Technology focus
Brain power
RFID standards keep operations on track

Technical committees
A holistic ecosystem approach to AI
Giving a new shape to the economy
Information technology for smart cities

Looking to the future
Looking to the future

2020 is set to be an exciting year for the IEC

New year, new tech and a new Secretary General and CEO at the helm of the IEC.

At the beginning of the year, we bade farewell to Frans Vreeswijk who held the position of Secretary General and CEO of the IEC for the past eight years. During his time at the IEC, Vreeswijk worked tirelessly to raise the organization’s visibility and create new opportunities for cooperation. He is succeeded by Philippe Metzger, whose previous positions include that of Director General of the Swiss Federal Office of Communications (OFCOM). Metzger, who was appointed by the IEC Council, brings to the IEC his solid leadership skills and strong vision for driving the organization forward.

On the Conformity Assessment side, IECEx and IECEx have both welcomed new Chairs. Alistair Mackinnon is the new Chair of the IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications, while Paul Meanwell takes over as Chair of the IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres. They talked to e-tech about their journeys in their respective industries and how they see the future of Conformity Assessment.

In January, the Consumer Electronics Forum (CES) once again brought to the forefront the newest trends and developments in tech. From gadgets to AI and automation, technology is disrupting not only our lives as individuals but businesses and society as a whole. With the excitement of new possibilities comes the uncertainty of dealing with issues that haven’t been encountered before. International standards can both help eliminate barriers to technology adoption and provide frameworks to help ensure smoother transitions.

The new Chair of IEC Technical Committee (TC) 100, Ulrike Haltrich, talks to e-tech about her vision for the TC, which includes continuing standardization work that improves people’s quality of life, and making environmental aspects a key priority.

For example, the IEC and ISO joint technical committee, ISO/IEC JTC 1 and its various subcommittees, work on areas such as artificial intelligence but ensuring they take an ecosystem approach which addresses not only innovation and speed of adoption but also wider issues such as societal and ethical concerns. And as more and more businesses incorporate AI technologies, standards can help facilitate client trust in organizations. Yet other standards address the complexities of smart cities and their ICT requirements.

Working hard to bring awareness of the circular economy and material efficiency to technical committees is ACEA, the IEC Advisory Committee on Environmental Aspects. Its Chair, Solange Blaszkowski and other industry experts, outline the important role international standards can play in helping businesses and industry as a whole transition to a more sustainable, circular economy.
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Frans Vreeswijk looks back at his eight years at the helm of the IEC

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Trend setter
On 3 February 2020, Frans Vreeswijk officially handed over the reins of the IEC to his successor Philippe Metzger. We have asked Vreeswijk to outline what he sees as major achievements during the eight years of his mandate at the head of the IEC.

Remaining relevant in the future

Seven years ago, at the IEC General Meeting in Oslo, I shared my vision for the implementation of the 2011 Masterplan. The Masterplan charted the changes the IEC needed to put in place to remain relevant to the broad IEC community and an increasing number of external stakeholders.

Increasing visibility

Since 2012, IEC has participated in over 600 major stakeholder events to make the case for IEC work. We held multiple CEO and industry roundtables in 22 countries to increase understanding of the strategic contributions we deliver to companies, and to motivate even more of them to involve their experts in IEC standardization work.

Since then, over 10,000 experts from 38 countries were trained by IEC Central Office (IEC CO) and IEC regional offices and we launched the new IEC Academy & Capacity Building department.

Encourage greater representation at NC level

In order to encourage greater representation in national committees (NCs), we trained 64 NC secretaries from 31 countries and provided them with tools to enable them to reach out to regulators and other stakeholders. We also organized international regulators’ events and participated in regional meetings on all continents to encourage a more active dialogue with them.

Increasing visibility with UN and international organizations

In 2016, IEC obtained UN Ecosoc (Economic and Social Council) consultative status. This new status significantly increased our visibility within international and UN agencies as well as development agencies, giving us the opportunity to correct misconceptions and share more information including about the IEC Conformity Assessment (CA) Systems. We also organized several joint workshops and contributed to background papers with several UN and non-UN organizations and were able to start raising awareness for IEC contributions to societal challenges such as the SDGs.

Staying ahead of technology development

With the help of the Market Strategy Board (MSB), the Standardization Management Board (SMB) and the Conformity Assessment Board (CAB) the IEC actively identifies new technologies that fall into its scope. The MSB helps us prioritize new technical work and shares trends with the SMB and CAB. Over the past eight years, the MSB published 15 white papers and one technology report with recommendations for industry, regulators and standardization activities. We share these publications with technical universities during stakeholder events and encourage our members to translate and share them further.
To support new technologies, we have put in place new technical committees, for example for solar thermal, printed electronics, e-transporters, wearable electronics and energy storage. We have also significantly increased our contributions to ISO/IEC JTC 1, the IEC and ISO joint technical committee.

**Leading in smart developments**

In 2013, the IEC organized the first World Smart Grid Forum in Berlin and, in 2016, the first World Smart City Forum in Singapore in partnership with ISO and ITU. The achieved objective was to show leadership in key areas, stimulate broad cooperation with many other standards organizations and limit duplication of work.

**Open the IEC to increased collaboration**

I am also proud about our pioneering role in the systems approach, which was approved in 2012 and is now fully implemented. This novel approach to standardization and conformity assessment has opened the door to a new era of collaboration both within the IEC and with organizations that didn’t traditionally participate in IEC work.

**Making conformity assessment better known**

During my tenure, the profile and awareness of IEC CA Systems has been significantly raised within and outside the IEC community and the new CA System, IECRE, was launched.

I am proud to say that the IEC is the only organization in the world to be able to offer a truly globally standardized approach to conformity assessment, resulting in the biggest working multinational agreement in the world.

IEC CA activities are an equal second pillar next to IEC standardization activities, gaining in importance in terms of the value they add, and revenue generated.

**Stimulating international cooperation**

Over the past eight years, I have been a defender and supporter of international cooperation with a view to stimulating the use and adoption of IEC Standards at the regional and national levels. We have signed 35 agreements and MoUs and now have 806 liaisons with 219 partner organizations.

**Cooperation on IT tools**

Over the past two years we have significantly increased our cooperation with ISO to provide common IT tools, whenever possible, for the benefit of our respective members. We have for example adopted the same single sign-in as ISO, harmonized APIs and use the same web conferencing platform. IEC and ISO are represented on each other’s IT Advisory Groups.

**Increasing harmonization and ability to trade**

In 2016, we signed the Frankfurt agreement with CENELEC. Its aim is to further increase the harmonization between European and IEC International Standards. Today, around 80% of European standards are identical or very similar to IEC International Standards and there is room for further improvement.

**More transparency for IEC Members**

Over the past three years, the IEC has put in place new governing bodies, including AudCom, FinCom (which replaced the former CDF), ITAG and NRG, and reactivated SAG to increase transparency of IEC operations. I provide regular written updates to all Members and we organize web forums and face-to-face meetings outside of the annual General Meeting to increase dialogue and cooperation with and between IEC Members.
Update and implementation of new Masterplan

In January 2016, we launched the development process for the next version of the Masterplan based on the most extensive and inclusive consultation of IEC Members and stakeholders in the history of the IEC.

In 2018, the Masterplan implementation plan was developed under the leadership of Past President Jacques Régis. It outlines the roles and responsibilities of the different parties that are invited to deliver the Masterplan.

I am happy to say that, since then, awareness of the need for more diversity in the IEC has significantly increased. A new IEC Council Board (CB) task force has started to identify activities that need to be put in place to durably increase gender and geographical diversity.

Defending our intellectual property

To ensure the financial stability of our Members and that of the IEC, we have put in place mechanisms to protect our common intellectual property, copyright and business model. In this context, we are also strongly pursuing the misuse of copyrighted content, including national adoptions online and offline.

To better defend the IEC business model, we have accelerated the global registration of all IEC trademarks. And we have been encouraging all IEC Members and IEC CA Systems Members to actively display the IEC brands at the national level on their websites and promotional material to increase our chances of defending against misuse by third parties.

Securing the future

Last year, we started the development of a risk management framework which I hope will allow the IEC to better pre-empt risks but also identify untapped opportunities that will help the Commission to become even more flexible and proactive.

And since change is the only constant, we also started to explore new business ideas that can lead to new revenue sources.

A growing organization

During my time at the helm of the IEC, the organization has grown from 163 to 173 countries and we now have four IEC CA Systems, up from three in 2012.

We also added a regional centre in Africa in 2015, which serves the needs of 54 countries.

I would like to thank the entire membership, all experts and my staff for their support and trust and leave you in the good hands of Philippe Metzger.

Next generation of experts

One of the objectives we already identified in 2011 was the need to increase the involvement of the next generation of experts. In this context, we have broadened the Young Professionals (YP) Programme to secure the long-term participation of young experts and leaders and significantly increase IEC outreach to academia. To date, the YP Programme has brought together 544 experts from 51 countries at the global level and a record 23 national YP programmes have been created on the same blueprint.

