What if objects around us flocked together and became intelligent?

The internet of things is already making us reimagine daily life, but could artificial intelligence be the key to reaching the full potential of this technology?

Smart objects have evolved beyond the original idea of the internet of things (IoT): to offer a better way to track products, replace obsolete barcodes and improve logistics. The inherent extended capabilities of simultaneous contactless identification of objects using a unique electronic product code (EPC), which can be referenced using the internet, has been apparent for some time. While leading to multiple new applications, it has also raised many concerns.

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With information from tagged products directly available to computers, some levels of computer-based intelligence can also be associated with the original object over the internet. In practice, the object becomes 'intelligent' in an abstract way, with no need to incorporate any electronics besides an RFID tag. The result is an intelligent physical object, whose brain is hosted by a computer elsewhere.

This kind of artificial intelligence (AI) can go a step further and associate the object, in the location where it has been identified by a reader, with additional information from sensors located in that area. It is also possible to draw conclusions by correlating the object with other tagged objects in the vicinity. What is more, this virtual network is not restricted to simple objects, but can be extended to more complex devices incorporating their own sensors. Either way, all the objects around us are now becoming intelligent as the technology of connected objects evolves to produce smart objects.

Potential impacts and developments

Smart objects are transforming the way we interact with our environments at home, at work and in our cities. The IoT network gathers vast quantities of data about our daily activities and is combined with AI to become AIoT (artificial intelligence of things) – a smart, connected network that communicates over powerful 5G links, efficient enough to take full advantage of big data and cloud computing.

We can be linked to the RFID tags in our clothes while wearable devices continuously gather medical data, as well as information about our preferences and habits. Applications include fitness and health tracking devices monitoring heart rate, blood pressure and blood sugar levels. Furthermore, a variety of widgets are also available, ranging from wireless headphones to highly sophisticated augmented-reality/virtual-reality (AR/VR) equipment with many applications, including gaming. Smart home devices such as thermostats, coffee-makers, lights and all sorts of smart appliances learn users' habits to develop automated home support for everyday tasks. This can improve energy efficiency and safety; but can also be used for entertainment, access control and personal comfort among other applications. Smart cities integrate all levels of services to become safer, more convenient places to live. Applications include open data for better urban planning, optimised energy consumption, smart public transportation and increased public safety through smart traffic surveillance and control. Smart industry devices – the industrial internet of things

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(IIoT) – use real-time data analytics and machine learning to optimise operations, logistics and the supply chain. Data generated by these devices help industries foresee challenges – preventing costly errors and workplace injuries. The data being gathered may be sensitive, and therefore their protection must be ensured at all times in any communications that could be subject to tampering. Research is ongoing on ways to improve wireless communication standards and provide for encryption at different levels.

Anticipatory policy-making

Smart objects and the AIoT constitute a new paradigm that incorporates all the possibilities attributed so far to both AI and IoT technologies and benefits from others such as 5G, but it also takes in all the related ethical and legal concerns. The compulsion towards guaranteed outcomes may lead certain companies to collect excessively detailed behavioural data incompatible with the General Data Protection Regulation (GDPR). The EU has been actively regulating these two technologies (AI and IoT) for many years now. Policy discussions on IoT began at least 15 years ago – STOA released a study in 2007. Policy discussions on AI have been ongoing for some time and there is a broad spectrum of dedicated services within institutions such as the European Parliament, the European Commission, the Organisation for Economic Co-operation and Development, the Joint Research Centre, Council and others. These services have already performed a variety of studies that have contributed to the development of a new set of EU rules for AI.

Over the years, the EU has become a reference for human rights and democracy. The precautionary principle enables decision-makers to adopt precautionary measures when scientific evidence about risks to the environment or human health is uncertain and the stakes are high. Its application presents many challenges, however, especially when it comes to the treatment of complexity, hazard and exposure assessment, research and economic activities. Nevertheless, it also presents opportunities, mainly regarding the possibility to reduce the overall costs of environmental and health research for society. Yet there are also concerns about the EU getting stuck in these discussions, losing technological sovereignty in the process, and not taking advantage of the fact that a good part of this path has been explored already. As already feared by the European Commission in 2009, the development of technologies such as IoT has been hindered in the EU by concerns about privacy that may have led to over-regulation, possibly over-rating the limited capabilities these technologies had so many years ago. The result was that the EU was left lagging behind, and the same may be happening now with AI. As all these discussions make more sense today because of increased connectivity, by looking to science for inspiration and information, evidence-informed policy-making can help strike the right balance.

On 21 April 2021, the European Commission presented a proposal for new rules and measures, aiming to turn the EU into a global hub for trustworthy AI; this took the form of a new regulatory framework on AI and a revised coordinated plan on AI. The proposal establishes a risk-based approach to regulation, where AI applications are classified according to levels on a pyramid. The broader lower levels of the pyramid refer to applications with minimal or no risk and the classification goes up to a restricted group involving unacceptable risks. Smart objects fit easily into the lower-risk levels in most cases, provided that no tracking is involved and the GDPR is duly respected. New rules on machinery products will complement this proposal by adapting safety rules to increase users' trust in this new, versatile generation of products.

Through a series of related resolutions, the European Parliament has also been contributing to a comprehensive regulatory framework of ethical principles and legal obligations relating to the development, deployment and use of AI. This includes smart objects, although Parliament has focused mainly on high-risk applications and not so much on the broader low-risk levels of the pyramid.

Some studies suggest that a common EU framework on ethical aspects of AI, robotics and related technologies has the potential to bring the EU €294.9 billion in additional grow domestic product and 4.6 million additional jobs by 2030. The EU cannot afford to miss the opportunities offered by new technologies such as smart objects. By taking advantage of what has already been done at the institutional level, it can still lead responsible development while maintaining ethical values and standards. By setting these standards, the EU can pave the way to ethical technology worldwide, while also ensuring that the EU remains competitive.