



Erich Prem: Welcome, everybody. It's good – and quite surprising – to see so many people still here because this is the last networking session on the last day of ICT Vienna...This is the EPIC session about a new European Digital Space: Research Challenges and International Impact. What this title does not say, is that it's really about EU collaboration with Australia, New Zealand and Singapore, which is why we have speakers here from all three countries. First, we will have short statements from the three researchers from Australia, New Zealand and Singapore, and then we'll switch to the policy level, again with representatives from the European Commission, Australia and Singapore, which is also the way that our project is set up.

But before we do that, I'd like to set the scene a little. EPIC is an initiative funded by the European Commission in order to improve the collaboration between Europe, on the one side, and the three regions I just mentioned, on the other. It identifies priority topics for cooperation and it supports the dialogue between these regions, mostly through the organisation of events. We also have some targeted research cooperation with these two regions that we are funding from the project, and then, in the end, as always is the case with support actions like EPIC, we provide the European Commission but also governments in the other regions with recommendations for future strategic collaboration.

Let me point out some potentially interesting aspects that I've just recently become aware of. When you look at the trends in international cooperation, there are two rather divergent trends. One is, of course, global sourcing of knowledge, especially for companies nowadays; where the knowledge comes from, where the IP comes from doesn't really matter that much. So, you would expect that regions go together nicely, globally, but on the other hand, we also have a fragmentation. It has been even visible in the internet, and there was an article recently (I don't know if you've seen it) in the communications of the ACM that argued: really, we are now seeing the development of several internets: one being developed in China that's behind the great firewall of China, one being a no-limits internet in the US, and maybe there is even a third internet being developed in the area of Europe which has slightly different rules which are in relation to what has now been termed "the Digital Single Market" in Europe. Maybe that's taking it a little bit too far, but you could maybe interpret it like this.

Now, what's the Digital Single Market, for those of you who don't know? It's a vast set of policies that has been rather speedily adopted in order to create a single market for digital services and products in Europe. The question is, of course, why should Europe's international partners care? One of the reasons is because it has changed the rules to which Europeans have to adhere when they want to sell products and services, but it has also changed the rules for international partners of the EU, and the most famous term in this relation is GDPR. We were in a session with the US yesterday and we learnt that everybody knows what these four letters mean. So, GDPR has become a real selling point.

But the DSM is not just about data protection; it's also about, for example, easier exchange of non-personal data between the countries now in Europe. It includes initiatives such as the e-ID, to electronically identify, for instance, companies in Europe more easily. It includes an initiative in the area of artificial intelligence – that's going to be an important Communications of the Commission tomorrow – initiatives in cyber security or in high-performance computing. All of that, I think, targets really significant areas, which should also be important for Europe's international partners.

The other point I'd like to make about this maybe-European internet that we see emerging, is that, of course, it's not just something that companies have to adhere to; it also creates a trigger for new research questions. For example, how to properly deal with personal data is something that we now see being addressed in research, so questions such as privacy-preserving machine learning, and differential privacy, have now become research topics that are internationally acknowledged. Yesterday, again, there was a mathematician from MIT who said he was actually inspired by GDPR and studied the mathematical consequences of differential privacy in his work.

I want to say something about EPIC. EPIC cannot do everything. We need to focus on a few topics that are of international importance, and, of course, this is slightly different for Singapore, Australia and New Zealand, but certainly this question of how to deal with data, how to exchange data is one topic. Other examples of topics which are based on data include artificial intelligence, the digital economy, and the digital disruption happening currently. Then, when you think about it, of course cyber security is a topic of international importance, as are the Internet of Things, next generation internet and spatial intelligence. So, these are our focus topics in the project, and we have representatives from these areas here.

I'd like to, without further ado, present to you the speakers. Stan Karanasios is a research fellow at RMIT, slightly jetlagged but I think okay now. He came from Melbourne. Next to him is Negin Shariati; she's from the University of Technology Sydney, also slightly jetlagged, she told me. Then on my left is Peter Rose, probably not jetlagged because he's actually Director of Europe for Orbica, a New Zealand company working in AI and GIS. So, Stan, please let us know your interests in collaboration with Europe.

