DEAR FRIENDS, DEAR COLLEAGUES,

The IMEKO World Congress is just within two months! The organisers bring the latest on the World Congress in the July issue. Furthermore, read about the UN Sustainable Development Goals, which aim to highlight opportunities for future interaction. The International Organization for Standardization (ISO) shares its "Strategy to Meet Global Needs". Hottinger Brüel & Kjaer, an IMEKO friend and supporter since 1979, shares some thoughts as an exhibitor for the IMEKO World Congress. Meet Professor Ron Summers, a very active member of the IMEKO community. There is so much more to tell…

It is so good to know that we will see each other soon in person!

NEWS FROM THE IMEKO WORLD CONGRESS 2024

UNFORGETTABLE EXPERIENCES
AT THE IMEKO WORLD CONGRESS 2024 HAMBURG - MORE THAN JUST SCIENCE

In the previous newsletter from April 2024, the exciting IMEKO World Congress workshops and technical visits were introduced. These workshops will cover topics from Digitalization, Quantum Technology, Sustainable Development and Metrological Traceability. The technical visits will offer insights behind the scenes into leading companies and research facilities like Airbus Hamburg, DESY, the European XFEL, EMH, HHLA, ZAL, and the Calibration Directorate North.

More exclusive events are planned for the upcoming conference, ensuring a perfect blend of scientific excellence and engaging social activities, including:

Senate Reception at the Hamburg City Hall

Experience the grandeur and historical significance of the Hamburg City Hall, a prestigious venue rarely accessible to the public. Be officially welcomed by Senate representatives and network with esteemed colleagues and VIPs in this majestic setting. The rich architectural heritage and high-profile atmosphere create an unparalleled environment for fostering valuable connections and collaborations.

Movie Night with "The Last Artifact"

This cinematic highlight unveils the high-stakes race to redefine the kilogram, one of the most important historical objects in metrological traceability. Enjoy the event's unique atmosphere, engage with fellow attendees, and participate in an exclusive Q&A session with one of the filmmakers. You might even recognise some of the scientists featured in the film, as they may be sitting just a few seats away from you.

This evening promises to be an enriching and memorable experience, blending entertainment with insightful discussions. It's a once-in-a-lifetime opportunity to interact with the filmmakers and the scientific experts who contributed to this remarkable production.

Several occasions for intense and inspiring exchanges are planned beyond the scientific sessions, with around 800 high-level contributions. From informal discussions to focused debates during workshops, these events are designed to foster intense networking and ignite new ideas and perspectives, fuelling passion for innovation.

Don't miss this unique opportunity, and remember to register soon, as early-bird and special offers (including a free gala dinner for the first 500 registrants) are expiring soon.

Looking forward to seeing you there!

For more information and to register, visit **imeko2024.org**.

*Written by the **World Congress 2024** Team*

INTRODUCING PROF. RON SUMMERS

Physiological measurement is what makes me tick. It always has as far back as I can remember. At school, friends would talk about cars and motorbikes, their engine design and how fast they could go – though perhaps interesting, I wanted to know more about how *I worked*, how and why I am 'designed' in the way that I am? Early questions may have been somewhat naïve, yet they put me on the pathway to who I am Today. So, how did my journey unfold, and what stopping points were made along the way? The first thing to admit is that there has been no grand plan to guide progression; rather, serendipity has been my yardstick. I also seem to have a happy knack for turning any setback into an opportunity; either that or I have a guardian angel looking after me.

My first job after school had the title 'Junior Physiological Measurement Technician', and I was in heaven! Not only did I enjoy this role - principally measuring the hearing of patients from children through to very aged pensioners - but the training provided in physiological measurement allowed me to experience the use of electro-physiological methods to gain clinical information about different functions of the body. I was getting to know how *I (i.e. the human body) worked* in much more detail, with dysfunction and its rectification through treatment also playing its part. In hindsight, due recognition has to be given to the training programme provided by the National Health Service in the North East of England in the 1970s; this comprised lectures from a mixture of senior clinicians, physicists and physiologists who backed up their contributions with live demonstrations on patients in their clinics.

It was a natural progression to move on to university to read Biophysics. What I also commenced was a life-long predilection to working at cross-disciplinary boundaries or working at the edge of single disciplines. This is the space where I thrive - it's exhilarating to extend knowledge and understanding and to see impact, whether potential or real. With a pleasant 18-month hiatus working in nuclear medicine at St Thomas' Hospital in London, I returned to the university to commence post-graduate study in Information Engineering. That university was City University in London, which brought me into contact with Professors Ken Grattan, Ewart Carson, and Ludwik Finkelstein, among others. Though I didn't know it then, it was the start of my academic career, my links with the Institute of Measurement and Control in the UK, and slightly later, IMEKO.

Note that at this point in Life, I had started to build my arsenal of tools - physiological measurement, medical physics, engineering, and now the icing - systems science. Each had its link to measurement, mainly physical measurement, though even at this stage, I recognised the need for the application of model-based measurements and 'soft' measures to solve real-world problems. It is relatively easy to measure heart rate, and a little more difficult to predict patient prognosis - clinicians would like to know both. Though required at times to apply these tools to problems not in the clinical domain, my early research career was very definitely steeped in bio-engineering. A further feature of my research career was the need to work with interdisciplinary and international teams of people with like-minded goals. Many of the researchers who were work colleagues at the time became friends with whom I remain in contact.

At the core of these research opportunities was the funding made available via the European Union – it was this funding that allowed the interdisciplinary and multi-national research teams to flourish. I became involved in a number of such research programmes throughout the 1990s, as shown in Table 1 below. The list produced, and the pithy descriptors used summarise a much larger contribution from all those involved. The science was good; measurements sound; impact attained. However, human contribution in terms of fellowship, camaraderie, and lasting friendships is both harder to measure and the most powerful outcome to savour.

Table 1 Research Programmes with Personal Involvement

EU-INFORM: 1989-1992
To introduce computer-based patient records in selected Intensive Care Units throughout Europe.

EU-IMPROVE: 1992-1995
To define a European Standard minimal data set for Intensive Care Units

EU-IBIS: 1995-1998
To introduce intelligent patient monitoring in Intensive Care Units and Operating Rooms

UN FAO: 2000-2002
To provide an information architecture for a web service implementation of the information services provided by the FAO

NHS (England) Information Directorate: 2002
To design an information structure for a nurse-led electronic patient record

EPSRC: e-Medic: 2002-2006
To design and prototype an 'intelligent' inhaler

EU-DOC@HOME: 2003-2005
To provide the information infrastructure and methods to establish a telehealth and telecare service for chronically ill patients receiving treatment in the community.

TSB: Knowledge Transfer Partnership: 2005-2007
To establish the first hospital-based Clinical Trials Support Unit in the UK

EPSRC: Project Fallot: 2008-2014
To develop a multi-scale understanding of congenital heart disease, specifically the tetralogy of Fallot.

In 1998, I moved from City University to take up the position of Chair of Information Science at Loughborough University. Soon after, I became the Head of Department – I'm guessing that not many Chartered Engineers have found themselves as the Head of a prestigious Library School – but there I was. I confess that though I was not able to confer the majority of my capabilities into my work, some of my colleagues were successful in transferring the importance of their work to me. I remain grateful for this opportunity to herald a different (and proper!) interpretation of information science terms, such as archive, legal deposit, ontology, cataloguing and classification. These interpretations became important in the United Nations funded work that investigated the design, implementation and evaluation of an information architecture for the services that they provide, and together with earlier EU research on the introduction of computer-based patient records, the NHS-funded work on a nurse-led electronic patient record.

In 2002 a multi-disciplinary team was formed to design and test a smart inhaler, which brought together novel components that included an electronic patient diary – this recorded when the inhaler was used as well as any direct patient input. The principal idea behind the work was to improve patient compliance, especially among teenagers where it was perhaps seen as not so 'cool' to have to use the device periodically, especially in front of friends. In fact, a much simpler solution was achieved in this patient cohort by simply changing the colour of the inhaler from grey to a 'snazzy' purple (and other prominent colours!). A lesson learned.

