

THE INTERNET OF THINGS

SUMMARY PAPER

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This summary paper is complementary to the ACOLA
Horizon Scanning report *The Internet of Things*
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- The IoT offers the opportunity to capture better quantitative and qualitative data about the physical world to improve decision-making, optimise processes and enhance productivity.
- IoT is likely to become ubiquitous in society, and presents opportunities to improve the liveability, wellbeing and productivity of Australian cities and regions.
- Opportunities include monitoring performance of our cities and regions, improving patient management and care, and optimising manufacturing processes.
- Increased knowledge and understanding of IoT, including security and privacy risks, will be important for all stakeholders. Strong, principles-based regulatory frameworks to oversee industry developments will assist.
- National leadership and oversight will enhance the deployment of IoT and help minimise harms over the next decade.

The Internet of Things (IoT) describes networks of smart “things”, enabled by connectivity, artificial intelligence and data analytics, that can make decisions or perform a task with little or less human interaction. It connects things-things, people-things and people-people. Examples include home devices, health wearables, and sensors in agriculture, autonomous factories and mines.

While the concept of the IoT has existed for some time, developments in wireless connectivity, cheap and low-power sensor technology, and artificial intelligence (AI) provide promising opportunities to revolutionise today's IoT systems.

It is estimated that there were 16 million IoT devices in Australia in 2018, and that by 2022 there will be 29 billion connected devices in the world, of which around 18 billion will be related to IoT.

The power of the IoT lies in the volume and granularity of data collected from devices, giving us unprecedented visibility into the systems, processes and products we use. This enables us to analyse patterns, anticipate changes and improve our decision-making.

The breadth of potential uses for the IoT has not yet been fully realised. As devices become more pervasive and knowing, with the ability to collect data and make decisions on our behalf, it will be important to consider the wider context of their use. Their inclusion and use in public spaces, business and our homes necessitates discussion on the social, ethical and environmental impacts.

Government, industry and community each have a role to ensure that the IoT is used effectively and responsibly to maximise benefits for Australia, while mitigating potential harms or unintended impacts. This will relate primarily to managing technical capabilities, the use and ownership of data, security and equality of access.

PROMISING USES OF IOT

The application of the IoT promises significant opportunities to increase productivity, efficiency, convenience and reduced cost across sectors. Sectors that use a high number of assets and involve high physical labour are likely to derive greater benefit. In Australia, service delivery, healthcare and advanced manufacturing are already seeing benefits, with further opportunities emerging over the next 2-5 years. In the mid-term, Australia is set to see the benefits of IoT in public transport and smart mobility, freight and logistics, public service transformations, and the education and creative arts sector. Long-term applications include the advent of digital twins and using data captured from the IoT to support novel applications and technologies such as augmented and virtual reality.

APPLICATIONS



Smart cities and regions

The IoT is increasingly being used in our cities and regions for real-time monitoring of traffic congestion, pollution, public safety, waste collection and infrastructure maintenance. The resulting data insights are informing future capital expenditure and decision-making. Sensory data can also enhance community engagement, where data collected on foot traffic, facilities and energy usage can inform and enhance the management of shared spaces. In rural, regional and remote areas, where limited resourcing and distance can be a challenge, IoT prospects include improving access high-quality healthcare and education.



Healthcare

IoT-based health tracking and monitoring devices have the potential to improve healthcare outcomes. For example, smart health wearables can aid in the management of chronic diseases by augmenting telehealth through remote monitoring and improving diagnostic capabilities.



IoT and COVID-19

The global pandemic has accelerated the maturation of IoT, particularly the monitoring and analysing of COVID-19 symptoms. Smart wearables, such as smart thermometers and pulse oximeters, have been developed in conjunction with telehealth initiatives to assist in patient monitoring, reducing physical contact and lowering the risk of exposure. This has enabled lower-risk patients to be remotely monitored at home, reducing the burden on hospital systems and reducing the risk of transmission.



