

Digitalization of key- and supplementary comparison data analysis

Digital Metrological Expert

Software for end-to-end digital workflows:

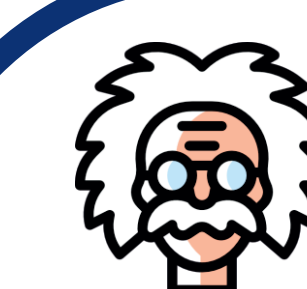
- § For **standard work** (taking over tedious human work)
- § **FAIR digital services of Quality Infrastructure** (QI)
- § **Assess data** and **propose ways of processing** (utilize AI)
- § **Machine-actionable reports** disclosing metrological traceability
- § **Itself a digital standard** when operated by authoritative organizations

Mission

- Providing **reliable digital toolset** for **interlaboratory comparison** data analysis
- Testbed for interoperating **digital standards** from the wider QI and **Digitalization**
- Community based development of 'cloud-ready' software "**FOR ALL**"



"Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; [Gartner IT glossary]"



$$E=mc^2$$

Quality Infrastructure

- **SI Digital Framework:** interoperable SI units and related core data (si-digital-framework.org)
- **Smart Standards:** machine-actionable number, table, formula, text, image
- **DCC & D-SI:** international, FAIR, and machine-actionable measurement data exchange formats of calibration based on SI, VIM, GUM (ptb.de/dcc)
- **DKD expert reports:** pre-normative standards for DCCs (tinyurl.com/pre-normative) and **metrological terminology repository** (tinyurl.com/metTerms)
- **CODATA:** values of fundamental constant

Virtual Comparison of Mass

Project on a fully automated evaluation of a virtual comparison of mass using the Digital Calibration Certificate (DCC) schema

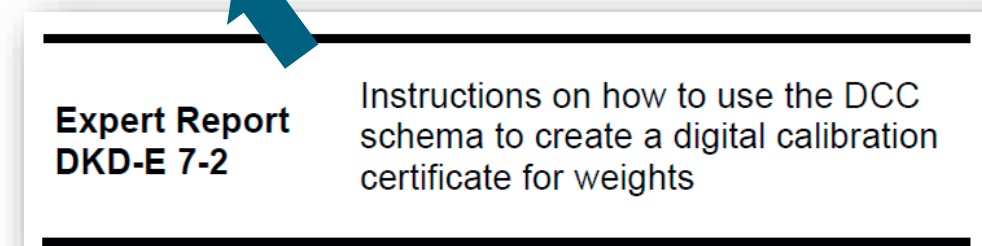


Paper
B. Rodiek
et. al.

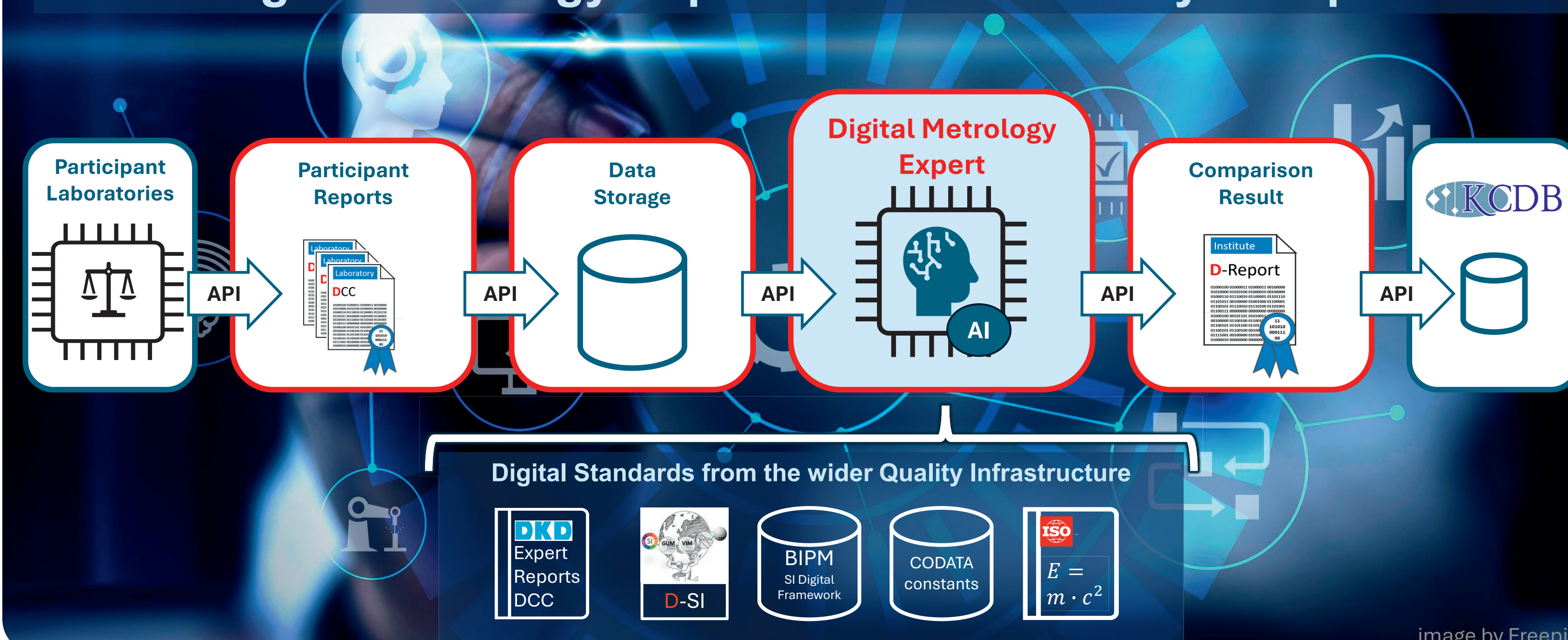
Participant	x_i / kg	U_i / kg
PTB	1.000000287	4.6E-08
KRISS	1.000000259	4.5E-08
NPL	1.000000283	4.6E-08
MSL	1.000000230	5.7E-08

```
<dcc:result refType="mass_mass">
  <dcc:data>
    <dcc:quantity refType="basic_measuredValue">
      <si:real>
        <si:label>mass</si:label>
        <si:value>1.000000287</si:value>
        <si:unit>kilogram</si:unit>
        <si:expandedUnc>
          <si:uncertainty>4.6E-8</si:uncertainty>
          <si:coverageFactor>2</si:coverageFactor>
          <si:coverageProbability>0.95</si:coverageProbability>
          <si:distribution>Normal</si:distribution>
        </si:expandedUnc>
      </si:real>
    </dcc:quantity>
  </dcc:data>
</dcc:result>
```

10 participants, randomized data from 1 kg CMCs



The Digital Metrology Expert in Interlaboratory Comparison



Radiation Temperature

CCT K11 blackbody temperature from 34.5 °C to 41.5 °C – Reporting and evaluation in the EURAMET loop using digital calibration certificates



Paper
I. Müller
et. al.



Set temperature (°C)	Average Resistance of monitor PRT (Ω)	Average Indicated temperature (°C)	Average Radiance temperature measured by participant (°C)	Room temperature (°C)
34.5				
37.0				
41.5				

comprehensive
real-world
comparison
model

Future Perspective

- **CCQM K186 “Quantification of Total Haemoglobin in Blood” including link to NIST Decision Tree** (C. Swart)



- Large Language Models for interoperation and Machine-Learning for method selection

d-si.ptb.de



Team & Contributors

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