At around the same time I was appointed as Chair of a Telehealth and Telecare Committee at the Polytechnic University of Hong Kong - a six year stint that meant meeting at least annually with the rest of the team. Experience gained here was put to good use when I was appointed as a EU Industrial Advisor to the EU: Doc@Home project. With healthcare costs increasing at an alarming rate, it was recognised that should the patient be treated at home - especially for chronic conditions that increased bed-blocking within a hospital setting - it would potentially see a saving in overall financial outlay. For this to happen, a socio-technological solution was required to capture health data remotely with the assistance of the patients themselves. It is perhaps interesting that the drivers for this particular work were the health insurance companies (in Scandinavia and the Baltic States). A device and a service were produced whose second and third generation products remain in use to this day.

Though the majority of my research has been at the 'finding out' stage, I did have an opportunity to work at the implementation end of the research technology pipeline when asked to co-lead a knowledge-transfer partnership with a partner hospital trust. In the UK, all of the clinical trial units were based in universities; the partner hospital trust rightly asked the question, why? Together, we were able to establish the physical processes required for the support of hospital-based clinical trials and locate the service in the Research Department of the chosen hospital. The final multi-national, multi-disciplinary project I was involved in received national funding for work that included an element of discipline hopping. Here, I am delighted to say that I could return to one of the research teams I worked with in the 1990s. A paediatric cardiologist in Rennes, France, had a clinical problem for which he sought an engineering solution.

The tetralogy of Fallot is a well-known congenital disorder of the heart; could a multi-spatial scale description offer any new interpretation of the underlying causes and could the condition be defined more precisely? The answer to both of these questions turned out to be, 'well, yes'. Modelling tools provided solutions to the multi-scale question; and medical imaging of cadaver hearts made available to us by a colleague in Paris provided more precise physiological measurement of the underpinning aetiologies.

Providing this solely research perspective of my academic career emphasises just one component of how time was spent, it still does not complete the full picture. Giving back lessons learned in terms of research-led teaching is a second component of my academic life that I won't dwell on here. Similarly, I have been involved in a couple of successful spin-outs; one now dissolved but at its zenith employed over 150 people, the majority of whom were fee-earning as XML programmers; the second was a spin-out from the smart inhaler project mentioned above - though not now involved personally, this spin-out morphed into a family concern to distribute and service machines for computer-aided manufacture and remains in business Today.

So what have I learned in all of this - what words of wisdom can I impart to those who are perhaps starting out on their careers? The first thing is that the application of technology (including measurement technology) can only be part of a solution. I've seen too many projects that use, say, a smart phone to capture an ECG. So what? That's by far the easy bit - even if it includes a component for automatic interpretation. How is the user expected to use the information obtained? What measures are in place for user education? How will the data generated be added to an electronic patient record? How will clinicians be included in the patient-monitoring loop? What is the legal position of the data and their interpretation?

Does the device have appropriate certification? These are just a few of the other considerations that need to be taken into account around any 'technological' solution.

From a wider perspective, it seems that science is seen as problematic by an increasing number of people in the western world given evidence from the activities of anti-science campaigners. As an example, witness the anti-vax movement as a response to the application of the COVID vaccine. Perhaps more work needs to be diverted to the public understanding of science to address these concerns for which the baton is passed to the younger generation of scientists and engineers to provide ways to re-engage with this section of the population.

Volunteering my time to engineering membership organisations has been a major part of my life, from about age 40 onwards. IMEKO is clearly one example, with the UK Member Organisation (Institute of Measurement and Control) another. The IEEE Engineering and Medicine in Biology Society also features in any compiled list. This type of activity provides an opportunity to meet and work with like-minded people from around the world, what's more is that it is fun! There is usually an opportunity to travel and experience other cultures; only some of the time is spent in meetings to report back on actions taken and the like. It also provides occasions that quickly become anecdotes to recall and re-tell – for example, rolling in the snow after a wood sauna in Finland, only to find that brambles underneath the snow layer left their marks on my back – thank goodness I have an understanding wife!

I mentioned serendipity and my guardian angel at the beginning of this piece, what follows are only some of the choice points in my life where they have had a bearing. My first experience of chairing a meeting came about as an eleven-year-old.

It was the 'Junior Naturalists Club' at school and my friend's Alan's idea and when we needed to elect a Chairman even I voted for him though I was the other candidate. I still managed to win the election by one vote (and remained in post for three years). Why did I vote for him? I know how much he wanted it whereas I thought that it would be fun, but would also be just as happy if I didn't win.Not voting for myself for the same reason has been a recurring theme in elections in later life too. My first job after school, as mentioned above? I came second in a two horse race, only getting the job finally because the person who was appointed decided to turn it down. What if he didn't? My feeling is that I would have found a different route to achieve a similar career progression. Moving on to post-graduate study, I could only afford to take up the opportunity if it was a funded place. I wasn't successful in obtaining any of the six Engineering Research Council grants, but the person who was earmarked for the sole Medical Research Council grant received a better offer elsewhere – it was mine only if I agreed to take the 'Measurement in Information and Medicine' option… …which is what attracted me to the programme in the first place! In later life, my Chair at Loughborough University came about as a result of the interview panel deciding to appoint two Professors at the same time. And so it continues. One might observe that should one door close, another door usually opens! Either that, or we have to accept the hypothesis that I do have a guardian angel! And now… …well, watch this space!

Written by Prof Ron Summers

Past TC13 Chair Measurement in Biology and Engineering
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UN SDGs AT 10 (ALMOST!)

Introduction

It is a sincere hope that the vast majority of IMEKO Newsletter readers will already be familiar with the Sustainable Development Goals published by the United Nations (UN SDGs) in October 2015. The agenda that they encompass has goals set for 2030, which means that next year presents a good intermediate opportunity to monitor progress and, at the same time, review the impact of measurement, in all its forms, on each of the 17 stated goals. Each goal has several targets; taken together, the 17 goals have 169 targets. The goals themselves are listed in Table 1 below and were formed after extensive engagement with all identified stakeholders over a two-year period. Though as will be shown below, the provenance of the goals can be traced back to at least 1972.

Table 1: Sustainable Development Goals [1].

Goal 1: End poverty in all its forms everywhere.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

Goal 3: Ensure healthy lives and promote well-being for all at all ages.

Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Goal 5: Achieve gender equality and empower all women and girls.

Goal 6: Ensure availability and sustainable management of water and sanitation for all.

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.

Goal 10: Reduce inequality within and among countries.

Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.

Goal 12: Ensure sustainable consumption and production patterns.

Goal 13: Take urgent action to combat climate change and its impacts.

Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Goal 17: Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development.

The pictogram representation (Figure 1) of the 17 UN SDGs has become more familiar and is particularly popular with young people with anecdotal evidence stemming from the number of student societies who have adopted it. The SDGs now appear on the national curriculum for geography in the UK which means that each child is aware of their existence and meaning.

Though the wording of each goal is much truncated to a pithy phrase, the accompanying use of colour and especially the design of the pictograms themselves make each of the goals memorable. However, I still would not like my own ECG to look like that of its depiction in Goal 3!

Figure 1: UN SDGs Translated to Pictogram Representation [2].

The IMEKO Newsletter has looked at the interaction with the UN SDGs in a previous edition [3]; the purpose of this newsletter item is to highlight opportunities for future interaction by looking at the history of how the UN SDGs have developed themselves, looking back in order to gain traction on forward planning. By noting previous successes and the methods used to achieve them may inform current and future practice. Equally, an analysis of failures may be instructive so as not to keep repeating past mistakes.

Historical Development

It is clear from the Resolution adopted by the UN General Assembly on the 25th of September, 2015 (UN A/Res/70/1) that the UN SDGs did not appear *de novo*, and though the UN Millennial Goals are referred to in the accompanying documentation, these too have antecedent proposals and actions. So, where to begin? A good, non-arbitrary starting point might be the 'Club of Rome' report of 1972 that appeared in book form as "The Limits to Growth" [4].

The 'Club of Rome' started out as an informal association of 30 individuals from ten countries. Its inaugural meeting was held in Rome in April 1968. The group was brought together to discuss the troubling relationship between exponential growth under the condition of finite supply and to provide an illustrative interdisciplinary view on five areas that determine and limit growth at a global scale: population, natural resources, agricultural production, industrial production, and pollution. From a model-based measurement perspective, a significant outcome of this action was the realisation that these factors are interrelated within feedback loops and can be represented qualitatively by signed digraphs. The development of these models also allowed exposure to Forrester's WORLD series of system dynamics representations at a global scale [5]. In the same year, the UN Conference on the Human Environment took place in Stockholm, its focus being the investigation of human interactions with the environment and its significance being that it was the first event that focused on global environmental governance. As a consequence of this meeting, the UN Environment Programme (UNEP) was initiated.