Stan Karanasios: Thank you, Erich, and thank you all for being here. My name is Dr Stan Karanasios. I'm a senior research fellow at RMIT University in Melbourne, and I'm from the School of Business, IT and Logistics. I also have a visiting position at the University of Leeds, so I float in between Europe and Australia on a regular basis, meaning I'm constantly in a state of jetlag, so it's something that I'm quite used to. If I have to describe my research, I would say I'm interested in the social, organisational and behavioural aspects of digitalisation and ICT, and I'm leading a programme of research on digital disruption and digital transformation.

Over the next few minutes, I'd like to connect with the opening panel discussion from Tuesday morning, where some things were talked about in terms of the Digital Single Market, but in particular around opportunities and challenges surrounding digitisation and digital transformation. You can see in my title there, the term "digital Darwinism," appears, and I've put that there on purpose to be a little bit provocative but I hope to explain why I think that term is important, over the next few minutes.

The first point I'd like to make is: digitalisation is not the same as digital transformation, and those terms have been used a lot interchangeably over the last three days. I'm an academic and academics like precise definitions. I see a distinction between the two, and that is that digital transformation is not about adopting a new technology or digitising an existing state, it's about reimagining an entirely different business model that places technology at its core. For instance: Uber is an example of digital transformation. A taxi firm using an app to allow for bookings by its customers, that's digitisation. They are very different, in my view.

My research now is looking at what I call frontier firms and laggards, and in particular, the unevenness we see unfolding in the space of digital transformation. Laggards are firms that are stuck in the old organisational paradigm. They use new digital technologies to do existing activities or activities that they've been doing for the last 10 years a little bit better, a bit more efficiently. But effectively, they're reinforcing their existing services and products. They also face challenges when it comes to adopting new technologies and face real challenges when it comes to finding people with the right digital skills to help their firms.

Frontier firms, on the other hand, create and exploit opportunities between new business models and digital technologies. A good example of that is Uber. But it's not just the technology firms, it's also incumbents that have managed to transform, and you're probably familiar with the fate of Lego, which transformed its fortunes. Other good examples: are Audi, Rolls Royce, etc.

My research also looks into this aspect of "Winner takes all" economics. That is that firms that manage to digitally transform are able to land-grab a bigger slice of the pie. This is where this notion of digital Darwinism comes in. There's some research out there that shows that firms that can digitally transform are up to 25% more profitable than other firms in their sectors.

Digital transformation also brings another challenge in terms of breaching industry boundaries, so firms, particularly technology firms, can hybridise traditionally siloed services in a way that's never happened before. So, we have firms such as Alibaba that can do retail, that can do finance, that can do entertainment, that can do media, that can do transportation, and they do these things much better than incumbents in those sectors. That is a new phenomenon. We see unevenness across sectors, so finance is an example of a sector that has been able to digitally transform fintechs etc. But on the other hand, we have sectors such as health which are strategically very important sectors in our economies and to our lives. There are very clear opportunities or benefits from this transformation, but the whole sector has really struggled to engage in digital transformation. Even within sectors, there is a whole host of challenges. For example, within hospitality, Air bnb and Booking.com are leading the way, but they're really squeezing small firms who haven't been able to keep up with these large players.

Just a quick point about policy, and there was a lot of talk, particularly on Tuesday morning about how the EU needs to compete better with the USA and China. My view is that when it comes to digital transformation, you're no longer just competing with other nations, you're actually competing with other firms. That is important. You're competing with the big players: Google, Amazon, Alibaba, Air bnb etc.

I'll move on to opportunities for research and collaboration, and there I have some research questions that I'm interested in: how to address the unevenness, how to study it, what to do about addressing digital skills. My research also shows that digital skills are important, but firms are actually finding it even harder to find people with a digital mindset.

Another important question is: what is the role of the institution in nurturing laggards - how do you help them with digital transformation while not constraining opportunities around digital transformation? In terms of RMIT, we are quite fortunate. We have a campus or an office in Europe. It's called RMIT Spain, and through that we are able to collaborate with European partners and apply for funding. I'm submitting a proposal for an ITN in January next year. So, there are opportunities to collaborate and apply for funding together. We also have student visits to RMIT Spain, as well as an exchange of staff - so in terms of RMIT Melbourne, this includes our colleagues from Loughborough, Leeds University, and Paris-Dauphine university, and we can help with things such as visas and some funding etc.

