POLICY BRIEF #7

CONNECTING THINGS & INDUSTRIES AROUND THE WORLD: EU–NEW ZEALAND INDUSTRY 4.0 & IOT SOLUTIONS

July 2019

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Recommendations

There is ample potential to improve the collaboration potential in the area of I4.0 and IoT solutions between Europe and New Zealand, for example through:

* Supporting the dialogue
* Developing IoT and Industry 4.0 technologies
* Education and training
* Regulation

SUMMARY

Internet of Things (IoT) and Industry 4.0 (I4.0) bring together digital technologies to enhance the performance, output, monitoring and control of processes. The IoT extends the idea of internet as a computer network to all sorts of physical devices and objects. Industry 4.0 refers to using IoT to enhance the performance, output, monitoring and control of manufacturing processes. Both IoT and I4.0 solutions lie at the heart of digitizing our societies, industries, and promise gains in efficiency and productivity, but also in sustainability and quality of living.

The European Union and New Zealand are facing many similar challenges in I4.0 and IoT. Developing ecosystems that can drive innovation based on IoT solutions or I4.0 remains a key mission for policy makers. A central task is to ensure that small- and medium-sized enterprises in Europe and New Zealand can benefit from and deploy IoT and I4.0 solutions. Another job is to ensure trust in these solutions based on secure systems respecting privacy and other ethical principles. Both regions have already put initiatives in place to foster IoT and I4.0 innovation. Europe has developed successful showcases of I4.0 and developed key legislation relevant for IoT. New Zealand is an excellent test environment for its vast geographical area and business-minded entrepreneurs.

Europe and New Zealand should therefore join efforts in areas such as developing and deploying solutions for and with the help of SMEs. There are opportunities for collaboration in technology policy, for example in studying and further developing international regulation and interoperability – especially in light of a forthcoming EU-NZ Free Trade Agreement. In addition, there still are many research challenges in areas such as energy efficiency, sustainability, privacy and security that New Zealand and Europe can jointly tackle with benefits for both regions.

INTRODUCTION

The IoT extends the concept of computers networked through the internet to all sorts of physical devices and everyday objects. Using sensors, actuators and embedded computing, these devices promise to provide ubiquitous monitoring and control in a large variety of applications. Industry 4.0 is the use of these technologies to enhance the performance, output, monitoring and control of manufacturing processes. It can be broken down into two distinct areas that are not mutually exclusive - Smart Factories and the manufacturing of Smart Products. Industry 4.0 initiatives include process automation, real-time process monitoring, additive manufacturing (3D Printing) and virtual and augmented reality visualisation. Industry 4.0 can be regarded the manufacturing version of the IoT and indeed in the U.S. sometimes the term used is *industrial internet-of-things.*

To understand the importance of I4.0 it is useful to revisit the trend towards offshoring (and outsourcing). In recent decades – starting from the 1970s – many industrialised nations experienced the dislocation of producing industries (i.e. manufacturing) to lower-cost countries, e.g. China. This trend started with consumer products, but in the late 80s onwards included work with a high percentage of engineering or technological development. The importance of I4.0 may lie in the ambition to re-shore manufacturing or at least to maximise productivity gains from the digitization and robotization of production together with improved flexibility and quicker delivery.[1] These

[1]Dachs, B., Kinkel, S., Jäger, A., Palčič, I., Backshoring of production activities in European manufacturing. Journal of Purchasing and Supply Management 25 (2019).

are important objectives for manufacturers in New Zealand and in Europe who are facing many similar challenges related to international trade and labour costs. A study commissioned by the New Zealand IoT Alliance and MBIE in 2017 found that better use of IoT could create at least $2.2 billion in net economic benefit for New Zealand.[2]

IoT and I4.0 bring together several digital technologies to enhance the performance, output, monitoring and control of processes. In industry the focus is often on improving the speed and quality of business decisions and further enhancing manufacturing processes and customer experiences. Although the term Industry 4.0 has now existed for some time, it remains an active area of research and development. As a technology, it is now successfully applied especially in large industrial enterprises who are often global players and keenly aware of competition.[3] However, harvesting the promised productivity gains of I4.0 has proven difficult. In more consumer-oriented IoT solutions, the focus is often on small, intelligent and networked devices in all sorts of applications from entertainment to health.

