

APMP Focus Group on Digital Transformation:

Preparations for establishing the DXFG - Blair Hall (Chair-elect)

Preliminary

Following an Executive Committee resolution in June 2021, a call was made to form a new focus group on digital transformation. Approximately 30 members joined the new group, representing 12 member economies and 2 associates.

An election for the Chair was held on Friday 15 October, 2021.

This document outlines proposed terms of reference and a draft strategic plan. These notes (submitted on 11 Nov) will be discussed at the EC-CC meeting on 18 Nov 2021. The focus group has not yet had enough time to finalise the plan. So, some details may change.

Terms of Reference

The DXFG will:

- Provide a platform for open exchange of ideas, resources, guidance, and best practice to support digital metrology and the implementation of digital transformation strategies
- Monitor and report on digital metrology and digital transformation activities that are relevant to the APMP
- Liaise with the CIPM/BIPM, RMOs, the APMP TCs, FGs, and DEC, and other stakeholders in global digital transformation of metrology
- Recognise the diversity of APMP members' needs for digital transformation
- Foster human capability development for digital metrology
- Encourage the application of sound measurement science in digital metrology and digital transformation projects

The role of a focus group for digital transformation

Digital transformation usually describes the application of digital technologies to business processes, where final outcomes are intended to benefit both users and consumers. There is certainly ample scope for this type of transformation in our quality infrastructures (QIs),

where traditionally paper-based systems prevail. However, the core competencies of NMIs extend to specialised scientific and technological processes and it is intended that these processes too will be subject to digital transformation. Indeed, digital information that originates from technical procedures will ultimately be incorporated in complicated business processes (such as, the preparation, checking, authorisation, and delivery of endorsed digital calibration certificates). This represents an unprecedented challenge. The outcomes of digital transformation in metrology are expected to be far reaching. They will introduce disruptive changes across all technical areas of metrology and associated QI activities. Developments such as digital calibration certificates and digital scopes of accreditation will be game-changers for metrology and the activities underpinned by QIs.

A focus group (FG) should be established to engage with the challenges posed by digital transformation in metrology and to coordinate efforts to find solutions. The scope is very broad, so there is a need to work across the various technical areas covered by APMP TCs; common problems should be identified and efforts to digitalise processes in different areas should be coordinated. A focus group can form an overarching view of the needs and important tasks within the APMP region. They can do this by consulting an extensive and diverse network of contacts, within NMIs, QIs, and other stakeholders like industry, government, and science organisations.

