Standard issue

The successful adoption of emerging technologies, such as robotics and artificial intelligence, requires the development of new ethical standards.

The International Organization for Standardization (ISO) — an organization dedicated to the formation of standards — lists over 20,000 published standards covering a range of technologies. These standards define accepted ways things should be done. Fundamentally, a standard expresses a principle, which could be related to the quality of a material, the safety of a process, or the mutual compatibility of systems or devices. Once a standard is established it becomes a key measure of how a system or process should operate. If the system or process conforms to the standard, then it is considered compliant. Compliance is important because it provides the end user with confidence that their product will operate as expected.

There are economic gains and benefits of convenience to be made through adopting a standard, such as the ability to manufacture at scale and operate on the same platform without the need for peripheral adaptors and converters. Standards also build trust. They provide a level of transparency and consistency that enables regulation, which is crucial to ensure products and services are developed to an expected level of performance. For example, a recently developed standard entitled Standard for Conformity Assessment Testing of Cardiac Defibrillators for Legal Metrology Purposes defines conformity testing protocols and procedures for verifying the metrological characteristics of external cardiac defibrillators¹. The standard lays out the commonly used terms and nomenclature in the conformity assessment of these devices for legal metrology purposes in order to provide consistency for the field. Standards, for a large part, ensure that these life-saving devices work as described.

Standards are also important in the adoption of nascent technologies. In a [Comment](#) in this issue of *Nature Electronics*, Alan Winfield considers ethical standards in robotics and artificial intelligence (AI). He argues, in particular, that ethical standards are a vital step in establishing ethical governance in the fields, and will be required to ensure that robots and AIs are trusted and accepted.

A key theme in the development of such ethical standards is taking a human-centric

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approach. In 2016, the IEEE Standards Association (IEEE-SA) launched a global initiative on the ethics of autonomous and intelligent systems. Its aim: “to ensure every stakeholder involved in the design and development of autonomous and intelligent systems is educated, trained, and empowered to prioritize ethical considerations so that these technologies are advanced for the benefit of humanity”². As Winfield explains, the IEEE initiative sets out to “reposition robotics and AI as technologies for improving the human condition rather than simply vehicles for economic growth.”

Last year, the IEEE-SA, in collaboration with the MIT Media Lab, also announced the creation of the [Council on Extended Intelligence \(CXI\)](#). The name of the group itself is worth a moment of consideration. As Joichi Ito, director of the MIT Media Lab, explains: “extended intelligence recognizes that we exist in a system with institutions, the natural environment, and other people”³. This is important because it moves beyond the simple ‘robots versus humans’ narrative and considers how we could work with robots⁴. Thus, the group aims to “foster the responsible creation of intelligent systems

by recognizing that they are part of larger human and environmental systems that need to be handled in a holistic way”³.

Standards are community-driven initiatives, formed by dedicated, expert volunteers who propose, debate, draft and re-draft until a consensus is met. They are an important step in establishing trust in a new technology, and therefore realizing its full potential. But establishing and maintaining trust also requires a broader initiative that moves technology development beyond a ‘move fast and break things’ mentality. With a more considered approach, which puts ethics at the heart of design, innovation can be disruptive without being destructive. □

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