Now that a starting point for the historical development of the UN SDGs has been identified, it is possible to prepare a roadmap that shows intermediate points until their publication in 2015. Table 2 on the next page shows a timeline of some of the events that have shaped the content of the goals and their targets, together with an indication of some events that have taken place after their publication.

Table 2: The Historical Development of UN SDGs is on the next page.

YEAR	EVENT	NOTES
1972	Club of Rome Report - "The Limits to Growth"	Covered five factors that limit growth (population, agricultural production, natural resources, industrial production, pollution)
1972	UN Conference on the Human Environment	The 'Stockholm Conference' was the UNs first major event on international environmental issues
1987	World Commission on Environment and Development (sponsored by the UN)	UN General Assembly resolution 38/161: 2020 vision - includes strategies for sustainable development
1987	UN Environment Programme	Montreal Protocol published to protect the ozone layer by phasing out chlorofluorocarbons
1992	UN Conference on Environment and Development	The 'Rio Earth Summit'
1994	Barbados Programme of Action (BPoA)	BPoA established by UN General Assembly resolution 47/189
1997	UN GASS19	Special Session of the UN General Assembly appraised progress made from the Rio Earth Summit - a 300-page plan to achieve sustainable development in the 21st Century was produced
1999	BPoA +5	Appraised progress made from BPoA
2000	UN Millennium Summit	Publication of eight Millennium Development Goals (MDGs) for sustainable development
2002	World Summit on Sustainable Development	The 'Johannesburg Summit'
2005	Mauritius Strategy of Implementation (MSI)	The MSI appraised progress made from BPoA
2010	MSI +5	Appraised progress made from MSI
2012	UN Conference on Sustainable Development	The 'Rio +20' event considered progress made since the Rio Earth Summit
2014	Third International Conference on Small Island Developing States	To prepare for what will become SDG 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development).
2015	**UN Sustainable Development Summit**	**The 17 Sustainable Development Goals (SDGs) are published**
2016	UN Framework Convention on Climate Change	Paris Climate Accord
2016	28th Meeting of the Parties to the Montreal Protocol	Kigali Amendment to protect ozone layer by also phasing out hydrofluorocarbons
2016	Global Sustainable Transport Conference	To support transport issues in SDGs
2017	The Ocean Conference	To support implementation of sustainability of marine resources (SDG 14)
2020	Second Global Sustainable Transport Conference	To review progress of transport issues in SDGs
2020	UN Ocean Conference	To review progress on SDG 14
2021	47th G7 Summit	Topics discussed relate to some SDGs (health, climate and environmental action, girls' education, food security and nutrition)
2021	UN Climate Change Conference (COP 26)	To support implementation of SDG 13

The 'Club of Rome' report and the UN Stockholm Conference are shown as the two events that kick-started the pathway to the UN SDGs but in different ways. It can be argued that the former takes a systemic perspective on the five stated interdependent global issues, whereas the latter is an acknowledgement that the UN placed significant importance on environmental issues at that time. As well as the more general planning meetings, Table 2 highlights particularly events related to the formation of SDG 14 (Conserve and sustainably use the oceans, seas, and marine resources for sustainable development) as a mirror to the process adopted for all other SDGs. It can be seen that five UN meetings took place between 1994 and 2014, whose content in some way contributed to what eventually became UN SDG 14 and its targets. A barb that is often used against the somewhat lofty ambitions of the UN is that it is strong on planning but weak on implementation and weaker still on assessing impact. To provide evidence of the opposite view, it is telling that the actions identified have follow-up meetings to assess progress against the set agenda. This is also the case for all other UN actions, including the UN SDGs themselves.

The Brundtland report of 1987 [6], the output from the World Commission on the Environment and Development, was an early adopter of the phrase "sustainable development" which is defined as,

"*development that meets the need of the present without compromising the ability of future generations to meet their own needs*".

Initially, the term referred to development in the social, economic, and environmental domains only, but it has since been extended to other areas, too. A further characteristic of this report is that it recognised that many of the global issues considered were interdependent and to find solutions would need actions from multidisciplinary teams.

It is easy to interpret these factors as a response to the systems thinking approach taken by the 'Club of Rome' in 1972, though moving from the purview of the few to more mainstream analyses.

The 'Earth Summit' held in Rio de Janeiro in 1992 requires some historical context: during the previous three or four years, the Berlin Wall had come down, and Mikhail Gorbachev signalled the end of the Cold War with emphasis on perestroika and glasnost. For the United Nations, this allowed member states to more fully commit to the cooperation and collaboration needed for global development issues to succeed. In fact, the major outcome of this Summit was a UN Framework Convention on Climate Change "to combat dangerous human interference with the climate system" and to stabilise greenhouse gas emissions. At the time of the Summit this Convention had 154 signatories; this rose to 198 signatories by 2002. Nations and international organisations (termed 'Parties') still meet annually for a Conference of Parties (COP) to assess the progress of implementation plans. Both the Kyoto Protocol of 1997 and the Paris Agreement of 2015 were COP actions, currently trying to limit the increase in global average temperatures to 1.5° C above pre-industrial levels by 2100.

The Millennium Summit held in New York in 2000 produced eight Millennium Goals (MDGs), with a total of 21 targets to be achieved by 2015 (see Table 3 below).

Table 3: List of Millennium Development Goals [7].

Goal 1: To eradicate extreme poverty and hunger.

Goal 2: To achieve universal primary education

Goal 3: To promote gender equality and empower women

Goal 4: To reduce child mortality

Goal 5: To improve maternal health

Goal 6: To combat HIV/AIDS, malaria, and other diseases

Goal 7: To ensure environmental stability

Goal 8: To develop a global partnership for development

The accompanying Agreement was signed by all 191 UN Member States and 22 international organisations. As a consequence of this Agreement, in 2005, the G8 group of nations agreed to provide enough funds to the World Bank, the International Monetary Fund, and the African Development Bank to cancel USD $55 billion in debt owed by 'heavily indebted poor countries' to allow them to redirect resources to accelerate the achievement of the MDGs. In fact, much of this debt relief ended up supporting national natural disasters rather than on future development. Assessment of the MDGs from a study in 2015 showed that their collective impact was limited: some countries achieved many goals, some none.

The Johannesburg Earth Summit meeting of 2002 (Rio + 10) allowed the assessment of progress from the first Earth Summit and an early appraisal of outcomes of the MDGs. Outcomes from the Summit were rather nebulous, though a political declaration was signed, which aided any future implementation of the earlier plans and goals. The UN Earth Summit of 2012, held in Rio de Janeiro once again, provided an appraisal of the Rio Earth Summit of 1992 (Rio + 20) and resulted in a document that comprised clear and practical steps a nation-state could take to implement sustainable development. Indeed, the output report "The Future We Want" [8] called for the development of sustainable development goals. Thus, the UN SDGs were formed as a consequence of a number of linked events that brought together world leaders and the brightest minds of the day to apply their combined efforts on problems that have a global scale.

Measurement Matters

The role of measurement in the formation of SDG goals, their implementation, evaluation and impact is pervasive yet lacking in prominence. For example, the term' climate change' is not particularly helpful as there is too much evidence from numerous sources and using different methods that demonstrate that climate has always changed throughout geological time. The goal itself to limit the increase in global average temperatures to 1.5° C above pre-industrial levels by 2100 is crying out for further definition. How can average global temperature best be measured? Given the importance of the target, it might also be a good idea to better define the benchmark pre-industrial global average temperature. From a scientific perspective, a multi-scale analysis in the time domain might be revealing given that we are potentially living through what is an instantaneous step change of temperature in the context of geological time. Can IMEKO and its contributing member organisations play a part in improving the role of measurement in the application of SDGs? If so, and at the same time given the prominence of the SDGs with the younger generations especially, the public understanding of measurement could be greatly enhanced.

A critique levelled at the MDGs combined an input with an output component: a lack of analysis and justification for the eight chosen goals themselves and a difficulty in defining measurements and measurement systems to assess success. Knowing this, those who are leading the current efforts lost no time in preparing the back story of how the 17 SDGs were arrived at, as illustrated by some of the content above. However, the measurement aspect of the critique of MDGs has some traction when applied to the SDGs - where a relatively simple scorecard index is used to provide the assessment of progress.