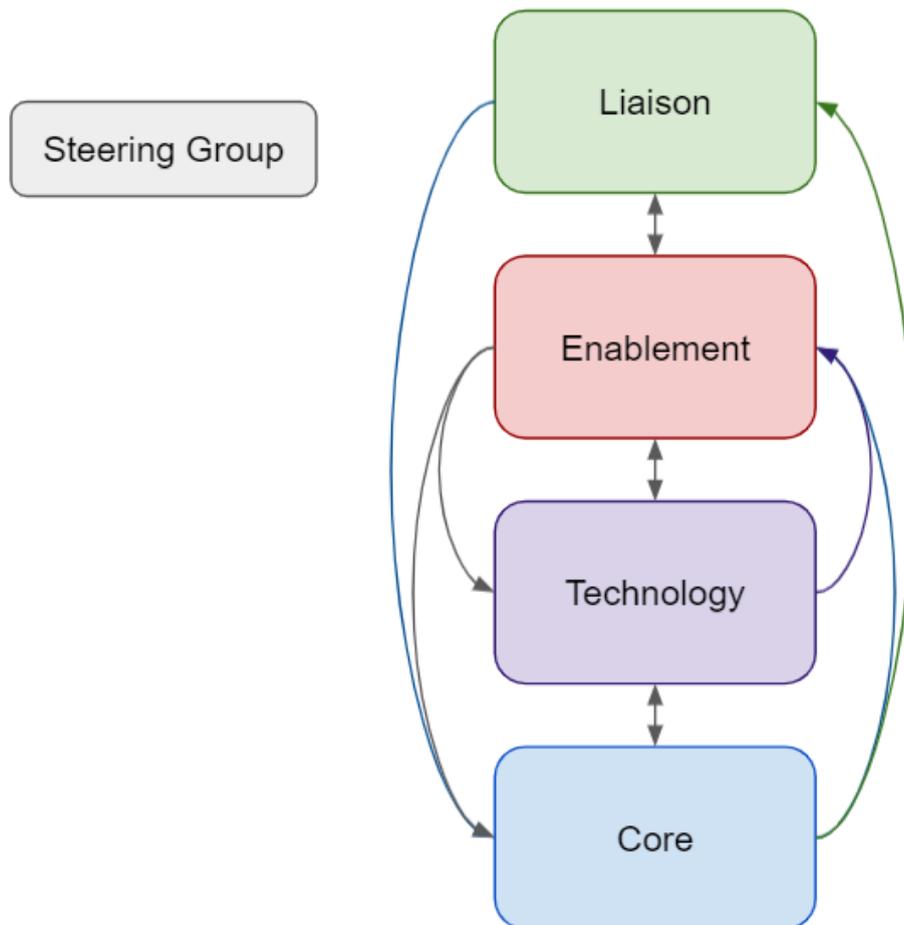
But there are unique challenges too. The digitalisation of scientific processes is not easy. The open-science community is farther along this road than the NMI community. However, they are struggling with basic concepts that really belong to metrology: quantities, scales, units, traceability, uncertainty, etc. These are also the foundations on which the digital transformation of metrology must be constructed. So, an FG must give careful consideration to the measurement science that ultimately must support our quality infrastructures. These scientific elements are sometimes difficult to perceive; they are often embedded in habitual routine processes, or hidden as tacit knowledge in the minds of metrologists. However, this knowledge must be identified and captured in a way that digital systems can use. Consideration must be given to the science before enduring engineering solutions can be realised for such things as digital calibration certificates and digital scopes of accreditation. This is a job for a FG, because it relates to general disciplines of metrology and how they can be captured and represented in digital form for a wide variety of stakeholders.

Digital transformation will affect different member states of the APMP in different ways. The needs for transformation in developing economies probably look different to those in economies with advanced manufacturing sectors. Yet the scientific basis is the same for everybody and access to digital technologies is ubiquitous. So, digital transformation may present unique opportunities for APMP members. The FG will provide a platform for dissemination of information and capability building and it will foster technical projects so that virtual teams can collaborate across the region. In this way, the FG can make substantial contributions to capability building in technological and metrological knowledge. This will help to future-proof investment, because digital technology evolves rapidly but the underlying metrology principles do not.

Focus Group structure

The FG is coordinated by a Steering Group consisting of the Chair and 3 members: Dr. Blair Hall (MSL-NZ), Dr. Sivinee Sawatdiaree (NIMT), Dr. Kazuaki Yamazawa (NMIJ) and Dr. Cui Shan (NMC).

The group's strategy is organised around four thematic pillars, depicted below with arrows showing interactions.



Ultimately, these pillars will support larger digital transformation projects, but until we have been able to consult widely with stakeholders, the details of such projects are not known.

The group's proposed strategy is presented in the following pages, in terms of these four themes.

Liaison: to engage with stakeholders, including quality infrastructure bodies, industry, and scientific organisations, and to coordinate with the BIPM and other RMOs on digital transformation

Three-year goal	Desired outcomes	How we might do this
<ul style="list-style-type: none"> The FG has established an excellent network of stakeholder connections and contacts and is engaged with all stakeholders 	<ul style="list-style-type: none"> The FG is informed about the needs and digital transformation activities of TCs The FG is informed about the activities of other RMOs and the CIPM in digital transformation The FG has established contacts with industry The FG has effective contacts with accreditation and legal metrology organisations 	<ul style="list-style-type: none"> Undertake detailed consultation with TC Chairs and designate FG members to liaise with each TC, FG and DEC [1] Participate in CIPM and RMO working groups [2] Consult with accreditation and legal metrology entities in member states [3] Consult with stakeholders in member states (industry, scientific bodies, government, etc) [4]

Notes

1. This has begun. Members of the FG made brief appearances at TC meetings in November, to raise awareness about the new FG. The Chair-elect will join the TCC meeting to discuss a plan to meet individually with each Chair, and to follow this up with group meetings to agree on needs and coordinate activities. There are also ex-TC Chairs and DEC and FG representatives in the DXFG.
2. Two members of the FG are members of the CIPM Expert Group, which is part of the CIPM D-SI initiative. Regular meetings of RMO WGs/experts have also begun, coordinated by EURAMET.
3. Some FG members have connections with ILAC signatories, OIML and ISO CASCO. We will use these to explore their plans for digital transformation.
4. NMI Australia has initiated a study. The FG will be able to build on their experience to survey their own economies.

