COOMET CONCEPT FOR THE ISSUES OF DIGITAL TRANSFORMATION IN METROLOGY

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Abstract

This document describes the COOMET concept for the issues of digital transformation in metrology, prepared within the framework of cooperation of national metrological institutions of COOMET member countries.

I. General

1. This Concept was prepared by the COOMET Task Group for digital transformation in metrology under project 825/RU-a/21 "Development of a COOMET concept for digitalization in metrology" according to item 97 (Ind-g.3.6) of the COOMET Development Program for 2020-2022.

The Concept covers the following aspects:

- ✓ review of electronic documents in metrology and formulation of requirements to their formats and structure;
- ✓ use of FAIR+T data;
- ✓ use of digital technology in COOMET activities;
- ✓ use of cloud and grid technology in metrology in COOMET member countries;
- ✓ development of recommendations on the structure of and requirements for the objects of digitalization which are constituent parts of the digital platforms of COOMET member countries;
- ✓ development of common approaches to the creation and maintenance of national information funds in the field of ensuring the uniformity of measurements in COOMET member countries.

This Concept describes objectives, tasks, principles, tools and suggests mechanisms for digital transformation, recommended for implementation in COOMET member countries.

2. The Concept for digital transformation within COOMET is a document initiating a range of activities geared towards the development of COOMET digital services and creation of conditions for the digital transformation of metrological services of COOMET member countries, and outlining development stages scaling up the economies of member states to a higher level of technological development that corresponds to the needs of the digital economy.

3. For the purposes of this Concept the following terms are used with their definitions:

DCC is a Digital Calibration Certificate (A digital calibration certificate (DCC) serves for the electronic storage, the authenticated, encrypted and signed transmission and the uniform interpretation of calibration results (S. Hackel, 2018));

FAIR+T data are data, which meet the principles of Findability, Accessibility, Interoperability, Reusability, Traceability;

UCUM is a Unified Code for Units of Measure. UCUM has been developed to ensure the uniformity and accuracy in transferring information, related to measurements, among various information systems and areas.

XML is an eXtensible Markup Language;

XSD (XML Schema Definition) is a language describing the structure of an XML document;

Digital platform is an information resource of a COOMET member country in the field of metrology that operates using modern digital technology;

COOMET digital platform is an information resource of COOMET;

Note – the Working Group for the Creation of a New Single Information Resource of COOMET (WG-Web) is directly engaged in the formation of a COOMET digital platform.

Digital service is a range of services, providing users with the possibility of remote work with specific information resources;

Digital transformation of cooperation is a process reflecting transition from traditional forms of interaction among COOMET member countries on the issues of metrology to interaction using the digital technology of digital platforms;

Digital transformation of metrology is a process reflecting transition of organizations working in the field of metrological support from one technological mode to another through extensive use of digital technology and information and communication technology in order to enhance efficiency and competitiveness.

II. Principles on which digital transformation of COOMET metrological cooperation and digital transformation of metrology are based

4. Digital transformation of COOMET metrological cooperation and digital transformation in metrology are carried out by member countries based on the following principles:

a) systematic approach in developing and coordinating the processes of digital transformation of COOMET metrological cooperation and digital transformation of metrology;

b) leadership of the COOMET Committee and public authorities of member countries in partnership with business communities of member countries as organizers and coordinators of digital transformation of metrological cooperation and digital transformation of metrology within COOMET;

c) application of mechanisms of public-private partnership in the implementation of projects on digital transformation in metrology;

d) coordination of processes of digital transformation in metrology with key world trends;

e) research on approaches, concepts and projects on digital transformation of metrological cooperation and digital transformation of metrology;

f) consideration of resource capacity of national economies;

g) optimization of time, organizational expenditures that are indicators of the performance of projects on digital transformation of metrological cooperation and digital transformation of metrology within COOMET.

III. Tasks and objectives of digital transformation of COOMET metrological cooperation and digital transformation in metrology

5. The objectives of this Concept are as follows:

a) update of the established mechanisms of integration cooperation in metrology in view of national agendas on digitalization in metrology implemented in member countries;

b) preparation of recommendations on defining the strategy and tools to ensure digital transformation in metrology.

6. The main tasks of digital transformation of COOMET metrological cooperation and digital transformation in metrology are:

a) review and formulation of requirements to the formats and structure of electronic documents in metrology;

b) facilitation of the development of metrological collaboration and cooperation within COOMET;

c) facilitation of digitalization of metrological activities, managing and supporting processes at the national level;

d) support of the application of digital platforms in the field of metrology in COOMET member countries, increased productivity and more effective use of production resources as a result of automation of metrological services;

e) development of a prospective structure of metrological activities based on new organizational principles and modern technological base;

f) creation of a system of tools for digital transformation in metrology.

IV. Basic tools of digital transformation of COOMET metrological cooperation and digital transformation in metrology

7. Digital transformation of COOMET metrological cooperation and digital transformation of metrology are implemented using the COOMET digital platform.