On the way to more diversity

I became an International Gender Champion back in 2016 and the IEC was one of the first signatories of the UN initiative for gender-balanced standards.

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Brain power

Harnessing the electric power of the brain

By Catherine Bischofberger

The brain contains about 100 billion microscopic cells called neurons which together can generate enough electricity to power a low-wattage bulb. Scientists, researchers as well as forward-looking tech companies are investigating ways to use that power to control devices remotely. Forget about voice control or facial recognition, one of the hottest gadgets at this year’s CES was a wearable brain-to-computer interface, which enables people to switch on the television using the power of their brains. The gadget, produced by a French startup founded by neuroscientists, fits around the skull very much like a headlamp. The technology used is based on the same principle as electroencephalograms. The brain emits electrical signals and these can be
Scientists have therefore been focusing on ways to get around the problems that hinder brain waves from being transmitted from the subject’s skull. It is still very early days and we are far from being able to interpret brain data in real time. Algorithms are now sufficiently sophisticated to perform such tasks.

Standards for these emerging technologies are essential as they help to save time and money for entrepreneurs who wish to bring new products to market. IEC Technical Committee (TC) 47 publishes key standards for the design, use and reuse of sensors, enabling users to measure their performance, for instance. IEC TC 124 develops standards for wearable devices.

The joint technical committee formed between IEC and ISO for ICT, ISO/IEC JTC 1, has created Subcommittee (SC) 42 which prepares standards in the field of artificial intelligence. SC 29 deals with the coding of audio, picture, multimedia and hypermedia information, and publishes ISO/IEC 23000-13, an international standard which focuses on the data formats used to provide an AR presentation using 2D/3D multimedia content. IEC TC 110 develops standards for electronic displays. One of its working groups, WG 12, has developed the first edition of IEC 63145-20-20, which establishes the measurement conditions for determining the image quality of eyewear displays.

In China, workers have been wearing helmets equipped with brain sensors which feed information to their employers about their state of mind – angry, depressed or anxious. The technology is used in the military, power supply and telecoms industry, according to a report in the South China Morning Post. The technology is used to increase workers’ productivity. Concerns have been raised about the invasion of workers’ privacy.

**Arise and walk**

Mind-reading technology is also making headway in medical science. Cervical spinal cord injuries leave about 20% of patients paralyzed in all four limbs and is the most severe injury of its kind.

In 2019, a young French man suffering from tetraplegia demonstrated how he could power an exoskeleton with his brain and walk. He initially trained with a computer avatar until he was ready to control the exoskeleton. The technology, which works by recording and decoding brain signals, was trialled for two years by scientists at biomedical research centre Clinatec and the University of Grenoble in France. But unlike the wearable headband launched by the Gaul startup, the brain computer interface, in this case, relied on implants surgically placed under the subject’s skull.

IEC has set up a System Committee on Active Assisted Living (SyC AAL), which focuses on the standardization of AAL products, services and systems to enable independent living for elderly or disabled users. IEC TC 100 develops standards for audio, video and multimedia systems and equipment and set up a technical area (TA) to develop standards relating to AAL wearable electronic devices and technologies, as well as accessibility and user interfaces.

**Brain implants versus wearables**

The drawback of mind-reading wearables is that the signals emitted by the brain are hindered by people’s skulls and hair which get in the way of the electric waves. Scientists have therefore been focusing on using implants to control items remotely, even if these technologies are invasive as they imply some form of surgery. The BrainGate programme is a long-running multi institution research effort in the US to develop neurotechnology aimed at restoring communication, mobility and independence to people with neurogenerative diseases, limb loss or paralysis. As part of the programme, devices named Utah Arrays were implanted in the brains of several trial patients who were then able to shop online and send phone messages to friends. Other US companies are investing into similar technology, including one of Elon Musk’s enterprises. The focus is on developing the least invasive form of implants, requiring little or no surgery.

In China, a mind-reading brain computer chip named Brain Talker was unveiled by researchers at the University of Tianjin last year. It is expected to be used in a wearable format as it cancels out most of the noise that gets in the way of signals captured with similar wearable devices. “The signals transmitted and processed by the brain are submerged in the background noise. This BC3 chip has the ability to discriminate minor neural electrical signals and decode their information efficiently, which can greatly enhance the speed and accuracy of brain-computer interfaces,” explains Dong Ming, Dean of the Tianjin University Academy of Medical Engineering and Translational Medicine.

Despite the ongoing investment and research, it will take many years for these technologies to hit the consumer market. It is still very early days and we are far from being able to control our immediate environment using our brain waves, let alone be able to read each other’s minds. These technologies demonstrate, however, that our electric brains have a huge potential that is only just beginning to be harnessed.
From healthcare to mining, RFID standards keep operations on track

Used to control inventory and track items in real time in logistics, retail and transportation, radio frequency identification (RFID) and barcode technologies improve inventory management, reduce checkout times in shops and improve safety.

By Antoinette Price

Hospitals quickly locate equipment required for surgery to ensure it is clean, safe and ready for use. Intelligent sports balls can capture data which help players learn and improve their game, while companies in oil and gas, chemical, mining, construction and energy can enhance personnel safety, track assets and maintain equipment in harsh environments.

A booming market

According to Statista, the global RFID market is expected to be worth around USD 24.5 billion in 2020 with retail applications making up the greatest part. Other key areas using the technology include financial, healthcare and industrial.

How do barcodes and RFID differ?

Barcodes and RFID read and collect data and track assets and inventory, however, there are differences – the main one being that optical scanners only work with an unobstructed view of the barcode, known as a clear line of sight. A well-known example is at a checkout where products are scanned one at a time. In the case of RFID tags, when they come within a certain distance of their reader, they are activated by radio signals, which means that potentially hundreds of tags could be read per second. This is particularly useful for production lines and warehouses management where multiple items can be tracked rapidly, as well as recognized individually.

Interview with Henri Barthel

e-tech caught up with Henri Barthel, who chairs the IEC and ISO Joint Technical Committee (ISO/IEC JTC 1/SC 31) which develops international standards for Automatic Identification and Data Capture (AIDC) techniques, to learn how a fundamental international standard first developed in 2005 is still being used to improve services and products in diverse industries. Barthel is also Vice President for GS1 System Integrity and Global Partnerships.
What does ISO/IEC 18000 series of standards do?

The series covers the parameters of air interface communications and is designed to make the dialogue between the reader and the tag as efficient as possible.

The series of standards addresses the interfaces at different radio frequencies. They do not specify how to build the reader or the tag. They set out the requirements for the equipment to conform with the standards, and the language to be used when organizing the dialogue between the reader and the tag.

An example would be the commands that the reader sends to the tags to make them behave a specific way, such as to allow the reading of multiple tags at the same time, which requires a very specific dialogue.

Can you give some examples of industries that are using the standard?

SC 31 develops horizontal international standards which are adopted by various industries.

Tyres

For example, the tyre sector uses the technology in its simplest form, meaning the tag only contains the identifier of the item to which it is attached, to keep track of it during production. But there are other benefits of using electronic labelling. Original equipment manufacturers (OEMs) use it to track a tyre throughout its lifecycle using a unique identifier per tyre, but it could also be used to access additional information, such as the tyre dimension, type and quality. Normally this is engraved directly on the tyre, which can get dirty and then cannot be read, however, the RFID tag would be embedded in the tyre itself.

By using RFID tags, regulators, customs and specific types of users, such as fleet managers would be able to access other information, including if the tyre is authorized in a country, type of use, and which markets it is available in. If an ultra-high frequency (UHF) tag is embedded in the tyre, it can be read from a distance of up to 10 metres.

While ISO has developed a series of application standards for the RFID tagging of tyres, these application standards are based on technical standards provided by SC 31, mainly ISO/IEC 18000-63.

Airline companies

Another example is the airline industry. Travelers who fly expect their luggage to arrive with them, but when it doesn’t, they want to be able to locate it as quickly as possible.

When it comes to handling lost luggage, while the barcode works, it can get damaged. If this happens bags may get lost in the sorting centre. Equally if there is a lot of luggage, if a barcode is not positioned so that the scanner has a clear line of sight, it won’t be read, and it will be considered as lost. But if you have an RFID tag, it will have a 99.9% accuracy reading rate, which is much higher than the barcode.

The International Air Transport Association (IATA) announced last year that it will deploy RFID luggage tracking, globally. This means a transition to barcoded bag tags with RFID inlays. IATA has not yet decided which coding structure to use for the tag data content, but one can say confidently that the base technology will be using the ISO/IEC 18000-63 Standard.

What’s in the pipeline?

Electronic labelling is probably one of the most important application areas for SC 31. The concept is simple, you have a barcode encoding the identification of an item. Once you scan the barcode you can access a database with further information, such as the price and article description.

More recently, industry has been looking to get rid of paper manuals for electronic products. We have a new work item based on this idea to replace paper. Instead, an electronic label would be scanned and lead to an information resource that would provide the information required by different applications for different markets.

