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Navigation tools for smart manufacturing

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

NAVIGATION TOOLS FOR SMART MANUFACTURING

FOREWORD

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The text of this Systems Reference Deliverable is based on the following documents:

Draft	Report on voting
SyCSM/81/DTS	SyCSM/89/RVDTS

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 Systems Reference Deliverable 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/standardsdev/publications.

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- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

This document aims to describe external requirements in terms of navigation tools for smart manufacturing to assist the development of manufacturing systems and international standards through linking reference models, use cases, architecture, and standards. Some of the requirements mentioned in this document (including annexes) refers to additional IEC internal IT support.

With this motivation, this document contains the following clauses; Clause 5 describes an outline of the navigation tool for smart manufacturing. Clause 6 presents a view of relationships between the navigation tool and related IT resources in IEC. And Clause 7 defines external requirements. Besides, annexes show a practical example of an IT tool having similar characteristics to the navigation tool, prior works as IT tools developed in IEC, an example of a practical development scheme of IT tool in IEC, and an outline of a potential development scheme for the navigation tool through a comparative analysis with the Mapping Platform.

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NAVIGATION TOOLS FOR SMART MANUFACTURING

1 Scope

This document describes requirements in terms of navigation tools for smart manufacturing.

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 terminology 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>

3.1 aspect

labelled designation for a collection of concepts in a particular context

[SOURCE: IEC 63339:–, 3.1.1, modified – The example and notes to entry have been omitted.]

3.2 business

series of processes, each having a clearly understood purpose, involving more than one person, realised through the exchange of information and directed towards some mutually agreed upon goal, extending over a period of time

[SOURCE: ISO/IEC 15944-20:2015, 2.2]

3.3 concern

matter of relevance or importance to a *stakeholder* (3.10) regarding a manufacturing system or element thereof

[SOURCE: ISO/IEC/IEEE 42010:2022, 3.10, modified – In the definition, "regarding a manufacturing system element thereof" has been added.]

3.4 dimension

coherent collection of *aspects* (3.1) relevant to a *manufacturing domain* (3.7)

[SOURCE: IEC 63339:–, 3.1.7, modified – Note 1 to entry has been omitted.]

3.5**facet**

framework composed of one or more *dimensions* (3.4)

[SOURCE: IEC 63339:–, 3.1.9]

3.6**manufacture**

any or all of the activities in the design, procurement, construction, commissioning, deployment, screening, testing, production, storage, labelling, packaging or distribution of products and production systems

[SOURCE: IEC 63339:–, 3.1.12]

3.7**manufacturing domain**

portion of a *business* (3.2) dealing with the *manufacture* (3.6) of products

[SOURCE: IEC 63339:–, 3.1.13]

3.8**reference model**

framework for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment

[SOURCE: ISO 19165-1:2018, 3.30]

3.9**use case**

technique for capturing potential functional requirements

[SOURCE: IEC TS 62443-1-1:2009, 3.2.132]

3.10**stakeholder**

role, position, individual, organization or classes thereof, having an interest, right, share, or claim, in an entity of interest

[SOURCE: ISO/IEC/IEEE 42010:2022, 3.17]

4 Abbreviated terms

ahG	ad hoc Group
GUI	graphical user interface
IEC	International Electrotechnical Commission
IEV	International Electrotechnical Vocabulary
IS	International Standard
ISO	International Organization for Standardization
JWG	Joint Working Group
MP	Mapping Platform
MPIP	Master Plan Implementation Plan
NT	navigation tool
OF1	Open Forum 1

OSS	open source software
SDK	software development kit
SDO	standards development organization
SEG	Systems Evaluation Group
SM2TF	Smart Manufacturing Standard Map Task Force
SM	smart manufacturing
SMB	Standardization Management Board
SMRM	Smart Manufacturing Reference Model
SRG	Systems Resource Group
SyC	systems committee
TC	technical committee
UCMR	use case management repository
URM-MM	Unified Reference Model – Map and Methodology
URMSM	Unified Reference Model for Smart Manufacturing

5 Navigation tool

5.1 Objective

Navigation tools aim to assist in the configuring of smart manufacturing systems by utilizing relevant ISs and existing products/solutions, including open source software, and the smart manufacturing example described in use cases.

5.2 Definition

In order to clarify the external requirements of navigation tools, a navigation tool is defined as follows:

"A set of software functions to navigate the development of smart manufacturing systems through exploiting information related to reference models, use cases, architecture and standards, which are stored in the accessible repositories."