8. To create conditions for digital transformation in metrology, the following actions are recommended:

a) identification of systemic problems during the implementation of digital transformation in metrology;

b) introduction of best practices and digital technologies;

c) establishment of cooperation with other metrology organizations (outside COOMET) on the issues of digital transformation in metrology;

d) networking with business communities;

e) preparation of recommendations on the content of national or regional documents defining the structure of and requirements for the objects of digitalization (digital objects), including requirements for:

at the national level:

- repositories of digital documents;
- digital directories (codifiers, rubricators etc.);
- digital MI group card descriptions;
- digital calibration and verification certificates for MIs;
- digital certificates, type descriptions for MIs, digital certificates for RMs;

at the regional level:

- information and communication e-infrastructure of NMIs of member countries to ensure information security when transferring data to the COOMET digital platform.

Note: COOMET recommendations, defining the structure of and requirements for the above mentioned objects of digitalization, should be drawn up as separate COOMET publications: publications are prepared under COOMET projects with the involvement of members of the COOMET Task Group for Digital Transformation in

Metrology (Tg-DIgTr, project 825/RU-a/21) and COOMET structural bodies, coordinating the field of cooperation within which the digital object exists.

9. For digital transformation in metrology the following fields of metrological cooperation should be emphasized in COOMET member countries:

a) standardization, cataloguing and identification of measuring instruments, technical specifications (e.g. digital calibration certificate, digital MI, digital verification/calibration certificate, catalogue of digital resources of COOMET member countries etc.), underlying the exchange of information, as well as quality infrastructures and metrological infrastructures of member countries, including measuring technology;

b) information and communication e-infrastructure (broadband internet);

c) information security and data protection;

d) introduction of the UCUM system in the implementation of COOMET digital solutions;

Note: introduction of a Unified Code for Units of Measure implies using international standards ISO 1000, ISO 2955-1983, ANSI X3.50-1986, HL7 and ENV 12435 when transferring information, related to measurements, among various information systems and areas.

e) tools for and systems (technologies) of electronic identification of measuring instruments;

f) automated tools for verification (calibration), tools for remote verification (calibration), sensors providing control and monitoring of production and technological processes in real time, service-oriented architecture, network infrastructure (data exchange environment), application software to monitor and manage measurements in real time;

g) technology of the industrial "internet of things": industrial platforms of the "internet of things", machine-to-machine interaction, standardization of technological solutions in wireless communications (radio frequency ranges and communication protocols) for mobile platforms and the "internet of things", provision of radio frequency bands (radio frequency channels) for the mentioned purposes;

h) digital technology reinforcing the potential for digital transformation in metrology: 3D modelling and prototyping, cloud and grid e-infrastructures for calculations, blockchain technology (including smart contracts), big data and their analytics, augmented and virtual reality, artificial intelligence, digital B2B and B2C platforms (business-to-business, business-to-customer);

i) digital twins;

j) digital platforms and ecosystems based on the common architecture and supporting e-infrastructures;

k) other digital technologies in metrology.

V. Stages of digital transformation of COOMET metrological cooperation and digital transformation in metrology

10. Digital transformation of COOMET metrological cooperation and digital transformation of metrology are implemented in stages:

a) first stage (till April 2024) – approval of the COOMET concept for the issues of digital transformation in metrology;

b) second stage (timeframes in accordance with the Roadmap for the implementation of the COOMET concept for the issues of digital transformation in metrology) – development of COOMET recommendations, defining the structure of and requirements for the objects of digitalization (digital objects);

c) third stage (timeframes in accordance with the abovementioned Roadmap) – development and launch of the COOMET digital platform, implementation of projects of digital metrological cooperation within COOMET that have passed a pilot try-out.

VI. Creation of conditions for digital transformation of COOMET metrological cooperation and digital transformation in metrology

11. In order to create conditions for digital transformation of COOMET metrological cooperation and digital transformation in metrology the following is required:

a) to identify authorized organizations in COOMET member countries responsible for digital transformation in metrology;

b) to prepare projects and facilitate implementation of program and normative documents providing for the fulfillment of a range of activities in the field of digital transformation in metrology in member countries;

c) to facilitate initiation and further implementation of initiatives and projects, geared towards ensuring digital transformation of metrology, by the authorized organizations involving interested countries;

d) to facilitate formation and implementation of the policy in the field of digital transformation based on integration projects by the authorized organizations;

e) to facilitate integration of the COOMET digital platform with digital platforms of member countries.

VII. Coordination of digital transformation of COOMET metrological cooperation and digital transformation in metrology

12. The stages of digital transformation within COOMET should be implemented in accordance with the Roadmap for the implementation of this Concept.

The Roadmap should provide for actions (projects) for digital transformation, responsible persons and time slots for the implementation.

The control of the implementation of this Concept and performance of the actions provided for in the Roadmap, is assigned to the COOMET Task Group for Digital Transformation in Metrology (TG-DigTr, COOMET project 825/RU-a/21), Working Group for the Creation of a New Single Information Resource of COOMET and COOMET Presidential Council.