This is a great opportunity. It could apply to many products and categories of information. For example, a consumer of pharmaceutical products could access detailed product information such as allergy warnings or exact dosage.

There is currently no framework for manufacturers to do this. We are trying to establish a more uniform level for the creation of such applications, which would enable businesses and consumers to get the product information they need. We are working on a standard, which enables interoperability between different applications.

We have just published a new DataMatrix rectangular barcode (ISO/IEC 21471), which can be engraved onto very small medical instruments and equipment for hospital theatres and used to track them. We are also working on a similar approach for a rectangular QR code (ISO/IEC 23941).
e-tech was present at this year’s Consumer Electronics Show which took place in Las Vegas from 7 to 10 January 2020.

IoT = Intelligence of Things

The past 10 years were all about the Internet of Things (IoT) and how it connects devices and people, but much of it still required some fundamental human intervention, monitoring and feedback.

According to the Consumer Technology Association (CTA), IoT is now moving to the next stage. By incorporating artificial intelligence (AI), which starts to permeate every aspect of consumer technology and human lives, it is turning into the Intelligence of Things. Intelligent devices are moving from being standalone to becoming elements within a collaborative web of intelligent things, with absolute minimal human intervention. This is a trend that is likely to dominate the next decade in consumer tech.

AI in everything, out of the box

AI in the form of facial recognition, object detection, speech recognition, voice-activation, etc. will be incorporated in most devices, interconnecting with many others. In the future, your bed might inform your coffee machine that you overslept, and your coffee will be ready, stronger than usual, because it knows that you need it.

Even better customer service

Currently, several applications for AI are already being implemented. For example, McDonalds is looking at adding voice assistants to take orders at their drive-throughs. During a media briefing at CES, Steve Koenig, VP of research at CTA, took the example of the fast food industry and explained that, by adding intelligence to the initial interaction when an order is taken, this guarantees it is precisely executed and frees the human worker to focus on handling the money transaction, thus providing a better service.

Ultimate personalization

At CES, L’Oréal presented Perso, an AI-powered personalized beauty system that creates tailored skincare, lip shades or foundations on demand. Perso is a box-like device that is accompanied by an app which helps evaluate the skin and assesses basic concerns such as fine lines, dark spots, lack of firmness. The AI also considers important environmental factors such as temperature, humidity, air quality, pollen level, UV index, etc. Inside the box, a robot-driven device then mixes different ingredients to produce skincare that exactly matches the needs of the consumer on that given day. Another box can identify and mix the exact type and shade of foundation that matches the wearer’s skin. A third Perso box can colour match lipsticks to skin tone or coordinate it with wardrobe items or latest fashion trends.

Inaugural year for 5G

The intelligence of things will be powered by 5G, underlined Koenig. 5G is expected to be at least 10 times faster than 4G and can support many more connected devices.

2020 is the inaugural year for 5G – 50 network providers globally are rolling out 5G networks, which will fuel demand for 5G handsets. Shipments of 5G handsets in 2020 are expected to reach approximately 20.2 million units (vs 145.6 million for 4G) and around 106.3 million units by 2022, when for the first time more 5G than 4G handsets will be delivered.

Contrary to 4G, 5G will be led by commercial applications such as autonomous vehicles, smart cities with connected infrastructure that lowers cost, energy consumption and will produce large data streams for improved services; critical IoT such as remote healthcare, traffic safety and control or consumer...
Virtual, augmented and mixed reality

For the first time, AR glasses resemble normal glasses: the Bosch Light Drive smart glasses look stylish and modern. They can be useful while shopping, biking, driving and allow users to check smart phones without actually looking at them. Generally, use cases for AR glasses are growing and include, for example, training of work forces, projection of repair instructions for mechanics, pre-sale of travel experiences in tourism and building designs in architecture.

Another deeply immersive experience is Teslasuit’s suit and glove, which combines VR and AR. It is an extremely accurate substitute for real-world conditions and can be used in public safety training or industrial environments to provide a full-body, real-world simulation of complex situations that could under normal circumstances put human safety at risk. The suit helps ensure that people are prepared when they face a real-life emergency situation. It provides haptic feedback and captures both motion and biometrics. The suit can also be used by athletes where it functions like a built-in personal trainer and provides more effective training.

From digital health to digital therapeutics

Digital health is all about using technology to improve the health and wellness of individuals and for many people it is becoming a lifestyle. They use it to measure the number of steps they walk
or to track their metabolism to learn how many carbs or how much fat they are burning. With increasing air pollution in many cities around the world, tech-enhanced anti-pollution masks had a strong presence at CES.

Modern citizens being more and more sleep-deprived, a lot of sleep tech promised a good night’s sleep to adults and babies alike. A show-stopper at CES was SNOO, a smart bassinet that plays white noise and aims to rock a baby to a calm state in around 30 seconds. It adapts the rocking to how fussy the baby is. Anyone who has had a baby knows that a full night’s sleep is something that happens only in fleeting dreams. Therefore, anything that keeps a little one asleep for an extra hour or two will give mums and dads a bit of time to prepare for another long and busy day.

One step closer to a medical device, is AerBetic, a wearable non-invasive diabetes monitor that passively and continuously monitors blood sugar levels. It does so by using a nano gas sensor that detects the gases humans naturally emit when their blood sugar is getting too high or too low. Using machine learning, the device becomes more accurate over time. When the wearer receives an alert, they can measure their blood sugar with a traditional monitor and enter the information into the device. The more feedback the system gets, the more useful the device becomes.

One of the fastest growing areas are so-called digital therapeutics, which consist of personal health connected devices, implantable medical devices and online telemedicine consultations. These deliver therapeutic interventions via software directly to the patient, to prevent, manage and treat a medical disorder or disease.

According to a 2019 digital health consumer survey by Accenture, more than half of consumers now expect digital capabilities from their health providers, and these expectations start to influence how patients choose doctors. In the survey, 49% of respondents were interested in video appointments and 53% in using remote or telemonitoring devices to record and monitor health. Consumers are also increasingly willing to share their health data with physicians and are becoming more engaged in their health care.

Flying cars

Several types of aerial vehicles resembling a cross between a helicopter and a drone were presented at CES. These so-called vertical take-off and landing aircraft (VTOL) are evolving quickly thanks to many of the same technologies that are used in self-driving cars and electric vehicles. Those include sensors, computing hardware and software, batteries and vehicle-to-vehicle and vehicle-to-infrastructure (V2X) connectivity. If promises are kept, Uber Air will become one of the first flying taxis in just four years, but others such as ASX and Bell Nexus are close on their heels.

Transportation isn’t just about cars, it’s about platforms that move people and things, and this can include scooters, bikes, mopeds and the like. However, because of limited space for ground-based infrastructure, air mobility could be a real opportunity.
According to a 2019 Morgan Stanley Research report, VTOLs could grow to USD 2,9 trillion worldwide by 2040. It also predicts that “flying cars” could revolutionize the ride-sharing industry by making four trips for each one trip made on the ground. Challenges include battery technology in terms of limits to energy density vs weight; enough power for smooth take-off and landing as well as battery reliability since a single failure would result with near certainty in a fatal accident. Besides regulations and aircraft certifications, the affordability question persists: will the price of a trip ever fall low enough for VTOLs to become a mass transit option?

**Food and urban farming**

Smart fridges can tell us how long items have been in there and when we are running out of them. Rather than going shopping, technology now offers other options to ensure food supply. Take 3D food printing for example. Although still a niche industry it is growing and nearly all kinds of food items can now be printed, including dairy and meat products, and even sushi. For high-class restaurants and caterers, 3D printers simplify the production of personalized objects like logos, chocolate labels for desserts or cakes, as well as fun pasta shapes. Food can also be customized to meet very specific dietary needs such as gluten-free or vegan.

Another option is to grow your own greeneries in your kitchen or on your roof or balcony. Sensors, LED lighting, heating elements and pre-mixed seeds and ingredients nearly guarantee crop success both in terms of quality and quantity. Several tech-improved options for newbie farmers were presented at CES.

**Robots reporting for duty**

Robots in all forms and shapes are here to improve our well-being. Companion robots seek to combat isolation of the elderly, manage stress or even educate children in STEM disciplines. The global market size for health care assistive robots is forecast to reach USD 1,2 billion by 2024 (Global Market Insights). While the potential for robots in caregiving and education is high, there are still barriers to widespread adoption. Many people aged 65 or older have negative associations with robots. They are concerned that robots can’t perform tasks safely and effectively. The ageing population across the globe creates opportunities for caregiving robots, but only if those negative associations can be overcome.

Educational robots are serving as teaching assistants, enabling remote participation via telepresence and promoting STEM learning outside the classroom. Consumer studies report near universal acceptance (92%) to using robotics for education applications ranging from gamified problem solving for children to programming lessons for older users. Much like care-giving robots, market estimates for educational robots are high and growing, reaching an estimated USD 1,01 billion in 2024.