Though perhaps intelligible at a glance, the complexity of meeting often competing demands hides compelling use cases for the advanced adoption of measurement-based systems thinking and its tools to illustrate in graphical form the results of different simulated scenarios. Model-based measurement as a generator of indirect measurements of a stated policy - say, the level of investment to obtain sustainable food production may provide the necessary insight to aid decision-makers in understanding the complexity of the problems they face from a multi-scale perspective.

One of the initial starting points of the historical development of the UN SDGs was "The Limits to Growth". As already indicated, this work was based largely on the use of Forrester's system dynamic models as an analysis tool. These analyses continue to the present day, for example in the work of the US-based Millennium Institute [9], who partner with governments and global organisations to produce reports that fulfil the needs for SDG target actions. Though qualitative in nature, these models can be quantifiable to some degree, giving the resulting behaviour of resource-time graphs more credence and utility. Again, is there a role for IMEKO and its member organisations to adopt systems thinking methods to improve understanding of the complex scenarios that the interacting SDGs provide?

The UN SDGs will supply a focus for international collaboration on sustainability for the next five years or so. There is a likelihood that a similar programme, or an extension to the current one, will follow. Too many people have invested too much time for the programme to fail, though it is unlikely to be a complete success either. A likely failing is the approach to the use of measurement, though it is a key contributor to assessing impact. Often, researchers are measuring what they *can* measure rather than what they *should* measure.

Possible reasons for this are poor understanding of the measurement process, but perhaps also the unavailability of a relevant measure itself. The latter situation occurs mostly where 'soft' measurement science is required; there are several SDGs for which a qualitative measure might illuminate understanding of competing system archetypes, for example, 'SDG 5: Gender equality and empower all women and girls' may be a good illustration to illuminate the need for innovative 'soft' measures. The measurement community has a lot to offer in this respect; is it possible for IMEKO to take a proactive stance and lead an action to facilitate the better use of measurement in the implementation, evaluation, and impact assessment of the UN SDGs? An open question for further debate.

Written by Prof. Ron Summers

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[1] https://www.un.org/sustainabledevelopment

[2] https://www.un.org/sustainabledevelopment

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[8] The Future we Want

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ISO STRATEGY MEETS GLOBAL NEEDS - SMART STANDARDS FOR THE QUALITY INFRASTRUCTURE

This article is based on the keynote speech of ISO Vice President (Policy) Mr Christoph Winterhalter at the BIPM Workshop "Towards Digital Quality Infrastructure", March 2024

Quality Infrastructure (QI) is the basis for the verifiable and comparable quality, safety and environmental compatibility of products and services. It is anchored in legal structures and trade agreements worldwide.

QI impact is grounded in the interplay of metrology, standardisation, conformity assessment, accreditation and market surveillance. Due to the central role of standardisation in the QI, the importance and usefulness of standards increases with the development of the QI. And vice versa: the efficient functioning and overall impact of the QI increases with improved usability and actionability of standards.
(In figure: "Norms & standards" should read "Standards & specifications")

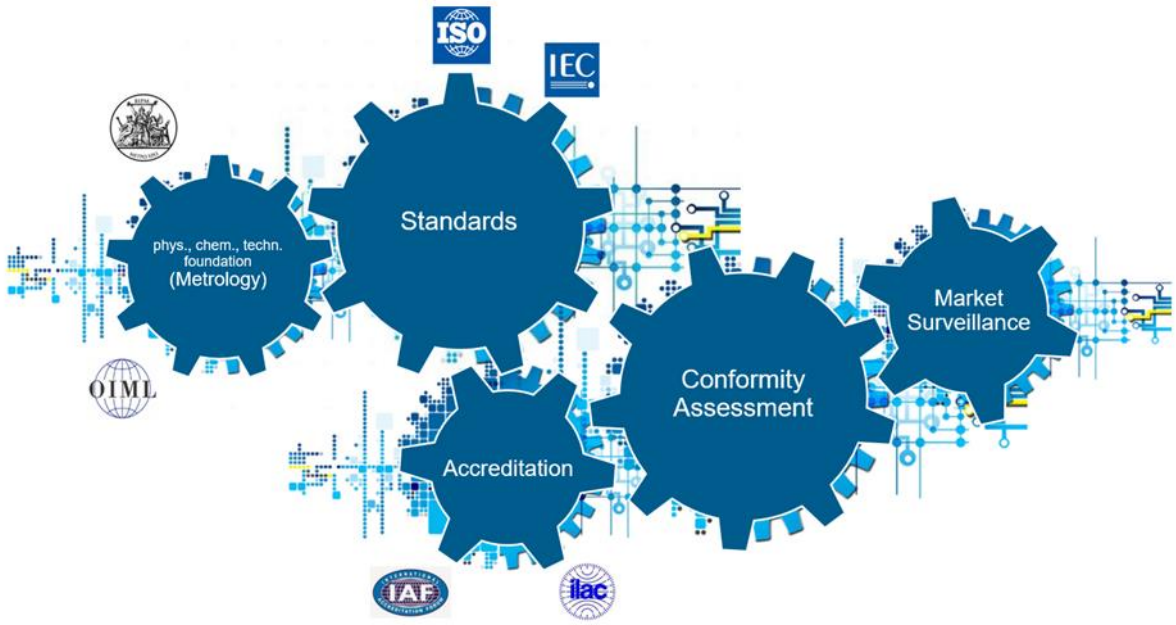


Figure 1. Systems Approach to the Quality Infrastructure

QI DIGITAL

Transformation of the QI

The United Nations Industrial Development Organization (UNIDO) proclaimed that further development and digitalisation of Quality Infrastructure is a necessary goal towards which QI stakeholders worldwide should be working.

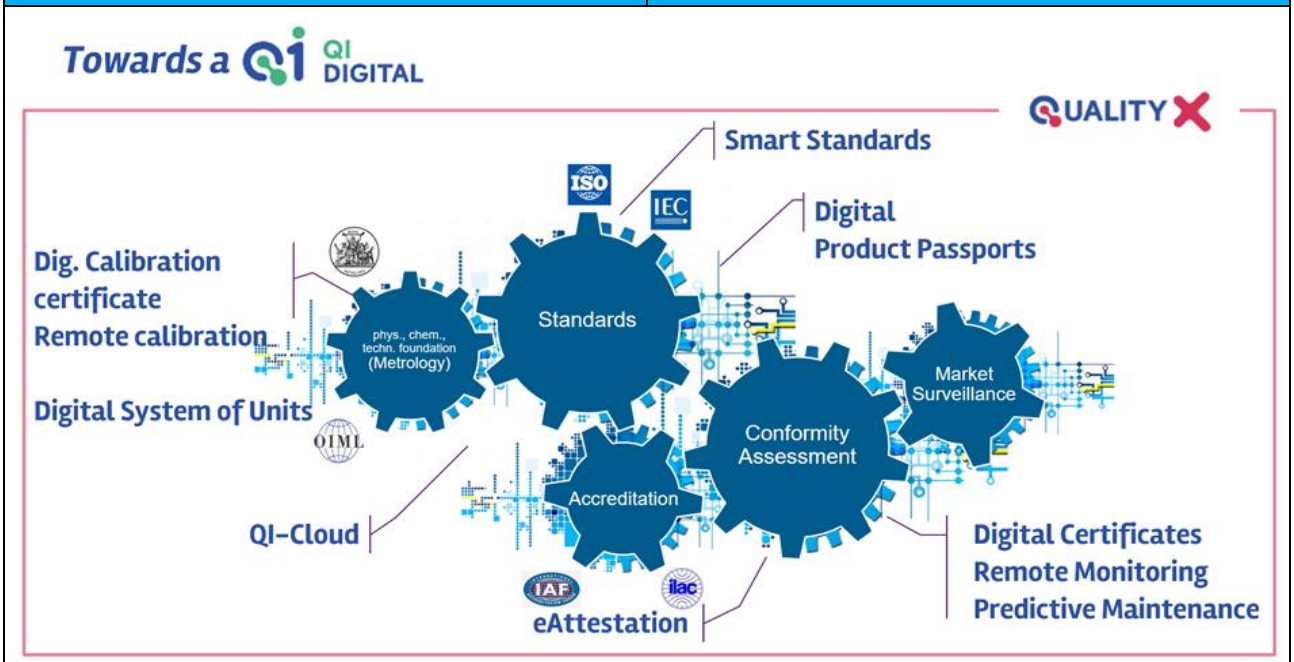
In Germany, the initiative "QI Digital" was founded for this purpose. The main idea is to rethink all elements together and further develop QI in order to leverage the full potential of digitalisation.

