achieve a consensus for maintenance or new development of standards. It is intended to derive the recommendations from the use cases and ensure backward traceability to the use cases.

INDUSTRIAL-PROCESS MEASUREMENT, CONTROL AND AUTOMATION – SMART MANUFACTURING –

Part 2: Use cases

1 Scope

This Technical Report has the goal of analyzing the impact of “Smart Manufacturing” on the daily operation of an industrial facility. It focusses on the perspective of automation and control of the production system, but also on the supporting processes of ordering, supply chain management, design, engineering and commissioning, operational technology, life cycle management, and resource management.

These recommendations are accomplished on the basis of several carefully selected use cases that are familiar to manufacturing industry. Therefore, each use case is described, followed by an analysis of the possible influence of “Smart Manufacturing” and the assessment of the impact on existing and future standardization.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

3.1 General

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 https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

NOTE In 3.2, all conceptual constituents of uses cases including their context are defined in a way that the document is self-explanatory. The definitions are fully aligned with IEC TR 63283-1 (65/683/DTR).

From these conceptual constituents the examples introduced in the various use cases are distinguished. These concrete roles are consolidated in 3.3, 3.4, 3.5 and 3.6 to provide a consistent cross reference of all concrete roles involved in the individual use cases of this document. For the sake of clarity, a distinction is made between business, human and technical roles. A technical role can be represented by a subject or an object, where a subject is an entity doing something, and an object is having something done to it. Thus, subjects have capabilities in the sense of having the ability to perform actions.

3.2 General terms and definitions

3.2.1
actor
entity that communicates and interacts

Note 1 to entry: These actors can include people, software applications, systems, databases, and even the power system itself.

[SOURCE: IEC 62559-2: 2015, 3.2]

3.2.2
role
set of characteristics that distinguish an entity's ability to exhibit a set of required behaviours

Note 1 to entry: In this document the entity is an actor.

[SOURCE: ISO 18435-1:2009, 3.22, modified – The word "resource" has been replaced by "entity" and the note has been added.]

3.2.3
Smart Manufacturing
manufacturing that improves its performance aspects with integrated and intelligent use of processes and resources in cyber, physical and human spheres to create and deliver products and services, which also collaborate with other domains within an enterprise's value chains

Note 1 to entry: Performance aspects include agility, efficiency, safety, security, sustainability or any other performance indicators identified by the enterprise.

Note 2 to entry: In addition to manufacturing, other enterprise domains can include engineering, logistics, marketing, procurement, sales or any other domains identified by the enterprise.

Note 3 to entry: In this document also the business context of manufacturing is considered.

3.2.4
standardization
activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context

Note 1 to entry: In particular, the activity consists of the processes of formulating, issuing and implementing standards.

Note 2 to entry: Important benefits of standardization are improvement of the suitability of products, processes and services for their intended purposes, prevention of barriers to trade and facilitation of technological cooperation.

[SOURCE: ISO/IEC Guide 2:2004, 1.1]

3.2.5
system
set of interrelated elements considered in a defined context as a whole and separated from its environment

Note 1 to entry: Such elements can be both material objects and concepts as well as the results thereof (e.g. forms of organization, mathematical methods, and programming languages).

Note 2 to entry: The system is considered to be separated from the environment and other external systems by an imaginary surface, which can cut the links between them and the considered system.

[SOURCE: IEC 61804-2:2018, 3.1.65]

3.2.6
use case
specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more actors or other stakeholders of the system

[SOURCE: ISO/IEC 19505-2:2012, 16.3.6]

3.3 Business roles

3.3.1
purchaser
legal entity requiring a good or a service in exchange for money or other resources

Note 1 to entry: A purchaser of a physical good can require it by selecting it from a catalog provided by a manufacturing company or by specifying an individual product order and requesting this specified physical good from a manufacturing company.

3.3.2
manufacturing company
legal entity being responsible for the design, development and manufacturing of a physical product in view of its being placed on the market, regardless of whether these operations are carried out by that legal entity itself or on its behalf

Note 1 to entry: Selling a physical product to a purchaser follows a negotiation procedure: on request of a purchaser specified by a product order, the manufacturing company prepares an offer. Upon acceptance of the offer by the purchaser, the manufacturing company delivers the product according to the assured product features.

Note 2 to entry: A product order can be specified by a purchaser and it is in the responsibility of the manufacturing company to assure the specified features. The purchaser can also select a product from a catalogue provided by a manufacturing company and it is in the responsibility of the purchaser to select an appropriate product.

Note 3 to entry: A product does not necessarily have to be manufactured individually for the purchaser, it can also already be in stock and delivered directly to the purchaser.

Note 4 to entry: A manufacturing company can act in the role of a supplier as well as in the role of a purchaser of another manufacturing company.

Note 5 to entry: Examples in the use cases: production resource supplier, robot supplier, gripper supplier, sensor supplier, physical asset supplier, device supplier, 3D printer supplier

3.3.3
non-physical asset supplier
legal entity delivering a non-physical product to a purchaser

Note 1 to entry: An example of a non-physical product can be a piece of information.

3.3.4
software application supplier
legal entity delivering a software application to a purchaser

Note 1 to entry: Examples in the use cases: engineering tool supplier, production system engineering tool supplier, simulation tool provider, virtual reality platform provider, data analysis tool supplier, device management system supplier, collaboration platform supplier.

3.3.5
broker
legal entity serving as an intermediary between a purchaser and a supplier or a provider

Note 1 to entry: A broker mediates a request from a purchaser to possible suppliers, selects one or more feedbacks received from suppliers and provides them to the purchaser.

3.3.6
computing and connectivity infrastructure operator
legal entity operating a computing and connectivity infrastructure (“IIoT-platform” operator)

3.3.7
collaboration platform operator
legal entity operating a collaboration platform

3.3.8
decentralized energy network operator
legal entity operating a decentralized energy network