Retail and hospitality robots, along with delivery robots represent the largest sectors for robotics. Humanoid robot Pepper, which can recognize human emotions, has been engaged as a greeter in Japan, providing information to customers. It has also been deployed in academic settings and health care, as well as a “sales person”. LGs PorterBot, ServeBot and CartBot are designed for environments such as airports, hotels, supermarkets and malls to assist customers, transport luggage, deliver meals or carry groceries.

Companion robots can help elderly people feel less isolated (Photo: Tombot)
A holistic ecosystem approach to AI

An ecosystem approach to the standardization of artificial intelligence can accelerate innovation and address societal concerns

By Wael William Diab, Chair ISO/IEC JTC 1/SC 42: Artificial intelligence

Historically, IT systems and their governing standards were based on well understood environments. Early approaches emphasized performance for a specific problem definition. For instance, going back a few decades, the communications world was focused on how quickly to get a bit of data from point A to point B. Understandably, the main aim was to overcome the technical challenges of transmission to achieve a target bandwidth.

The need for an ecosystem perspective

As technical capability advanced and IT became ubiquitous, other considerations started to play a more prominent role such as the relative cost of a particular approach and its sustainability (environmental footprint and cost of operation). More recently, factors such as the security of the system, privacy and trustworthiness have become a commonplace topic of discussion and play an increasingly important role in defining requirements around emerging IT technologies.

The digital transformation of industries has further changed the landscape for IT standardization. For instance:

→ Emerging non-technical requirements such as ethical and societal considerations and the ability to design trustworthy systems are key aspects
→ Stakeholder diversity has increased considerably (eg. regulatory, social scientists, etc.)
→ Early engagement by the various stakeholders has become the norm
→ The use cases for IT have dramatically increased
→ Understanding uses, proving business cases and developing standards are now concurrent
→ The ‘data ecosystem’ is as important as hardware, software and operational technologies
→ Maintainability of the solution and portability into other uses cases, within or across domains, has become top of mind for architects, technologists, etc. and increasingly part of the business planning for adoption of new IT
→ Integration of a solution within larger technology deployments has become essential

A new approach to standardization

Not only has IT become ubiquitous, the way we have come to rely on technology and its presence in our daily lives has changed. Whether it’s at work or at home, IT is ever present in our daily lives. Most of us check our smartphones when we wake up and before going to sleep. We carry them around all day with us and have come to rely on their capabilities for everything from shopping to making a dinner reservation. At work, we are interacting with IT systems on a constant basis. Virtually every sector of the economy has been leveraging the innovations that IT is bringing and continues to digitalize.

While these innovations have increased efficiency throughout society, they also come with concerns that need to be addressed as highlighted above.

Standards play an important role in enabling technology adoption by eliminating barriers. Thus, it stands to reason that technology standardization can no longer only focus on the technical requirements and needs to concurrently consider implications and context of use. Furthermore, in the way that standardization provided an open forum to address technical challenges and came up with innovative solutions to address them, it can do the same for considerations such as ethical and societal concerns.

Topics like ethical and societal considerations are incorporated across the entire programme of work of SC 42.
SC 42 and the holistic AI ecosystem

What is needed is a framework that:

- Takes into account the context of use of the technology by looking at both technology capability and non-technical requirements, such as business requirements, regulatory and policy requirements, application domain needs, and ethical and societal concerns
- Translates the above into technical requirements
- Builds foundational standards that communities can build upon, such as terminology, use cases, application guidance and reference architectures
- Links technology innovation communities such as proprietary implementations, research, standards development organizations (SDOs) and open source communities

The work of SC 42 addresses all these points. SC 42 is the focal point and proponent for the joint programme between ISO and IEC for IT Standardization, AI and Big Data work (ISO/IEC JTC 1/SC 42). In addition, it provides guidance to other JTC 1, IEC and ISO committees looking at applications of these technologies.

The ecosystem approach allows the assimilation of requirements from a variety of sources that include application domain, regulatory, societal, ethical and business considerations. While SC 42 produces ‘horizontal’ standards, it considers application domains and a broad collection of use cases to achieve this. Moreover, its deliverables provide the foundation for other AI and Big Data work to build on. The current programme of work is organized into a number of groups that include:

- foundational AI standardization
- big data
- AI trustworthiness
- use cases and applications
- computational approaches and computational characteristics of AI systems
- governance implications of AI
- AI management systems
- AI systems engineering

Topics like ethical and societal considerations are incorporated across the entire programme of work and topics like lifecycle are given consideration from a variety of perspectives in different groups.

The ecosystem approach extends to external collaboration. To-date, SC 42 has over 25 liaison partnerships and growing. The work also enables other SDOs, open source communities and R&D organizations to build on it, resulting in accelerated technology adoption.
What lies in the future for IEC Technical Committee 100? Ulrike Haltrich, its new Chair, gives us a preview.

Ulrike Haltrich has been appointed Chair of IEC Technical Committee 100: Audio, video and multimedia systems and equipment, one of the most prolific IEC TCs. IEC TC 100 has published close to 500 standards which shape the audio-visual (AV) as well as the information and communication (ICT) landscape. It is organized in 20 different technical areas (TAs), dealing with topics such as colour measurement and management (TA 2), audio (TA 20) or multimedia systems and equipment for cars (TA 17).

Before becoming Chair of TC 100, Ulrike Haltrich was Secretary of TA 16, which prepares IEC International Standards for active assisted living (AAL) technologies. These can be defined as systems and devices which support the well-being, health, care and independent living of people with special needs. Among other things, she oversaw the work of TA 16 on accessibility and user interfaces. She is also the Chair of the IEC Systems Committee on Active Assisted Living (SyC AAL), which was established in 2015 to oversee standardization work relating to people who need assistance systems for their well-being and comfort in their connected homes. The systems committee contributes significantly to UN sustainable development goal (SDG) 3: good health and well-being.

Ulrike Haltrich, Chair of IEC TC 100

Can you quickly run us through some of the key achievements of TC 100 to date?

IEC TC 100 has a great track record in improving people’s quality of life (QOL) with publications in the area of smart television, Internet Protocol Television (IPTV) and Internet TV receiver specifications, optical cable distribution systems and audio archive systems, to name but a few. The TC has also been involved in the maintenance of Digital Living Network Alliance (DNLA) guidelines in addition to developing the e-book and e-publishing related format as well as the USB and MIDI interface. It also produces tremendous work in multimedia systems and equipment for cars. The TC includes 324 experts and issued 16 publications in 2019 bringing attract more men than women. However, that is not a fatality. IEC has enhanced the gender diversity in SyC AAL for instance, where nearly half the members are women. I would like the IEC to continue encouraging its members to commit to more gender diversity when sending participants to the IEC Young Professionals Programme and adopt a more gender-balanced approach in all committees. Female participants have a lot to contribute – technical expertise, a unique approach to collaboration and consensus building and the ability to go beyond cultural differences.

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the total to 474. That gives you an idea of the volume and depth of the work we do.

As new Chair, where will your priorities lie?

Alongside continuing to improve people’s QOL, TC 100 has defined some new priorities which relate to making our world a more sustainable place. Environmental aspects will be key. We will be looking at measuring methods for power consumption for AV and ICT equipment, for instance. Energy efficiency and smart grid applications will be part of the mix. Other technical areas that will be prioritized are AAL, and more generally the question of accessibility and usability for AV and multimedia equipment. Next generation audio is also important, as is wireless power transfer.

Which new technologies are expected to have an impact on the standards TC 100 will develop?

Artificial intelligence, the Internet of Things and cyber security systems are gaining traction in AV and multimedia. There are also demands for standardization relating to new types of user interfaces, such as haptics or vibrotactile multimedia systems. Augmented reality, virtual reality and mixed reality continue to be hot topics. There are equally many demands for standardization in the area of multimedia systems and equipment. As mentioned earlier, we will aim to improve inclusion and sustainability and will specifically focus on the environmental aspects for multimedia systems and equipment.

What will be your greatest challenges?

The technical boundaries between the IT, broadcast and telecommunications industries are vanishing and that affects standardization, especially in TC 100. At the IEC, we are moving away from traditional product standardization to a systems approach. We are looking to work in a collaborative environment with other international standardization bodies, particularly on systems standardization management. Another challenge is to develop novel standards which set new market directions and that will be used in the marketplace. We have to create an environment where both innovation and standardization cross-feed. Standards need to drive technological change across sectors and borders.

We will aim to improve inclusion and sustainability and will specifically focus on the environmental aspects for multimedia systems and equipment.

What can you tell us about the joint advisory group (JAG) that was recently created between IEC TC 100, SyC AAL and IEC TC 124: Wearable electronic devices and technologies?