Today, the QI is facing new challenges and opportunities in a changing world. For example, products in the digital domains, such as IT, software and AI, require new forms of quality assurance; hence, cybersecurity is becoming a key factor alongside safety. In addition, society's expectations, such as the ecological sustainability and climate neutrality of products, are creating new facets in the assessment of quality. Product quality becomes a result of data from production, use and recycling.

These challenges can only be met if the opportunities offered by digitalisation are exploited. So new ways of conformity assessments are being carried out on digital twins, and processes such as predictive maintenance or remote monitoring are being used. Electronic attestation (eAttestation) digitally confirms that conformity assessment centres can carry out certification procedures. Digital certificates are supplied as proof of conformity and are made available to buyers and market surveillance authorities via QR code scan – together with all mandatory information in a digital product passport (DPP). The Digital System of Units and digital calibration certificates for measuring devices form the foundation for the necessary quality-assured data. Connected through trustworthy dataspaces, the digital QI modules merge into a system, which allows a paradigm shift from document-centred to data-based quality assurance. Rethinking the Quality Infrastructure in this way enables effectiveness in quality assurance regarding products of the digitalised world and, even more, an enormous increase in the efficiency of existing quality assurance.

Imagine designing a new product in a CAD system that automatically tells you whether the product conforms to quality requirements. Or imagine that the digital twin of a machine knows automatically, using data from its calibrated measuring instruments, whether it conforms to the latest change in legislation, and no third party has to check on site.

The development of such a system and such innovations requires **S**tandards that are **M**achine - **A**ctionable, **R**eadable and **T**ransferrable (**SMART** standards). Furthermore, many of these processes and procedures require or must be described in such SMART standards.



Quality Infrastructure for Sustainable Development (QI4SD)

In this sense, it is important to be aware that standards and standardisation do not stand on their own; they are crucial building blocks of systems and processes that directly contribute to the general vision and beyond. While standardisation and standards play a central role in the QI, as they provide the requirements for the quality of the test objects and the quality assurance process, the QI is seen as one of the central enablers of sustainable development. According to the first QI4SD Index published by UNIDO in 2022, 15 out of the 17 Sustainable Development Goals of the UN will be affected positively through increased development and effectiveness of the QI.

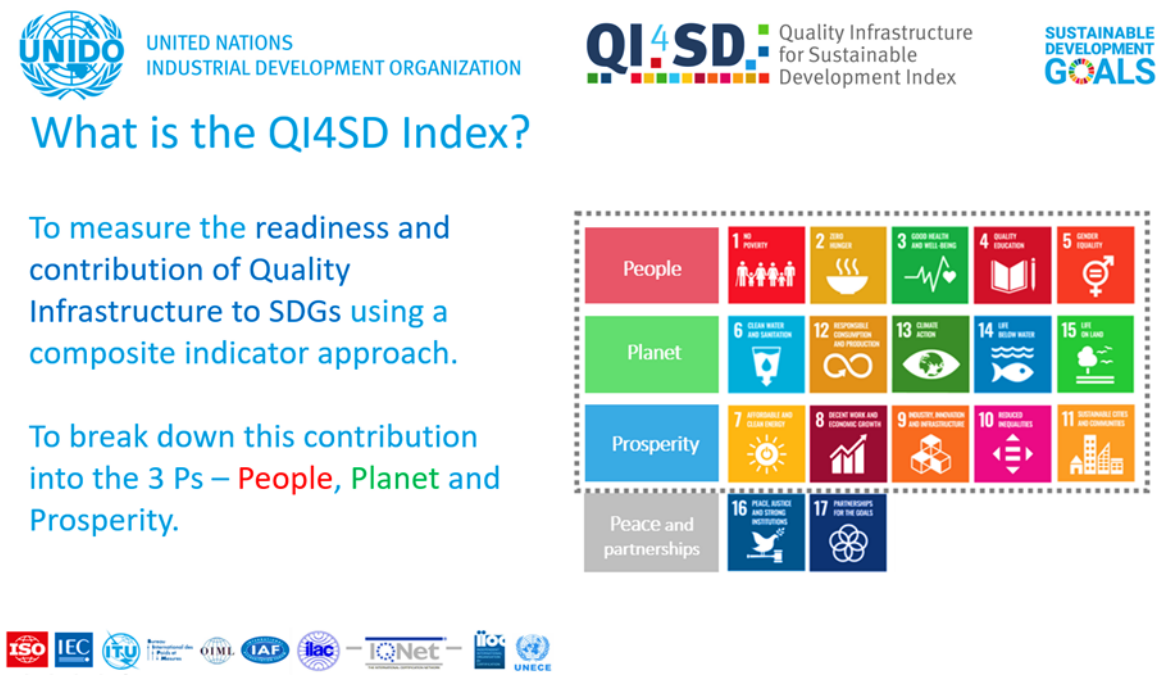


Figure 2. UNIDO QI4SD Index

ISO Strategy

In its current Strategy 2030, the International Organization for Standardization (ISO) brings multiple perspectives and expectations together. It addresses innovation to meet users' needs by improving the usability of standards and facilitates sustainable development to meet broader global needs.

The three goals of the ISO Strategy 2030 - "ISO standards used everywhere", "Meeting global needs", and "All voices heard" - as depicted in Figure 3, are stepping-stones towards ISO's vision - *making lives easier, safer and better*. Priorities supporting each goal not only allow their achievement but also ensure and maximise the impact of this work.

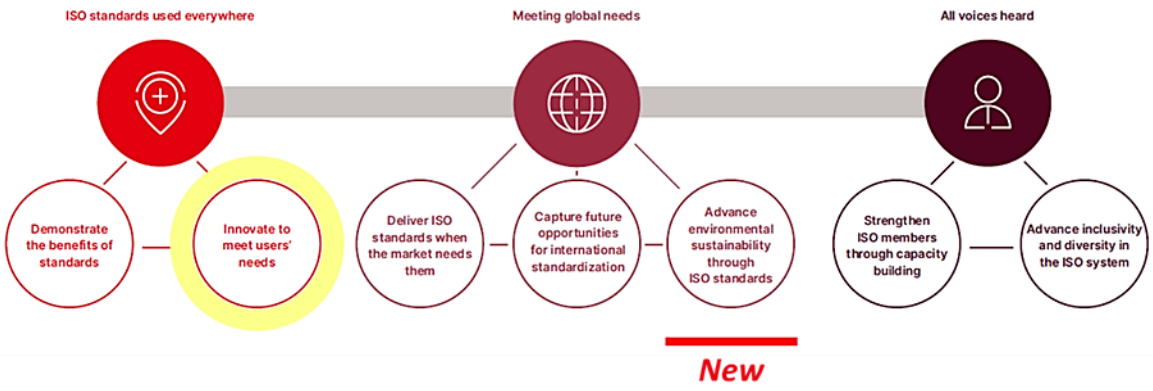


Figure 3. ISO's strategic goals and priorities

With the ambition to be a driver of innovation and responding to the evolving needs of the standards' users, "SMART" is the strategic joint ISO and IEC initiative that supports the strategic goal of "ISO standards used everywhere" and contributes to the priority "Innovate to meet users' needs".

SMART - acronym for Standards Machine Actionable Readable and Transferrable - refers to the formats, processes, and tools necessary for a user (human and technology-based) to interact with standards. These digital solutions serve the needs of all stakeholders, ranging from industry, regulators, and end users to society as a whole:

- Manufacturers will integrate SMART standards into their entire product and service lifecycles to accelerate development at a lower cost and ensure compliance with the latest applicable regulations.
- Regulators will be part of the SMART ecosystem to ensure consistency between market-driven standardisation and policy-guided regulations
- Standards developers will focus on content creation in a much more effective way by using advanced digital tools, automating processes over the whole development lifecycle.
- End users will benefit from digital standards whose content is tailored to their needs and is constantly maintained up to date.

Yet, step by step, international standards will evolve to meet also the growing digital needs of stakeholders and society – and into *actionable content* that empowers dynamic deliverables adaptable to specific user needs.