Advanced manufacturing

IoT is creating a new paradigm in manufacturing, by collecting, analysing and acting on real-time data, leading to time savings, reduced costs and using materials with minimal human intervention. This could catalyse an Australian manufacturing renaissance over the next decade, allowing the design and construction of many products to be re-shored.



Transport

Urban mobility could be improved with the use of the IoT, using data captured from sensors on road infrastructure and in connected vehicles. The detection of data including incidents, faults and traffic flow will improve road safety, congestion and road maintenance.

Promising future developments include 'Mobility as a Service' (MaaS), where different modes of travel can be aggregated into a scheduling platform for a single trip. Utilising real-time public transport data, MaaS has the potential to improve customer preferences and needs, increase efficiency and sustainability, and reduce travel costs.



Digital twins

Digital twins are virtual models of assets, products and services that are created in real-time and can be used to assess current and future capabilities across an entire production lifecycle. For example, a digital twin could be used to test the feasibility of a new product or an entire new factory prior to physical development. The value of digital twins is likely to rise exponentially over the next decade and will eventually overtake the value of the physical assets (e.g. the physical factory) themselves.

KEY CONSIDERATIONS

The uptake of connected devices and IoT systems by businesses and community will progress regardless of government intervention. However, actions across key areas will maximise the benefits and economic gains for Australia, while mitigating harms.



Security

The volume of IoT devices and networks creates many access points ('surfaces') for hacking, especially if there are inadequate data management practices or firmware is not regularly updated. Where devices are not maintained or updated, they may present security issues.



Privacy

Users need to feel safe about how their data are created, transmitted, tracked and recorded. Responsive regulatory measures that protect citizens and provides mechanism for redress will be instrumental in establishing community acceptance and trust.



Workforce

A focus on training soft 'non-technical' skills and hard 'technical' skills will be needed to create a capable future workforce. Industry-education sector collaboration will help to identify the skills required for the jobs of the future and ensure training and education is responsive and flexible to these needs.



Connectivity

There are an increasing range of connectivity options to support different uses of the IoT (including wireless, long-range low-powered, satellite, fixed wired). However, it is likely that connectivity will continue to challenge uptake in rural, regional and remote areas. National scale 5G networks are not likely to emerge until the mid-2020s.



Community

To realise the full potential of the IoT, communities need to have access to connectivity and devices, as well as sufficient skills and knowledge to utilise and understand the IoT. There is the risk that the IoT may exacerbate existing social inequalities. It will be important to consider a range of community perspectives to encourage equal access and uptake.

REALISING THE POTENTIAL

The IoT offers extraordinary insights to enhance our cities and regions. However it is currently poorly understood, which may be a barrier to uptake and community understanding. Nonetheless, it is clear that the IoT, in conjunction with developments in AI and data analytics, has the potential to cause disruptive change over the next decade. Australia must be ready to embrace the opportunities the IoT offers to maintain global competitiveness in an increasingly digitalised world.

A national approach would help build community understanding and galvanise areas for individual and collective action by government, industry and community. Proactive regulatory measures on privacy, security and data management will help build community trust and acceptance, and guide industry efforts so that deployment is safe, effective and fit for purpose. Governments should continue to be responsive to international developments and emerging risks and harms as this technology matures.



Focusing industry efforts in areas where Australia already has comparative advantage such as healthcare, agriculture and mining will help Australia carve out a unique role in the global market to separate itself from overseas competitors.

Australia has a moment in time to capture the benefits from the IoT and to boost its economic trajectory. By taking a strategic and considered approach, Australia can facilitate ongoing innovation, adoption and acceptance over the next decade to maximise the social and economic opportunities presented by the IoT.

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We live in a time of rapid change; change that is driven by developments in science and technology and challenged by our capacity to adapt in the present and prepare for the future. ACOLA's Horizon Scanning reports present independent and timely analyses to guide decision makers through the decade ahead.

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"It is fascinating to imagine where we will be in ten years time. The IoT will create economic impact for Australia, present novel opportunities for the ways we live and conduct business, and provide solutions to societal issues such as environmental disasters and pandemic management. The applicability of the IoT across all sectors is enormous."

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