The JAG serves as an open platform between the three committees and their experts. It was established to foster cooperation in these three neighbouring technical domains and develop mutual understanding of the standardization work involved. The idea is for the JAG to establish new frameworks and workflows which will not affect the competencies of the three committees involved. An ongoing task is to identify areas of cooperation and that’s why we plan to exchange very regularly. We will start our common work by swapping use cases and terminology, which can be different depending on the area. We will start with a use case from SyC AAL called “Personal Health Check”. It will be a first exercise used to discuss how work can be taken up by each of the three committees.

What are the plans for closer cooperation with the joint technical committee created by ISO and IEC, ISO/IEC JTC1, which prepares standards for ICT?

We are eager to collaborate with JTC 1 and work closely with its experts on standards development. Several IEC TC 100 experts have recently joined JTC 1 advisory groups. These include AG 6: Autonomous and data rich vehicles; AG 8: Meta reference architecture and reference architecture for systems integration; AG 11: Digital twin and AG 13: Use cases for VR and AR-based ICT integration systems. We will also build liaisons wherever we can and take part in joint study groups as well.
Cities can benefit from the widespread use of data and technology. However, in order to leverage the benefit of new technologies, standards are needed. Not only do they allow for the provision of competitively priced and effective products and services that can function together, but they also provide clear descriptions of best practice and enable common approaches to tackling common challenges.

The IEC has developed many standards that are important for the efficient functioning of cities. Over 1,800 standards have been identified that are vital to cities, in sectors such as energy, lighting, transport and city services. However, smart cities require a holistic approach. As a result, the IEC has taken a systems methodology to better address the complexity of smart cities which are systems of systems.

Standards for smart cities can help cities all over the world to benefit more quickly and effectively from global best practice and provide new opportunities for industry. In the area of information technology, the IEC partners with ISO to develop standards for smart cities. According to Heng Qian, Convenor of the joint IEC and ISO working group on smart cities (ISO/IEC JTC 1/WG 11), “JTC 1 is focused on ICT aspects. Many of the technologies used in smart cities, such as software
engineering, artificial intelligence, privacy, rely upon the standards developed by JTC 1”.

New standard published

In October 2019, IEC and ISO published a new standard, ISO/IEC 30146, which provides assessment indicators and evaluation methods to measure the functionality of different ICT systems within a city. Indicators have been developed to evaluate such systems as a city’s transportation, public safety and city management services. The indicators can be used to measure a smart city holistically or tailored to measure individual parts of the city.

According to Qian, “the standard is based on international best practices and is already being tested in several countries around the world. It can be used to help promote the harmonious development of smart city projects”.

Standards under development

Work is underway to develop a smart city ICT reference framework. Three standards will be published, each addressing a different viewpoint within a city and focus on the concerns for each of the viewpoints, to be used by city information officers when planning and implementing a smart city. The frameworks include business process, knowledge management and engineering. “From the ICT perspective, it gives the stakeholders in the smart city a common understanding of the full framework”.

Two other standards are also under development which address smart city data terminology and digital platforms.

ISO/IEC 21972 will establish the general principles for an indicator upper level ontology (IULO) that allows for the representation of the indicator definition and the data used to derive the indicator. Qian remarked, “ontology in information science is used to support semantic interoperability. We are looking at upper level ontology for smart city indicators, including data models, so that we can better understand what we mean by the indicators and their data”. This standard is expected to be published by March 2020.

ISO/IEC 24039 is another standard in development which will define a smart city digital platform at the basic level. “We know that cities are comprised of vertical applications. However, these applications generally share a similar common platform which could serve as a basis for all vertical applications. Each vertical application can focus on their specific area but use a common digital platform for their ICT requirements”. By sharing a common digital platform, sectors such as public transportation or government services could easily share data or simplify user access to their offerings.

Areas for future work

It can be expected that the new areas of interest in ICT standardization work, such as digital twins, trustworthiness and data usage, will find their way into smart cities. However, as Qian notes, “we need to be aware of the uniqueness of smart cities and their ICT requirements. They will require the interoperability of data, the coordination of urban operating systems and a platform for open data”.

Other topics of interest include city data models and smart city visualization. Smart cities will need to integrate data from multiple systems and a framework will be necessary to integrate the information. With smart city visualization, users can access a single platform that brings together the various data points about a city and its various systems in real-time and in a visual manner. Doing so provides contextual information on the environment and the various systems within the city.

However, as Qian noted, “we need to work quickly because cities need these standards”.

Technical committees
New standard will enable trustworthy mobile driving licence

As digitalization progresses, using personal ID for online transactions is expected to increase

By Antoinette Price

 Reserve a table, purchase a plane ticket, pay a bill and receive all confirmations, tickets and receipts electronically. We’ve grown accustomed to the convenience and ease of carrying out many paperless transactions on our devices, wherever we are in the world.

What about situations that call for proof of identification and age? Many people already use their driving licence, which gives them more than the right to drive and also provides credible proof of identity. But wouldn’t it be great to have an easily accessible mobile version if needed, for digital transactions?

*Interview with Peter Waggett*

*e-tech* caught up with Peter Waggett who leads the work by IEC and ISO for the mobile driving licence (mDL) application standard – ISO/IEC 18013-5.

For over 30 years, IEC and ISO joint technical committee (IEC/ISO/JTC 1/SC 17) has been developing international standards, enabling people to conduct business across the world without having to worry about different formats. Waggett oversees the group covering cards and security devices for personal identification, which includes passports, driving licences and bank cards.

As digitalization evolves, situations in which there will be a need for secure online ID will increase and could cover:

→ obtaining social services, voting, opening bank accounts
→ car rental, hotel check-in, boarding a plane, access to government buildings, airport security
→ entering a bar/club, purchasing age-restricted item

**What standards do you develop?**

“We’ve developed international standards, such as for machine readable passports and visas and bank cards, which ensure aspects like the data elements on these items, dimensions and testing, in the case of cards, for bendability, resistance to temperature or surface distortions. These standards have made it possible for people to travel to any airport in the world, enter that country, hire a car, get money out of an ATM machine and conduct normal business. Now, we’re looking to the future to see how we can move this to the next generation, which would be to continue these capabilities on mobile devices”, explains Waggett.

**How will the new standard facilitate the mDL?**

For several years, a number of countries have been running pilots and trials for the mobile driving licence. Finland, Norway, the UK, Argentina, Brazil, Thailand, parts of Australia and the US have made mobile driving licences available since the beginning of 2018, and more countries are following suit.

"In order for the mobile driving licence to be successful, it will need to be accessible and we’ll need to be able to trust the data. The mDL standard we’re developing provides mechanisms for both these aspects and is expected to be finalized in 2020", says Waggett.

The new standard – ISO/IEC 18013-5.2, *Information technology — Personal identification — ISO-compliant driving licence — Part 5: Mobile driving licence application (mDL) — describes interface specifications for the implementation of a driving licence on a mobile device, in other words, the interface between the mDL and the mDL reader.

It provides ways in which verifiers other than the mDL issuing authorities, such as police, government services, websites or apps, building access systems, can ensure that the photo and data of the mDL holder are authentic and therefore trustworthy.

The standard covers:

→ attended use cases, when a person is present to check the identity of
Driving licences provide more than the right to drive, often used as credible proof of identity

the mDL holder, for example, police during a roadside stop. It also makes provisions for connected and disconnected devices.

→ unattended situations, such as vending machines for tobacco or alcohol, using connected or disconnected devices.
→ access to certain websites, such as government services.

The technologies stipulated in the standard which enable the mobile device reader to make the verification include optical QR code, near field communication (NFC) and Bluetooth low energy (BLE).

How secure will the mDL be?

In order to maintain confidentiality, integrity and authenticity of the data exchange between the mDL and the reader, the standard addresses anti forgery, anti cloning, anti eavesdropping and anti unauthorized access, by using encryption and message authentication methods.

“There is a whole section of the standard which deals with security. This will help authenticate the origin of mDL data, how up to date it is, verify that it has not changed from the issuing authority and prevent unauthorized access to it. This also covers data privacy, which must be achieved if the mobile driving licence is to be adopted broadly”, remarks Waggett.

The standard also defines the principles for privacy protection. Some examples include making sure that the device reader only requests and receives data appropriate for the use case, and that the privacy protocol does not make users identifiable if they cannot already be identified by the transmitted data.

Looking ahead

Technology is radically changing how we live. According to Statista, the world mobile commerce share of e-commerce is expected to reach 72.9% globally by 2021. There are many more statistics that show a growing trend for using mobile devices to carry out many online transactions.

We create online accounts to do everything from ordering a cab, paying bills, shopping, to tracking our insurance claims, monitoring our health and making investments. It is not hard to imagine that one day we would no longer need the check out at the shopping centre, if items we buy are scanned to an app in our phones, which automatically bills our bank accounts or something similar for car sharing programmes. The arrival of the new mobile driving licence standard could not be more timely.