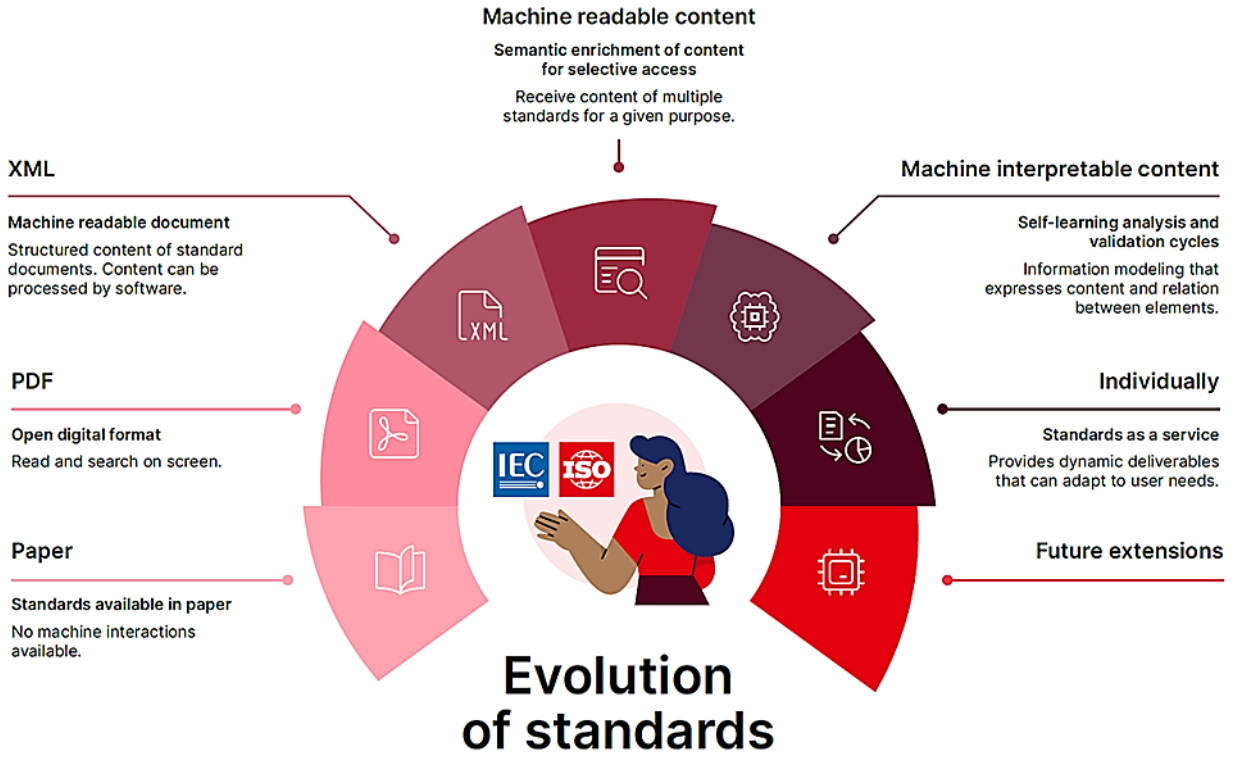


Figure 4. SMART - Evolution of standards

The next generation of IEC and ISO Standards will provide tailored and up-to-date content at the right time to the relevant users - whether they are humans, computers, complex machines or small intelligent devices. IEC and ISO Standards will be embedded into product development supply chains and become much more integrated into everyone's daily life.

Considering the long history of delivering trusted, high-quality standards and a collaborative and consensus-driven way of working IEC and ISO are best positioned to implement this new way of developing and distributing standards.

Today, ISO and IEC lead the way to SMART standards by:

- Identifying and understanding the needs of standard users and how SMART can address them.
- Exploring new business models supporting the distribution and commercialisation of SMART standards and identifying related legal implications.
- Specifying and piloting the technical architecture supporting SMART standards and integrating it into the existing production lifecycle.
- Assessing the impact of SMART standards on how conformity assessment will be undertaken.

How SMART solve user problems?

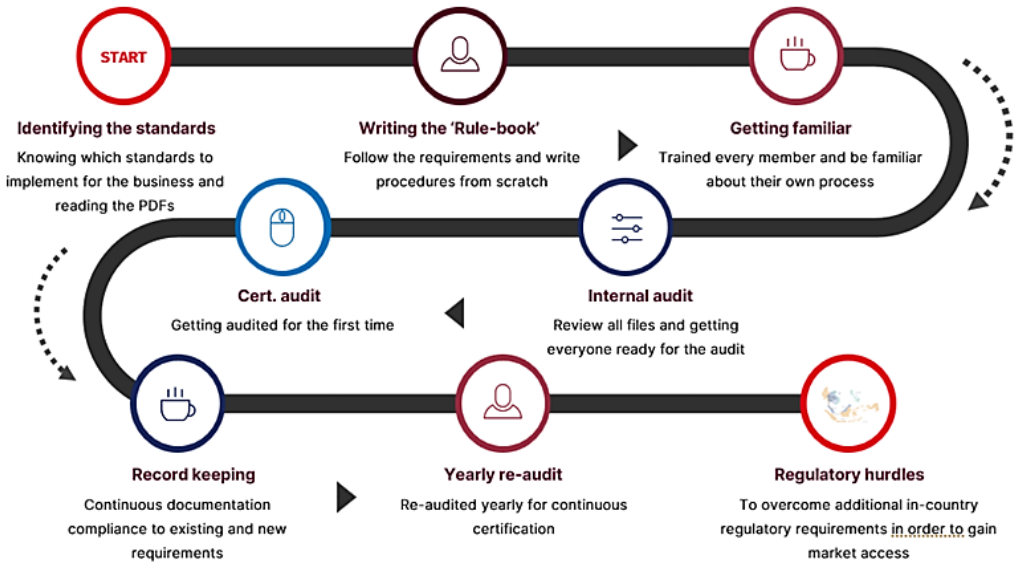


Figure 5. Typical company journey of standard implementation

The typical company journey of standard implementation is complex, expensive, time-consuming and non-transparent, especially for beginners.

There is substantial motivation for the company to choose the SMART way of implementing the standards, allowing for a smoother and more efficient experience compared to the conventional method, as described in the table below.

	Conventional method	SMART method
Identifying the standards	Reading through multiple PDFs for information	Identify, search, compare and add notes to standards clauses
Writing the 'Rule-book'	Write procedures from scratch	API with other software apps to generate custom procedures with ease
Getting familiar (Training)	Trained material developed from scratch	Training content and materials can be easily integrated across multiple standards

	Conventional method	SMART method
Internal audit	Audit checklists created using Word or Excel manually	Integrated audit checklists generated with a few clicks
New revision in standards	Identify new changes, prepare revised audit checklist, procedures and training material from scratch	Identify revised clauses, prepare all relevant contents, with ease
Regulatory approvals	Lengthy timeline due to the resources and time needed to prepare the above activities	Significant time-saving in achieving regulatory approval and revenue

In order to reach the benefits outlined in the SMART method, the SMART strategic initiative prototypes and tests potential uses of what can be powered by SMART, as well as evaluate the business and process changes needed to produce this content on a large scale.
Existing SMART prototypes do not yet have all of the potential capabilities that would be included or developed for a full commercial product, however, they are intended to demonstrate and visualise a few simple functions which are powered by SMART. These functions and features, and the process of achieving them in general, provide a key new energy source for making the use of standards *simpler, more innovative and more efficient*.

SMART as an enabler for global development

To summarise, SMART represents an enabler for innovation and is placed at the heart of our digitalised Quality Infrastructure, allowing us to deliver on broader promises and expectations by driving diverse stakeholders' interests towards a more sustainable, digitally advanced, safe and secure future.

(In the picture, Christoph Winterhalter, DIN CEO and ISO Vice President Policy)

Written by Roberta Gerasymchuk, Mara Rolando, (ISO Christoph Winterhalter,) and Benjamin Helfritz (German Institute for Standardization DIN)

HOTTINGER BRÜEL & KJAER (HBK) PARTICIPATES WITH INNOVATIVE TOPICS AT THE IMEKO WORLD CONGRESS 2024

We are thrilled that the IMEKO World Congress is coming to our home country, Germany, very soon. After 42 years, when it was held in Berlin in 1982, it is now coming to Germany's second-largest city. Hamburg, the host of the event, as a 'Free and Hanseatic City', has always been our 'Gateway to the World'. It can be said that in both the history of trade as well as in metrology, the principles of cooperation and mutual trust have always been essential.