Similar challenges

The EU and New Zealand face many similar challenges in I4.0 and IoT. For example, SMEs form a key portion of the business and manufacturing ecosystems in both regions. In fact, in Europe and in New Zealand, SMEs constitute the vast majority of firms in the respective economy. IoT solutions on the other hand are still often focused on large industries. Furthermore, some very interesting applications of IoT solutions are being discussed for sectors that are only slowly taking up digitization. This includes agriculture, food ind-ustry, and also health services.

The main challenge for policy makers remains developing ecosystems that would be driving innovation based on IoT solutions. Especially for someone new to I4.0, it can be daunting to navigate the ecosystem of providers (and solutions) available in New Zealand.[4] But also in Europe, the take-up of I4.0 technologies in sectors such as agriculture has proven slow.

Data security and privacy are important challenges for the development of IoT and I4.0 technologies. The installation and networking of hundreds of ubiquitous components constantly evaluating, transmitting and storing sensor data can be hugely demanding from a security and privacy perspective. In addition, there can be an increasing dependence on such systems – especially in I4.0 applications – so that reliability and security become important design criteria. The European Commission and the New Zealand government share concerns regarding IoT security and privacy. For example, both in Europe and in New Zealand privacy legislation focuses on principles of data minimisation, where organisations should only keep a minimum of personal data. It would be only natural to collaborate on research and technology development as well as policy aspects in this matter.

Future-proofing IoT and I4.0 solutions for the forthcoming Free Trade Agreement should also be a key strategic objective for EU-NZ collaboration. This concerns legislation and regulation, but also practical aspects of international data exchange, EU and NZ standards, and even aspects related to training and education.

INITIATIVES IN THE EU & IN NZ

In New Zealand, Callaghan Innovation has been putting the spotlight on I4.0 for several years. It runs an Industry 4.0 Hub website that provides a range of information on the topic. The New Zealand government's 'Wellbeing Budget' unveiled on 30 May 2019 has allocated $NZ6.8m to fund the creation of an I4.0 demonstration network with up to two smart factories to prepare New Zealand industry for the future. Already in 2017 Callaghan targeted innovation in the area of IoT where it organised the C-Prize to champion wearable technology.[5] This initiative was prepared via wearable technology seminars with EU experts which were organised in collaboration with the EPIC project.[6] Callaghan will continue to focus on sustainability issues such as sustainable land use, environmental innovation, and the low carbon economy. It is expected that IoT technology will be a key enabler.

The European Commission has created several initiatives to develop and deploy IoT and I4.0. A digital transformation monitor[7] assists the member states in monitoring and benchmarking progress in the area. It also helps to network national and regional initiatives. In the Framework Programme, I4.0 and IoT initiatives feature prominently, and the topics are also addressed in other policy areas including, for example, the EU's Smart Specialisation strategies.

New Zealand's IoT Alliance has investigated European activities such as the creation of the Alliance for Internet of Things Innovation and the Digital Single Market (DSM). Both aspects (IoT/I4.0 and DSM) also featured prominently in the EPIC event series in New Zealand and a good degree of mutual understanding already exists.

Industry 4.0 research and development strongly features in many European countries and industry has developed showcases and innovation factories. For example, a New Zealand brochure on IOT lists two key examples from Germany:

At the Siemens' flagship factory for Industry 4.0 in Amberg, Germany, the factory is said to be 8 times more productive than 25 years ago (with the same number of employees) thanks to the incorporation of digital intelligence. The Bosch Rexroth factory at Homburg, Germany, adopted Industry 4.0 technology for its production of hydraulic valves for mobile machinery like tractors. Aiming to become more competitive through manufacturing at lower costs with increased flexibility, and higher quality standards, it has reduced

[2] IoT Alliance, Accelarating a connected New Zealand. https://tuanz.org.nz/wp-content/uploads/2017/06/Accelerating-a-Connected-New-Zealand-eBOOK.pdf
[3] Strange, R., & Zucchella, A. (2017). Industry 4.0, global value chains and international business. Multinational Business Review, 25(3), 174-184.
[4] https://www.callaghaninnovation.govt.nz/sites/all/files/industry40-provider-map.pdf
[5] https://www.cprize.nz/
[6] https://www.cprize.nz/insights-experts
[7] https://ec.europa.eu/growth/tools-databases/dem/monitor/tags/industry-40

set-up time from 450 seconds to zero, reduced inventory days from 3 to 1.5, with a 30% stock reduction. It also cut cycle times from 474 seconds to 438 seconds, with a 10% output increase and saved €500,000 per year.