“In order for the mobile driving licence to be successful, it will need to be accessible and we’ll need to be able to trust the data.”
The circular economy calls for a paradigm shift in production and consumption across society. Continual cycles recover and restore products, components and materials through strategies such as reuse, repair, remanufacture and, ultimately, recycling. It is a systemic approach to managing resources, which impacts all participants in the product value chain: manufacturers and their business models, suppliers, consumers and their behaviour and the waste management industry.

According to Solange Blaszkowski who chairs the IEC Advisory Committee on Environmental Aspects (ACEA), “in very simple terms, circular economies are about resources and how to keep them in use”. The circular economy approach reassesses how resources are managed and how waste is perceived throughout the entire lifecycle of a product from its design to its use, repair, reuse, remanufacture and, finally, its transformation into parts for new products.

Material efficiency is an essential part of the circular economy. It consists of the conservation of materials by making products more durable and repairable as well as facilitates the reuse and recycling at the end of the product life. For Andreas Schneider, a member of ACEA, “material efficiency is trying to be responsible with materials, the building blocks of products and services. These materials need to remain available, not only for now or for one use, but continuously through recycling and reuse”.

A recent IEC ACEA survey demonstrated that certain aspects of the circular economy are directly relevant to the work of many IEC committees. Industry is also taking interest in issues such as product design optimization, refurbishment and recyclability. To better understand the impact on industry, e-tech spoke with several IEC experts who are involved in issues related to the circular economy.

Industry is taking note

Many businesses have understood the importance of the circular economy and taken steps to begin integrating its concepts into their business practices. Andre Nieuwland, who works for a leading health technology company and presented at a recent ACEA workshop on the circular economy held during the IEC General
Meeting 2019, remarks, “our company has some quite ambitious goals for 2020 to become more circular-oriented and have more revenues from circular types of services and products.”

However, moving towards a circular economy is not an easy endeavour. It requires a deep reflection on how to implement circularity into business practices. According to Blaszkowski “when thinking about the circular economy, a lot of people think in terms of incremental improvements. But to really achieve a circular economy, we need to put in place a totally new way of thinking”.

Christian Dworak, who is involved in the circular economy at the European level, concurs. “The circular economy means rethinking the whole strategy of a company, including sales, marketing and finance. This is a major challenge”.

For example, companies need to refocus their business from selling goods to providing services. According to Nieuwland, “our current business system is still quite heavily biased towards selling goods rather than maintaining them. If you look at the biggest challenge for our industry to become more circular, it is that we must change our business models”.

Standards can help

Standards can serve as an important tool to promote the circular economy. According to Blaszkowski, “if a company wants to make its business more circular, it will need to reach out to supply chains, users and regulators. For businesses operating internationally, it may also mean reaching out to the value chain spread throughout the whole world. Standards play a very important role in that they create one terminology and the same understanding about what today are seen as difficult concepts in the circular economy”.

For Nieuwland, “we need to find a solution in standardization so that it is possible to sell refurbished systems across borders. It is not waste that we are producing, but rather it is waste that we are trying to prevent by becoming more circular and reusing parts in a smart and efficient way”.

For Dworak, “international standards can help give manufacturers the confidence and security that what they do will be recognized worldwide”.

Standards can help with issues related to international trade and the legal issues associated with the shipment of products across national borders. Manufacturers are confronted with different rules and regulations where it is not always possible to use refurbished components. According...
IEC and ISO develop international standards for AI. SC 42, the joint committee of IEC and ISO tasked with this work, recently approved new standards projects in the areas of trustworthiness and computational methods.

"International standards can help accelerate the adoption of AI by simultaneously addressing the technical requirements of emerging applications and providing a mechanism to ensure that expectations we have on the technology, such as trustworthiness, are met," said Wael William Diab, Chair of SC 42. “The two newly approved projects complement and build on the broad portfolio of the committee’s work looking at the entire AI ecosystem.”
International standards build trust in AI systems

Increasingly, many industries such as healthcare, manufacturing and transport, use innovative artificial intelligence (AI) technologies in their services and products. As more people work with non-human entities which deploy different AI technologies, it is important to ensure that these systems are trustworthy.

SC 42 has already identified certain characteristics of trustworthiness, such as accountability, bias, controllability, explainability, privacy, robustness, resilience, safety and security.

New standard for assessing robustness in AI systems

Artificial intelligence (AI) systems must be able to maintain their level of performance under any conditions, in other words remain robust.

Work has begun on a new standard – ISO/IEC 24029-2, Artificial Intelligence (AI) – Assessment of the robustness of neural networks – Part 2: Formal methods methodology – which will provide methodology on the use of formal methods to assess robustness properties of neural networks. It will focus on how to manage and put in place formal methods to ensure robustness properties.

“This project will build on the ISO/IEC TR 24029 part 1 of the series that provided an overview of the topic and complements the portfolio of AI trustworthiness deliverables that SC 42 is working on”, said Diab.

Who will benefit?

Engineers

Must consider which properties are desired in a system and how to translate these in terms that formal methods can assess.

Industry and commerce

The standard will help increase the trust in AI systems commercialized, improve the time allocated in validation of neural networks, as well as the quality of neural network overall performance. Providers will be able to advocate stronger safety or performance properties on their products, which will in turn reduce barriers to adoption.

Governments and consumers

Formal validation of AI systems ensure higher quality systems with better understanding and assurances to end-customers and users. Explicit robustness properties of neural networks will help achieve this by improving risk management of AI systems.

Academic and research bodies

Evolving neural networks technologies will encourage the development of new techniques of formal validation of neural networks within the guidelines proposed, which could increase the use of neural networks technologies in research programmes.

The new project will be placed in SC 42 working group 2 that is focused on AI Trustworthiness.

New project for assessing classification performance for machine learning models

Work has begun on a new Technical Specification which will specify methodologies for measuring classification performance of machine learning (ML) models, systems, and algorithms.

For example, ML allows for modelling procedures to be easily transferred across data sets without necessarily considering possible covariates hidden in, and unique to, those data sets, nor the potential contextual differences that influence the choice of metric. The relative ease with which modern ML can be implemented may absorb unintended biases or, more concerning, biases that we cannot detect.

Moreover, it is essential to be able to objectively and consistently establish report performance in a quantitative measure. This enables controlling for the behaviours of deployed machine learning, through a quantitative evaluation of its performance.

The project is tasked with addressing these concerns and building on the current AI and ML horizontal standards being developed by SC 42 in the areas of foundational concepts, frameworks, terminology, trustworthiness, computational approaches, governance implications, ethics and societal concerns, use cases and applications.

Who will benefit?

AI and associated machine learning algorithms are being deployed across a large variety of application domains and sectors with an ever-increasing set of stakeholders. As this project will develop quantitative methods to evaluate ML performance, its applicability is expected to be wide, benefiting consumers, regulators, government, startups to small and large industry, academic researchers and other SDOs in this area.

The new project will be placed in SC 42 working group 5 that is focused on AI Computational Methods and Techniques.
With an illustrious career spanning over 30 years, Mackinnon has worked on a vast array of wind turbines, from small onshore, typically less than 50kW, to large multi mega-watt offshore turbines. His work has covered horizontal and vertical axis machines, as well as a few with novel architectures. He has also worked for ISO/IEC 17065 accredited Certification Bodies (CBs) and ISO/IEC 17025 accredited Testing Laboratories (TLs).

Mackinnon’s early career was in the defence sector, working on submarine acoustic signatures which led to involvement in the early acoustics work on wind turbines. Since then, he has worked actively in the development of standards in IEC Technical Committee 88: Wind energy generation systems, as well as a number of wind turbine research and development projects. He also helped the UK National Engineering Laboratory establish the Myres Hill Wind Turbine Test Centre in the late 1980s after which he remained in the wind sector.

e-tech caught up with Mackinnon to find out about his vision for IECRE in 2020.

Mackinnon is Head of Standards, Conformity and Compliance at the Energy Technology Centre, located on the outskirts of Glasgow, Scotland, which develops energy conversion devices in the renewable and low carbon sector.

What do you do at the Energy Technology Centre and what is the connection with IECRE?

In April 2016 I was appointed as Lead Assessor for the evaluation of all Test Laboratories wishing to participate in the IECRE and since then, I have undertaken over 30 Test Laboratory and three Certification Body assessments.

Prior to the establishment of IECRE in September 2014, the wind sector already had a conformity assessment committee which was chaired by our immediate past Chair – Sandy Butterfield. Although I had worked for both ISO/IEC 17065 accredited Certification Bodies and ISO/IEC 17025 accredited Testing Laboratories, Energy Technology Centre was more of an R&D centre, so we were not doing the same type of work as our colleagues in CBs and TLs. I think it was partly due to this independence and my long time in the wind sector that prepared me to take on the role of Lead Assessor.

What does a Lead Assessor do?

I’m very grateful to IEC and our Member Bodies for placing their faith in me. As Lead Assessor I manage the assessment process prior to, during and after the onsite visits. My primary responsibility is to the System, to ensure that all applicants meet or exceed minimum criteria as defined in our rules.