Enablement: to acquire and curate information about digital transformation in metrology, and related topics, and to disseminate this to APMP stakeholders

Three-year goal	Desired outcomes	How we might do this
<ul style="list-style-type: none"> A knowledge management framework and dissemination channels are available and are contributing to capability development 	<ul style="list-style-type: none"> The FG facilitates access to appropriate information, knowledge, and technology APMP members can obtain support for digital transformation projects APMP members proactively engage in digital transformation APMP members have well-developed digital transformation strategies 	<ul style="list-style-type: none"> Organise regular FG mini-conferences with presentations on APMP projects [1] Organise educational sessions about various topics and technologies [2] Initiate collaborative technical projects with support for DEC members Provide infrastructure to support collaborative technical development projects [3] Encourage FG participation in international meetings and conferences

Notes:

- SIM have been doing this and it seems very successful
- There are skill-deficits to be addressed and also capability development opportunities. A lot of expertise can be accessed from open-science communities who are already fully engaged in digital transformation.
- Digital platforms facilitate collaborative work and interactions, which will foster knowledge sharing and capability development

Technology: to acquire and maintain appropriate technical resources and competencies to address challenges posed by the digital transformation of metrology

Three-year goal	Desired outcomes	How we might do this
<ul style="list-style-type: none"> The FG coordinates, maintains, and contributes to technological support for digital transformation 	<ul style="list-style-type: none"> The FG has an inventory of skills and technological expertise available to support digital transformation The APMP is building an enduring and interoperable digital metrology infrastructure The APMP helps member institutions to identify technologies that facilitate communication and collaborative activities across the APMP 	<ul style="list-style-type: none"> Organise workshops and seminars on technical topics [1] Survey digital technologies and identify compatible choices for the APMP [2] Advise the APMP about harmonisation of digital technology and service choices [3]

Notes:

1. This overlaps with Engagement and Core activities, and will be informed by Liaison
2. The FG could identify useful digital technologies for the organisation and facilitate access to them. Consideration must be given to durability and cost of ownership, which are important for metrology, because we have a long time horizon and limited budgets. Standardised open technologies will generally be preferred
3. The FG surveyed its members to determine constraints on platforms and digital services for virtual teams. The results will be analysed and made available to the APMP Secretariat.

Core: to identify and understand the challenges posed by digital transformation of metrology and appropriate scientific solutions to those challenges

Three-year goal	Desired outcomes	How we might do this
<ul style="list-style-type: none"> Metrological challenges posed by digital transformation have been identified and understood 	<ul style="list-style-type: none"> Digital transformation projects in the APMP are of high quality Digital transformation projects apply world best-practice Digital transformation projects implement sound metrological principles 	<ul style="list-style-type: none"> Organise and participate in workshops and seminars on metrological topics related to digital transformation [1] Review the measurement science underpinning other RMO projects and validate key metrological aspects [2] Develop knowledge management resources for digital transformation [3] Consider the impacts of digitalisation on the operation of the MRA [4]

Notes:

1. Overlaps with Enablement and Technology activities, and will be informed by Liaison. There may also be opportunities to engage on core topics with metrologists at international meetings and conferences.
2. An understanding of the science is a prerequisite to responsible use of any technologies used to implement digital transformation.
3. The FG must find effective ways to capture, store, and disseminate knowledge generated during digital transformation projects. This will be constrained by institutional policies on digital technologies. Perhaps the APMP could ultimately curate some knowledge-management resources.
4. For example, the exchange of digital records during international measurement comparisons can have a significant impact on comparison analysis, and contribute to the transparency of outcomes. This could help to build confidence in the MRA.