Under its headline `Think Metrology', the IMEKO XXIV World Congress promises to be an inspiring event for all of us. IMEKO world congresses have always embodied the bridge-building spirit of the organisation. That's why we were among the first companies to decide to regularly participate in accompanying exhibitions of the IMEKO World Congresses. HBM began its relationship with IMEKO by participating in the VIII World Congress in Moscow in 1979, driven by its former R&D Manager, Manfred Kreuzer. Brüel & Kjær joined IMEKO even at the VII IMEKO World Congress in London, UK, in 1976, initiated by General Manager Per Brüel. Over the years, Torben Licht, Herbert Kitzing and many others have been key figures. Today, HBK regularly participates in IMEKO events, of course, to all the World Congresses and also to numerous Technical Committee events such as TC3, TC4, TC16 and TC22.

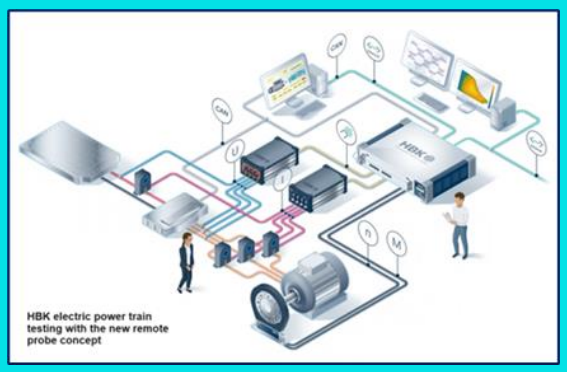
Understanding this, the ties with IMEKO have always been very close. For the 2024 World Congress, our passion for measurement technology is demonstrated by our central exhibition booth, ready for dialogue with metrologists worldwide.

We will showcase our latest technology in metrology, spanning many fields of mechanical quantities, with a particular emphasis on electrical quantities this time.

This emphasis stems from the importance of electrical quantities and electrical measurement technology in mastering crucial pioneering technologies of our era. These include forefront areas such as electromobility, aerospace, and wind power generation.

The renowned "Genesis HighSpeed" family offers comprehensive solutions for high-speed data acquisition. In this spirit, the data acquisition instruments and transient recorders of the Genesis HighSpeed family open the gateway to high-speed measurements.

Practical portable data recorders, now known as "Genesis HighSpeed", have a long history in National Metrology Institutes (NMIs) worldwide. Known by different names such as LDS Nicolet, LDS Dactron, and Gould Nicolet, they have been used for many decades, especially in mechanical departments of major NMIs.



HBK electric power train testing with the new remote probe concept

Now, in 2024, we present a groundbreaking innovation, the "Fusion remote probes". Different types of "remote probes" can measure current or voltage, feeding these values into Genesis HighSpeed Power Analyzers. Power, as the mathematical product of these two quantities, must be determined with the smallest uncertainties.

These probes use fibre optic transmission instead of electric connections, offering advantages such as reduced susceptibility to EMC and low attenuation, allowing for comparatively long transmission distances.

This innovation will be detailed and shown in its application context in the presentation 'Torque as a key parameter for better efficiency determination of electric motors and generators in TC3'. It will illustrate how mechanical and electrical knowledge is crucial for advancements in pioneering applications, such as electromobility and renewable wind energy generation, to optimise the relevant electric power train.

There will also be several other presentations and associated scientific publications in both TC3, the Forum of the measurement of force, mass, torque, and gravity and TC22, the Forum of vibration measurement and dynamics.

In TC3, a focus will be on intelligent sensor technology and its advantages over passive measurement transducers. In TC22 - vibration analysis, HBK will present topics on seismic measurements for the International System of Units.

"Hottinger Brüel & Kjaer" (HBK) originated from two well-known companies: the German company `Hottinger Baldwin Messtechnik' (HBM) founded in 1950, and the Danish company 'Brüel & Kjær' (B&K) founded in 1942. The two companies joined forces in 2019 to work seamlessly as one, providing exceptional calibration system solutions for a wide range of mechanical and electrical quantities.

In the history of both companies, setting standards has always played a major role, as all industrial measurements for quantities like force, torque, pressure, as well as current and voltage on the Darmstadt side, and vibration, acoustics, and sound level on the Copenhagen side, must ultimately be traceable.

In 1977, HBM opened the first calibration laboratory in Germany within the framework of DKD ('Deutscher Kalibrierdienst'). In 1991, the DPLA (Danish Primary Laboratory on Acoustics) was founded through a cooperation between the Technical University of Denmark and B&K. Besides always being pioneers in technology, the two companies were also the first to establish overseas relations. In 1980, B&K became the first Western electronics company to set up a service centre in China. HBM has had a liaison office in Shanghai since 1991. In 1997, it established its Suzhou load cell factory as one of the first wholly foreign-owned enterprises.

Today, Hottinger Brüel & Kjaer is one of the largest measurement companies worldwide.

Written by Dr.-Ing. André Schäfer (andre.schaefer@hbkworld.com), HBK Darmstadt, Germany

IMEKO PRESENTING AT THE EURAMET GENERAL ASSEMBLY

IMEKO and EURAMET are both esteemed organisations with a long history of collaboration. Their strategic plans harmonise nicely.

Last year, the two organisations further solidified the partnership with a formal Memorandum of Understanding, a testament to shared goals.

EURAMET, our valued partner, presented its activities at the IMEKO General Council (GC) session last year. They are warmly invited again to this year's IMEKO GC, which will be held just before the IMEKO World Congress!

The EURAMET annual General Assembly (GA) meeting was held in the UK from the 3rd to the 7th of June. As IMEKO, EURAMET also had several meetings around their GA. These included the EURAMET technical committee's activities and the EURAMET's European Metrology Networks (EMNs). (https://www.euramet.org/european-metrology-networks)

Quoting the EURAMET site: "The EMNs will analyse the European and global metrology needs and address these needs in a coordinated manner. EMN members will then formulate common metrology strategies, including research, infrastructure, **knowledge transfer** and services.

The members will be committed to contributing to the EMN and helping to establish sustainable structures strategically planned from the outset."

IMEKO will collaborate with valuable input and services by helping identify global needs and facilitating knowledge transfer.

The series of EURAMET GA meetings included a one-and-a-half-day plenary session, giving the perfect opportunity for IMEKO to present itself to the broader EURAMET public with a general introduction of its activities for the first time.

Our Secretary General, Zoltan Zelenka, introduced the IMEKO organisational structure, the principal functions and philosophy. He also outlined specific areas of possible collaboration, such as organising events and providing publishing possibilities in the IMEKO journals.

Furthermore, the presented 25 IMEKO TC's scopes overlap with most of the EURAMET technical areas, offering exciting opportunities for even stronger collaboration in the future. This prospect is something we can all look forward to.

There are already strong bridges between the TCs of the two organisations, and there is potential for more. IMEKO encourages its TC members to exploit these opportunities.

For more information about EURAMET and IMEKO, please visit our web pages or email the IMEKO Secretariat.

Written by Zoltan Zelenka, the Secretary General of IMEKO

THE SECOND GULF METROLOGY FORUM

(Picture of the participants during the panel discussion. The fourth from the right is Prof. Frank Härtig, the IMEKO President)

The 2nd Gulf Metrology Forum occurred in Dubai on April 22-23, 2024. The event was hosted by the Ministry of Industry and Advanced Technology (MoIAT) in collaboration with the Gulf Association for Metrology (GULFMET) and the Abu Dhabi Quality and Conformity Council (QCC), represented by the Emirates Metrology Institute(EMI). The Forum brought together over 200 local and international officials and experts.

Under the theme of "Metrology for Sustainability," the two-day Forum aimed to explore the role of metrology in enhancing industrial capabilities and supporting sustainability. It featured a series of panel discussions and technical presentations addressing the latest field developments. The discussions focused on raising awareness of metrology's importance in supporting quality infrastructure in the industrial and technological sectors and fostering innovation to enhance product competitiveness.

One of the key highlights of the Forum was the emphasis on supporting emerging national metrology institutes in Gulf Cooperation Council (GCC) states, enabling them to expand their capabilities.