My second responsibility is to the applicants to ensure they are fairly and equitably treated and all assessments, insofar as is possible, are completed in the same way. This means to ensure the same rigour is applied to all and that all applicants are given the same opportunity to demonstrate compliance.

My final responsibility is to the group of excellent peers that we have, in order to ensure consistency of approach and that no peer is left isolated or without support. I also like to make sure that everything we
do is fun. I see the assessment process as a collaborative opportunity where applicants and peers work together, and the assessment team works to achieve a consensus view. So far, we have always been able to do this.

What are main goals for IECRE in 2020?

My main goal in 2020 will be to build on Butterfield’s excellent work and leadership, which saw the establishment of a three-sector scheme – solar PV, marine and wind – which are all at different levels of maturity. I would hope to build on that platform so that we have a financially stable base on which to develop the IECRE offering. The wind sector is probably most mature but has now exciting opportunities particularly offshore. Marine is somewhat less mature but great work is being undertaken to achieve a customer deliverable. The economics in the PV sector mean that we will have to continue to work hard to deliver what our PV sector requires.

What would you especially like to achieve?

I’d like to see more recognition of the benefits of the IECRE System where testing and certifying once for a global marketplace becomes the norm.

What if any challenges are there?

There are many challenges ahead – our most acute is probably to achieve the financial stability required for a sustainable system that can grow. I have seen huge technical challenges addressed in my time in the industry and I have no doubt that the future will see even greater challenges addressed. I look forward to the year ahead and fulfilling my new role.
On 1 January 2020, Paul Meanwell became the new Chair of IECEx, the IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres. He takes over from Thorsten Arnhold, who chaired the System for the past six years and is now IECEx Immediate Past Chair.

A lifetime in mining

Meanwell has spent his entire career in the mining industry for companies including the British Coal Corporation, Gencor in South Africa, Davis Derby, and currently Komatsu Mining Corporation, which manufactures construction, mining, forestry, military equipment and industrial equipment like press machines, lasers and thermoelectric generators. As Engineering Governance Manager in the Underground Soft Rock Mining division, he runs the certification department which follows IECEx certification. He also manages the design risk assessment department, which covers legal issues and compliance in terms of standards, laws and regulations. He is also responsible for policies and procedures within the engineering department.

Standards development and certification at national level

Based in South Africa, Meanwell joined the South African Flameproof Association (SAFA), which acts as the South African mirror committee of the IECEx System, and was its President for 18 years, until September 2019.

He is Chair of the South African Bureau of Standards (SABS) TC 065, the South African technical committee on explosion protection technology, and has a seat on the IEC National Committee of South Africa (SANC). Over the years, he has been on a number of working groups in the Ex arena.

Regional role

Meanwell is also involved in the African Electrotechnical Standardization Commission (AFSEC), serving on its Conformity Assessment Committee. He was chair of its technical committee 31 on equipment for explosive atmospheres, disbanded in 2019. He has participated in IEC-AFSEC workshops, notably leading a course in area classification in the Democratic Republic of Congo. He regularly makes presentations at conferences and seminars and writes articles for various trade magazines.
Involvement in IECEx

Before his appointment as IECEx Chair, Meanwell was involved in the System for many years, as a member of various working groups (WGs), notably the Business Development WG and the Ex Mark Committee. As such, he has seen how the System has increased its reach to industry. “IECEx is the only system of its kind for the Ex equipment,” he explains.

However, while IECEx has taken off in industrialized countries, the situation is different in Africa, where only a few countries are IEC members. Most of the others participate in the IEC Affiliate Country Programme, which allows them to become familiar with standards development and conformity assessment activities.

Another reason is that, in Africa, a lot of investment comes from overseas, mainly from Australia, China or Europe. When overseas companies come to Africa to open a plant or a mine, they do it on their own terms, using the same standards they rely on in their home countries. African countries, in turn, will accept those standards which are based on IEC International Standards. IEC Standards are used on the continent, if only indirectly.

Meanwell says that in his experience, Southern Africa tends to use IEC Standards, while in the West and North, they tend to favour European standards. However, one of the roles of AFSEC is to promote the use of IEC International Standards on the continent. “It is generally accepted that IEC Standards are the way to go but governments and authorities still have to be convinced to adopt them.”

Evolution of mining equipment

Meanwell explains that automation has come a long way in mining. “I have observed that in general technology tends to develop more for surface applications, and is only later adapted for the mining environment, although a minority of specific technologies are developed for underground mining.”

“Today, all surface and underground equipment is or can be monitored by surface monitoring stations. For instance, our monitoring centre in South Africa is linked to all our mines. We can see how equipment is working or not working, we’re using predictive software to monitor the various components so we can anticipate and prepare for breakdowns before they occur. We can bring spare parts to the site and advise the mine to change components during maintenance shifts rather than waiting for a break down which stops production.”

The challenges ahead

For Meanwell, one of the key issues for the IEC and IECEx is the speed of the services the IEC, the IECEx certification bodies (ExCBs) and test labs (ExTLs) have to provide. “We’re in a world now where technology is advancing at a rapid pace. By the time we have written standards for these new technologies they are already obsolete and industry is moving on to something else. And of course, once new standards are released, then within IECEx, accreditation processes have to be followed to allow ExTLs and ExCBs to test and certify to those standards. We have to find new ways of streamlining those processes, to adapt to new technologies in standards development and in certification.”

As an example, Meanwell cites the release, a few years ago, of the standards on the risks of ignition of non-electrical or mechanical equipment. “They have rapidly taken off around the world and IECEx has done a really good job with more than half of the CBs and testing labs now accredited to certify to those standards.”

The System also needs to attract young people into its fold. “We’re also facing some skill gap with older staff getting close to retirement. We need to modify our marketing approach to appeal to young people. IECEx will have to use the technologies favoured by the younger generation and adapt to the mindset of younger people to get them active in IECEx.”

As IECEx Chair, Meanwell will have influence over the business development of the System. “Both Arnhold, who now chairs the Business Development WG, and Vice-Chair Martin Cole agree on this marketing effort. IECEx is the only system of its type in the world and if we want it to be accepted globally, we need new people on board to support our drive to convince regulatory authorities of the countries where we operate that they can accept our certificates without further testing within their countries.”

On gender diversity

Meanwell agrees that there has been a big change in recent years. “In the South African National Committee of the IEC, we’re working hard to get a better gender balance. It is a very hot topic today in my country. At SAFA, more women have responsibilities in our executive committee. The situation is improving but we still need to hire more women in both standards development and conformity assessment.”

Meanwell concludes: “I am just taking over from Thorsten Arnhold and I want to keep pushing forward and hopefully be at least as good as he while he was Chair. In representing IECEx, I hope I’ll be able to invigorate and energize people.”
For the first time perhaps in the history of mankind, industrialized countries now often have four generations cohabiting in the workplace: baby boomers (born between 1944 and 1964), generation X or Xers (1965–1980), generation Y or millennials (1980–1995) and generation Z or Zers (born after 1995). Better living and working conditions, better healthcare and healthier lifestyles have all contributed to a rise in life expectancy since the second half of the 20th century.

OK boomers?

Another key factor that singles out the last 80 years is the ultra-rapid pace of technological advances. Baby boomers grew up while radio, television, and fax were still developing and saw the transition to the digital workplace to which they had to adapt. They are referred to as “digital immigrants” as opposed to the “digital natives” born after 1980 of which a good part grew up in the digital era.

To communicate, boomers may still favour face-to-face or phone conversations, gen Xers may rely more on emails, millennials and gen Zers may prefer texts and social networks. Still, the workplace is a great unifier, where the unique knowledge and viewpoints of each group can, if well managed, blend and lead to greater efficiency. Also, each group can learn from the others and acquire skills that are not innate.

The transition from analogue to digital has, over time, affected all sectors of industry, the healthcare environment, transportation, education, leisure, culture, services and so forth. So much so that it is becoming increasingly difficult to remain unconnected in 2020.

Many new technologies rely heavily on sensors to work
Electronics inside

Technological advances in the electronics sector would be non-existent without electronic components. Those are often classified into three main categories: active, passive and electromechanical.

Active components rely on a source of energy (DC) and inject power into a circuit. In recent years, technological advances have greatly enhanced their use in an ever-growing number of applications. They include, among others, semiconductor and display devices. Semiconductors comprise diodes, transistors, integrated circuits and optoelectronic components.

Passive components are electrical components that do not generate power, but instead dissipate, store, and/or release it. Among them are capacitors, resistors and inductors. In most circuits, they are connected to active elements, typically semiconductor devices.

Electromechanical components, such as connectors, relays, fuses, switches, microphones, or wires and cables, use an electrical current to create a magnetic field which causes a physical movement.

Sensors everywhere

One type of electronic component in particular plays a major role in many of today’s technologies: sensors. These can be active or passive. Active sensors require an external source of power to operate while passive sensors simply detect and respond to some type of input from the physical environment. They come in many shapes and forms: vision, flow, fibre optic, gas, motion, image, colour, light, pressure, infrared, photoelectric and so on.