5.3 Expected value

Navigation tools provide access to related reference models, use cases, architecture and standards based on the needs of standard developers and smart manufacturing system developers in the development and implementation of smart manufacturing systems.

5.4 Related information

There are some prior studies and activities related to navigation tools, such as Unified Reference Model – Map and Methodology (URM-MM) (see Annex A), Smart Grid Standards Map (see Annex B), and Mapping Platform (see Annex C).

6 Relationships among related activities developing IT tools in IEC

6.1 General

Subclause 6.1 describes the relationships among individual IT resources involving related committees within IEC. Figure 1 shows an example of an assumed IEC service system configuration, which allows IEC to deliver services to end users through its own platform. A navigation tool provides a functionality as a domain-specific function by exploiting functionalities provided as domain-neutral functions and repositories.

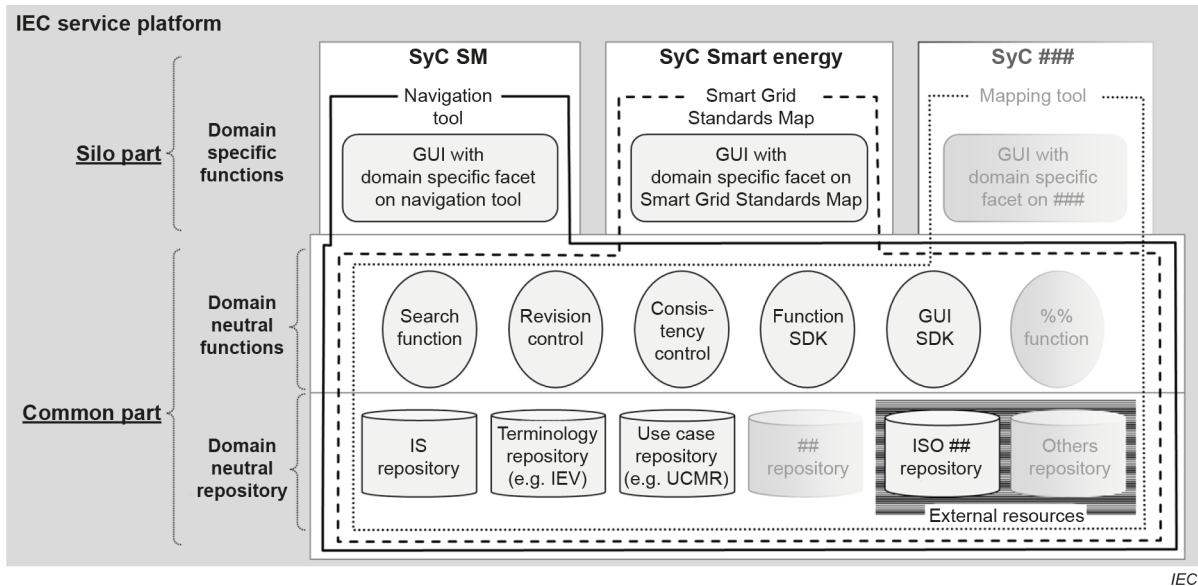


Figure 1 – Example of an assumed IEC service system configuration

6.2 Categorization of functionalities

Subclause 6.2 describes the categorization of functionalities provided through the IEC service system. According to the assumed configuration depicted in Figure 1, a typical system configuration is composed of two parts: a silo part composed of individual domain-specific functions, and a common part composed of domain-neutral functions and repositories. The common part will be utilized from multiple domain-specific functions at the silo part. As domain-neutral functions, the common part also provides a software development kit (SDK) for developing domain-neutral functions and for domain-specific functions, respectively. Domain-neutral repositories are to be provided by relevant groups not only in the IEC but also by those external to the IEC. Moreover, the common part allows the IEC to provide domain-specific functions such as a navigation tool, which may utilize multiple domain-neutral functions and/or refer to related repositories of the common part, as necessary, to end users via the Internet. To understand how IEC proceeds with IT tool development, Annex D provides a case of practical IT tool development in IEC. Besides, to consider practical implementation approaches for navigation tools, Annex E describes similarities and differences between the case of Mapping Platform and the case of a navigation tool.

7 Requirements for navigation tools

Clause 7 describes the functional requirements and non-functional requirements from a user's point of view. Moreover, it also describes the expectations for interfaces between navigation tools and domain-neutral functionalities. Table 1 shows the list of functional requirements of navigation tools.