The Forum also stressed the need for training programs, scholarships for metrology specialists, and increased cooperation between education providers and metrology institutes. Furthermore, there was a call to increase youth participation in metrology to support long-term sustainability and to enhance community awareness of metrology's role in various sectors.

H.E Omar Al Suwaidi, Undersecretary of the Ministry of Industry and Advanced Technology, expressed that the Forum provided a unique platform to discuss the latest trends, challenges, and opportunities in the field of metrology. He emphasised the ministry's commitment to coordinating and cooperating with regional and international partners to enhance quality infrastructure, standards, technical legislation, conformity, and accreditation systems. Al Suwaidi highlighted the crucial role of accurate metrology results in promoting sustainable industries and supporting the UAE's strategic national vision for enhancing industrial sector output and implementing international best practices.

(In the picture, participants of the Forum)

During the Forum, two Memorandum of Understanding (MoUs) were signed. The first MOU facilitated collaboration between GULFMET and IMEKO, focusing on the exchange of knowledge and expertise, research facilitation, and enhanced cooperation between specialists and experts. The second MOU focused on technical cooperation between GULFMET and the European Union Laboratory Association (EUROLAB) to promote cooperation among the main technical committees of both regions. This agreement aimed to enhance the industrial sector's competitiveness through knowledge and expertise sharing.

A discussion session was dedicated to emerging professionals recognising the importance of empowering youth in the metrology sector.

The session provided a platform for young metrologists to share their views, experiences, and insights on the challenges and opportunities arising from the rapid developments in the field. This initiative was aligned with the BIPM Young Metrologists 2050+ initiative.

The 2nd Gulf Metrology Forum received support from international and regional metrology organisations, with the participation of directors from BIPM and OIML, the president of IMEKO, the Secretary-General of GSO, the President of EUROLAB, and directors of national standardisation bodies from across the GCC, along with the UNIDO."

Written by Eng. Omar Kanakrieh at : okanakrieh@gso.or.sa

ACTA IMEKO HAS BEEN SELECTED FOR INCLUSION IN THE WEB OF SCIENCE

The Secretariat just received the news on the 3rd of July that our Acta IMEKO is now included by Clarivate in the Web of Science!

PRESIDENTIAL BOARD SPRING MEETING 2024

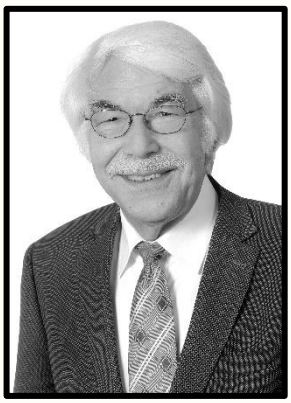
(In the picture, the online participants are Prof Elisabeth Costa Monteiro, observer and Prof. Masatoshi Ishikawa, Advisory President. From right to left, Prof Paolo Carbone, the President-Elect; Mr Zoltan Zelenka, the Secretary-General; Prof. Frank Härtig, the IMEKO President; Prof. Ken Grattan and Kristine.)

The very fruitful Spring Meeting of the Presidential Board took place on the 4th of May 2024 in Vienna-Austria. The discussions involved the preparation of the General Council Sessions and World Congress. Marking a new three-year period at this GC, new IMEKO Officers will be chosen.

IMEKO thanks all the nominees for volunteering to serve in the next three years.

Much time was invested in the IMEKO's long-term Strategy, which is very important. New possible future plans were formed and shall be introduced to the General Council.

FARAWEL TO MANFRED PETERS



The metrology community mourns the loss of Prof. Manfred Peters, a former IMEKO President and former Vice President of the German Physikalisch, Technische Bundesanstalt (PTB), who recently passed away at the age of 76.

Prof. Dr. Manfred Peters began his impressive career directly after his physics studies when he joined PTB's Laboratory for Force Measurement in 1972. Under his far-sighted and committed leadership, which he took over in 1979, this laboratory developed into one of the world's leading force laboratories. Later, he was appointed Head of the Department of Solid Mechanics and Head of the Division of Mechanics and Acoustics. From the 1st of March 2006 until his retirement at the end of March 2014, he was Vice President of the PTB.

From 1982 to 2006, Prof. Peters chaired and headed various national and international committees in metrology, standardisation, testing and calibration. From 1982 to 1988, he was Chairman of the European Committee "Mechanical Measurements" of the Western European Calibration Cooperation (now European Accreditation, EA).

From 1985 to 2006, Chairman of the international working group "Force" in the CCM, the Consultative Committee for Mass and Derived Quantities in the International Committee for Weights and Measures (CIPM).

His involvement in IMEKO started back in 1986 when he became the Chairperson of the Technical Committee for "Force and Mass" (TC3), which he led until 1998. From 2000 to 2003, he was the President of IMEKO. During all these years, Prof. Peters, a highly recognised and appreciated metrologist, has significantly strengthened metrology's international role with his extraordinary creative power.

He also rendered outstanding services to the integration of the metrological state institute of the former GDR, the Office for Standardisation, Metrology and Product Testing (ASMW), into PTB. With reunification, considerations began as to how the ASMW in Berlin-Friedrichshagen, which in the former GDR was responsible not only for metrology but also for standardisation and quality assurance, could be linked with PTB, the Federal Institute for Materials Research (BAM) and the German Institute for Standardisation (DIN). Prof. Peters played a central role in this issue as part of a secondment to the ASMW in East Berlin from 1990 to 1992. As a result, around 400 employees were finally able to find a new metrological home at the PTB sites in Braunschweig and Berlin-Charlottenburg. After the successful integration of the ASMW into PTB, Prof. Peters took over the lectureship for technical mechanics at the Braunschweig-Wolfenbüttel University of Applied Sciences, known as Ostfalia since 2009, where he was appointed honorary professor in 2001.

In 2005, he was awarded the Technology Transfer Prize of the Braunschweig Chamber of Industry and Commerce in recognition of his contributions to the development and marketing of a new type of dental implant. He received the honorary membership of IMEKO TC3, the Technical Committee for Measurement of Force and Mass. In addition, his outstanding work in international metrology was recognised with the Ludwik Finkelstein Medal of the Institute of Measurement and Control, London, 2015.

As Vice-President of PTB, Prof. Peters also had a formative influence in many respects. In addition to many innovations in organisation and administration, including the introduction of the working groups and departments with a clear separation of technical and disciplinary responsibility as well as the first comprehensive task review in response to necessary personnel savings measures, he also played a key role in the further development of the Braunschweig campus. The representative entrance area of the PTB in Braunschweig, the modern guest house, the remodelling and redesign of the PTB daycare centre, and, last but not least, the communicative space between the casino and the administration building were all based on his initiative and ideas. In technical terms, Prof. Manfred Peters was an early and visionary advocate for the redefinition of the SI units. He took over the overall management of the Avogadro project to redefine the kilogram. He won over Russia for the project in a spectacular way so that the first high-purity Si-28 single crystal was produced there, from which two almost perfect kilogramme spheres were manufactured at PTB. He thus established PTB's leading role worldwide in this field. He remained significantly and passionately associated with this project in a leading role until well after his retirement in 2014.

Prof. Peters also rendered outstanding services in the founding of the German Accreditation Body (DAkkS), which was able to commence its business activities on the 1st of January 2010 after a very short start-up phase. Due to his expertise, he was appointed the first Chairman of the new Accreditation Advisory Board (AKB) of the Federal Government at the beginning of 2010. In this function, which he held beyond his retirement until 2016, he played a key role in the successful reestablishment of the German Calibration Service (DKD) with the DKD technical committees finding their new home at the PTB. He was also instrumental in shaping the so-called "experimentation clause", which led to programme accreditations in line with the recommendations of the German Council of Science and Humanities and, thus, to quality assurance at universities.

Prof. Manfred Peters has thus played a decisive role in shaping metrology in all areas, from research and teaching to scientific-technical services and committee work to legal metrology, with outstanding creative competence and extraordinarily great personal commitment over many years and has contributed to PTB's excellent reputation at home and abroad.
In addition to this impressive technical work, he always had an eye and an ear for the people at PTB. He was, therefore, highly esteemed and extremely popular among the staff as a colleague and superior with a high level of social competence. His work for PTB for IMEKO will be remembered, and we will always honour his memory. Our deepest sympathy goes to his family and all his relatives.

Collected from several sources by the IMEKO Secretariat)