Sensors and sensor systems are a key underpinning technology for a wide range of applications. They can be used to improve quality control and productivity in manufacturing processes by monitoring variables such as temperature, pressure, flow and composition. They help ensure the environment is clean and healthy by monitoring the levels of toxic chemicals and gases emitted in the air, both locally and – via satellites – globally. They monitor area and regional compliance with environmental standards. They enhance health, safety and security in the home and workplace through their use in air-conditioning systems, fire and smoke detection and surveillance equipment. They play a major role in medical devices, transportation, entertainment equipment and everyday consumer products.

Smart and safe

Electronic components may come in many shapes and sizes but they have commonalities. They need to be accurate, reliable and high quality. Defective components can have serious consequences for humans and their environment. They also have to meet the requirements of national or regional regulations concerning hazardous substances.

A lot is at stake

Manufacturers and suppliers of all types of electronic components throughout the world have a powerful tool at their disposal, enabling their products to meet the strictest requirements: IECQ testing and certification. IECQ is the IEC Quality Assessment System for Electronic Components.

As the worldwide approval and certification system covering the supply of electronic components, assemblies and associated materials and processes, IECQ tests and certifies components using quality assessment specifications based on IEC International Standards.

In addition, there is a multitude of related materials and processes that are covered by the IECQ schemes. IECQ certificates are used worldwide as a tool to monitor and control the manufacturing supply chain, thus helping to reduce costs and time to market, and eliminating the need for multiple re-assessments of suppliers.
Standards for AI governance help facilitate client trust in organizations

Innovative technologies are increasingly being used to improve systems and services. Robots and people work together in factories and offices, while automated systems are used in cars and planes to ensure safe, efficient journeys.

By Antoinette Price

As more businesses incorporate AI technologies to improve their services and products, more questions are being raised. For example, do clients trust and understand how these technologies are being used? What is the role of humans in the organization and can they control the AI technologies deployed? What about societal concerns around big data analysis which could be used in other unfair ways? Should there be an ethical framework for AI?

**Top technology and transformation trends**

These were some of the important issues raised during an event entitled *Top technology and transformation trends*, co-organized by CPA Australia – one of the world’s largest accounting bodies – and Australia New Zealand and India Business Association (ANZIBA), held in New Delhi, India last November. Around 60 people attended, including business and financial analysts, financial controllers and accountants.

Jan Begg is Technology and Transformation Lead, Policy and Advocacy, CPA Australia, and Chair of ISO/IEC JTC 1/SC 40: IT Service Management and IT Governance, which develops international...
standards for the governance, service management and business process of outsourcing activities. In her keynote speech, she highlighted concerns around AI technologies already being deployed in business. For example, there is a growing need to ensure the privacy and security of data gathered and analyzed by AI technologies, as well as how it will be used.

“The Australian government is under pressure to release data it collects in an aggregated, deidentified way, for businesses to use, but how do you do this safely? Under the European General Data Protection Regulation (GDPR) data obligations, there is a right for people to say that they want their data to be forgotten. But what if it has already been used in machine learning? How do you undo that and comply with GDPR? There are big questions such as having privacy by design from the outset”, said Begg.

**Why standards?**

It can be a challenge for the leadership and management of public, private and not-for-profit organizations to keep up-to-date with new technologies, which may have different terminology, definitions, ways of doing things, opportunities for innovation or new threats to business viability.

Begg leads IEC and ISO standardization activities which look at how technology areas or opportunities are managed within an organization, and at governance level – board or executive managers – how they think about their governance responsibilities when it comes to technology.

Among some of the key standards already published are ISO/IEC 38500, Governance of IT for the organization, is a principle-based guidance document comprising six principles which can be applied to any technology or service enabled by technology, and the ISO/IEC 30105 series of standards relating to IT-enabled business process outsourcing (BPO).

**The impact of AI on business**

Connectivity and smartphones have changed how we live, work and play. There have been numerous examples, such as the move from physical paper to e-tickets for transport, or services which disrupt across industries.

The event’s panel session covered a number of questions including why CPA members should be interested in technology standards and technology trends, evolving government policy in AI and ethics, the changing BPO landscape, the need for new ethical principles for AI and the impact of AI and data analytics on the accounting profession.

Sundeep Oberoi, Global Head, Cybersecurity Delivery Tata consultancy services and Chair of ISO/IEC JTC 1/SC 7: Software and systems engineering, gave his thoughts on technology and transformation trends.

“There is on the one hand a clear trend in every field that involves replacing custom built hardware with commodity hardware where functionality is implemented in software. On the other hand, business processes are being digitized and implemented as software-based processes. This “softwareization of everything” is resulting in software development on a much larger scale, by a much broader set of entities and individuals and with much shorter development times than ever before. This produces several challenges for developers, consumers of software and software development services. There is demand for “agility” and the SC7 community is revising its standards for software development as well as introducing new ones to deal with this need. In a world where requirements change, how is contracting to be done? Traditional software contracts required an up-front definition of requirements in order to have fixed price agreement. We will need newer ways to do contracting and that is an active area of study for us. The other important question for a consumer of software services is how could the maturity of an organization, which delivers development services, in an “agile” manner be assessed? One way to do this is to use ISO/IEC 30105 five-part standard”, said Oberoi.
The age of hydrogen

New IEC Standard to accelerate the scaling up of hydrogen and fuel cell energy storage systems

By Catherine Bischofberger

As concerns over climate change escalate, the case for using clean sources of energy becomes obvious. Renewable energy (RE) generation is gaining ground year on year. Many of these RE sources fluctuate, however, and are therefore difficult to harness in the conventional grid. That’s only one of the reasons why hydrogen is gaining new momentum.

Hydrogen is already used to power electric cars, trains, trams and buses. Several Japanese car makers have championed fuel cell electric vehicles. Unlike conventional vehicles which run on gasoline or diesel, fuel cell cars and trucks combine hydrogen and oxygen to produce electricity, which runs a motor. The cars emit water vapour instead of CO₂. Trains running on hydrogen have also been launched, notably in Germany and hydrogen-powered trams are common-place in China. Buses using that from of energy are now widespread across many countries in Europe, Asia and America.

Hydrogen momentum

On a much wider level, multiple experts around the world are seriously contemplating a “hydrogen society” as a complete and sustainable alternative to our fossil fuel-based economies. In June 2019, the IEA published a much talked-about report, *The Future of Hydrogen*, analyzing the current state of play for hydrogen and offering guidance on its future development. “Hydrogen is today enjoying unprecedented momentum, driven by governments that both import and export energy as well as the renewables energy, electricity and gas utilities, automakers, oil and gas companies, major technology firms and big cities”, says Fatih Birol, the IEA’s Executive Director.

Hydrogen can be generated from natural gas and biomass, but also from oil, coal and nuclear energy as well as by electrolysis using renewable energies such as solar, wind or hydro power. Once generated, it can be compressed and liquefied for storage and transportation in fuel tanks. It can even be transported using the existing infrastructure of natural gas pipelines. As a means of energy storage, it compensates the fluctuation of some renewable energy sources.

Using reversible solid oxide fuel cell technology, devices can split water through electrolysis to produce hydrogen, as well as convert hydrogen back to electricity. “Hydrogen can be used to generate power but also for energy storage and this flexibility calls for a standard which deals with the toing and froing between energy generation and storage,” explains Stephen J. McPhail, one of the convenors of IEC Technical Committee (TC) 105 which prepares publications relating to fuel cell technology.

IEC expertise in hydrogen and fuel cell technology

Alongside Tsuneji Kameda from Japan and Hongmei Yu from China, Stephen J. McPhail, who is based in Italy, leads the work of TC 105 WG 13, which has recently published a number of ground-breaking standards relating to fuel cell technology. Among these, IEC 62282-8-201 concerns energy storage systems using fuel cell modules in reverse modes. It establishes performance indicators and test procedures of power-to-power energy storage systems using hydrogen. These systems typically employ a set of
electrolyzer and fuel cell or a reversible cell for devices of electric charge and discharge.

One of the tests specified in the standard is an electrical energy storage capacity test. Another is a roundtrip electrical efficiency test to determine the amount of net electric energy output which the tested system can deliver. “It is a very complete and robust standard. We based a lot of our work on the Solid Oxide Cell and Stack Testing, Safety and Quality Assurance (SOCTESQA) project, funded by the European Union and we are very happy about the result”, McPhail says.

The publication of the standard should help scale up hydrogen production and storage which, in turn, will reduce the costs of using the technology. “Hydrogen and fuel cell technology can be expensive but by standardizing components and operating conditions in the field, we are paving the way for mass production”, McPhail adds.

In the future, he expects that IEC TC 105 experts will publish a safety standard. “We will also be looking at other vectors of energy beside pure hydrogen, for instance hydrogen carriers such as ammonia, methanol or methane”. Whatever the future holds, hydrogen is expected to play an increasingly important role, helped by key IEC International Standards.