In New Zealand, the University of Auckland has set up a *Laboratory for Industry 4.0 Smart Manufacturing Systems* (LISMS), claiming it to be "the leading research institute on Industry 4.0 in New Zealand." The lab aims to support collaboration with industry and improve the transfer of IoT and other smart solutions to businesses.

CURRENT STATUS & RECOMMENDATIONS

There is ample potential to improve the collaboration potential in the area of I4.0 and IoT solutions between Europe and New Zealand. Europe has excellent research and industry in key enabling technologies for IoT solutions including embedded systems, power electronics, energy efficiency, real-time protocols, and wireless communication. New Zealand entrepreneurs have successfully experimented with IoT technologies and developed creative solutions in new sectors. For example, many of the NZ IoT Alliance[8] members are working on smart city initiatives using IoT connections to help traffic flow safer, make parking easier, improve air quality, manage crowds and help maintenance crews in New Zealand's major cities and regions. New Zealand entrepreneurs experimenting with IoT and I4.0 solutions benefit from a business environment conducive to innovation and a relatively light regulatory framework.

Collaboration between the EU and New Zealand can therefore:

* Help to find new ways of supporting local industries in better understanding I4.0;
* Encourage the early demonstration of IoT and I4.0 solutions in less digitized sectors based on collaborations between industry and researchers;
* Showcase and implement the research works at local industries.

#1 Collaboration should focus on

* Adopting IoT and I4.0 solutions that enable small- and medium-sized enterprises to easily develop solutions for their customers.
* Addressing environmentally beneficial and energy-efficient solutions, potentially covering large areas, for example in agriculture.
* Overcoming specific challenges of less digitized sectors or in application fields that suffer from processes without seamless interfaces today, e.g. in food industries.
* Deploying safe and secure solutions that foster efficiency, but also trust, e.g. in the health sector.

#2 Supporting the dialogue

* The EU and New Zealand should continue initiatives that further the exchange of experts, for example similar to the EPIC experts supporting the C-Prize.

#3 Developing IoT & Industry 4.0

* New Zealand can provide an excellent environment for testing the suitability of I4.0 and IoT solutions for small- and medium-sized enterprises.
* Facilitate collaboration in IoT and I4.0 security and reliability, especially with a view of IoT and I4.0 deployment to SME customers and consumers.
* Jointly showcase and advertise innovative IoT solutions that provide clear customer benefits while at the same time preserving people's autonomy and privacy.
* Investigate the potential of IoT and I4.0 solutions for sustainable development and environmental protection. This should also include potential benefits and negative impacts of IoT solutions deployed over large areas and in remote areas.

#4 Education & training

* New Zealand and Europe should collaborate on IoT and I4.0 education and training including vocational training. There is currently a lack of skilled people required to adopt solutions for the often unique environments of IoT and I4.0 solutions.
* Governments in Europe and New Zealand should exchange experiences and practices of ensuring that both industry and consumers understand the security risks of IoT and I4.0 systems and can take appropriate steps to protect themselves.

#5 Regulation

* Jointly investigate whether existing legal frameworks are adequate to cover the unauthorised use of IoT devices and similar risks. Europe and New Zealand should cooperate to better understand what international and extraterritorial jurisdiction issues arise from the proliferation of IoT devices.
* Both IoT and I4.0 development today offer a plethora of standards and protocols. Although there is room for multiple standards, there should be coordination for future interoperability and seamless integration of solutions.

CONCLUSIONS

Technologies such as Industry 4.0 and Internet of Things have become almost commonplace. This can make it hard to see the potential and the challenges deriving from them. The potential includes important contributions to improving energy and resource efficiency, greater sustainability of production pro-cesses and generally increased levels of productivity. Some challenges involve the role of SMEs in proper utilisation of the technologies, developing trusted and secure systems, and ensuring benefits for large parts of the society. These are challenges for the European Union and for New Zealand. Both

[8] https://iotalliance.org.nz/

regions can build on excellent researchers and policy initiatives and synergistically bring in their complementary strengths to jointly develop the fields of IoT and I4.0.

This policy brief was prepared as part of the EU project EPIC. The views expressed in this brief are solely those of the authors and not of the European Commission or its services.

How to cite

When quoting information from this report, please cite the following: „EPIC consortium (2019). Connecting things and industries around the world: EU-New Zealand Industry 4.0 and IoT solutions policy brief EPIC policy brief #7.“

This project has received funding from the European Union's Horizon 2020 research and innovation programme (ICT) under grant agreement No 687794.