I will stop there. I'll pass the microphone over to Negin. But I'm happy to continue the discussion later.

Erich Prem: Thank you. That was a good introduction. A bit long, but anyway, cheers, we got a good overview.

Negin, you are on the completely opposite side of things in hardware.

Negin Shariati: Yes. Thank you so much. Hello, everyone. Welcome to this EPIC session. Thank you for having me. I'm an academic at the University of Technology in Sydney and our university, UTS, is the number one young university in Australia. I'm a director of the RF and Communication Technologies Research Lab at UTS. UTS is very keen to explore external engagement collaboration with European universities. So far, we have connections at university level - not only at faculty level - with universities in Germany, in Belgium, and in different universities in France. With Spain, I'm going to create a collaboration. And also, we've already established connections with universities in the Netherlands.

Under this umbrella, under these connections, we can have joint degree agreements. Students can spend a couple of years at UTS, a couple of years at the other university and they can get their certificates from both universities. Also, we can do exchange research and we can apply for joint grant applications. These are some things we are keen to explore. I already have a cross appointment: I'm also a lecturer at a university in Japan. So, we can explore these opportunities with universities in European countries.

Erich asked me to discuss briefly about IoT. I'm a hardware person - I'm more in charge of designing circuits, microwave circuits; I'm directing a lab. We have different expertise, we have multi-disciplinary collaborations between our RF lab.

Briefly about the future of IoT, as you know, by 2020, over 200 billion sensors will be enabled and over 30 billion will be connected to the internet. This is a huge number. This would create our lives smarter, this would create a smarter agriculture and cities, but from my point of view, there is a big problem. Apart from implementation connectivity, I think energy would be a big issue. All these sensors require energy and power. Imagine

we have some sensors in remote and harsh environments. Their accessibility is a problem. It's really hard to replace batteries frequently. People will say, for example, we can keep them for roughly around five years' time, but it depends on how many signals a transmitter receives through sensors. You can kill them easily. So, replacing batteries and considering pollution would be a big issue.

My research would address this problem. The idea is to integrate antenna rectifying circuits, which we call the rectenna; in other words, RF energy harvesting. We can integrate this energy harvesting unit with existing IoT devices and sensors to extend the lifetime of sensors. So, we can harvest free energy from ambient signals, for example, from basis stations, from broadcasts, from mobile phones, from WiFi, from cellular systems. These sources are freely available in ambient. The beauty about energy harvesting is, we can harvest these signals throughout the day and night, both indoor and outdoor, because RF signals penetrate inside building materials. We can harvest energy inside buildings.

Then we can capture all these signals in the ambience. We can transfer them to rectifying antenna, receiving antenna, and at the output we can generate use for this power. The power is suitable for low power applications, as I mentioned, for sensors and IoT devices, and also for drones. We can extend the lifetime of drones by integrating this energy harvesting unit with the existing systems.

The other scenario is that we need more power because the amount of power we can capture from ambient is quite low. It's in terms of millivolts, sometimes microvolts; it depends on the ambient. If we need more power, we can use a dedicated RF source. We can use dedicated antenna to shoot power when we need to power up, for example, sensors in bridges or tunnels. It's really hard to pull out sensors and change the batteries. We can just wirelessly transfer power. This was Nikola Tesla's dream.

So far, we have implemented this technology. We are working with our industrial collaborators. Especially for smart farms we are working with a CRC in Australia. We are going to integrate our energy harvesting systems with sensors, for example, soil sensors, to measure the nutrition of soils, and we don't need to replace batteries because we can extend the lifetime of RF energy.

Erich Prem: Very good. One sentence I wanted to add is that it, of course, lends itself nicely to the Australian dimensions, which is probably something you also bring to the European case. Our dimensions tend to be smaller but it's still an issue.

Great. Thank you so much.

The third speaker in this row would theoretically have the longest travel time but you don't since you're based in Berlin: Peter Rose. Peter Rose is an expert in artificial intelligence and geographic information.

Peter Rose: I will briefly introduce our company, Orbica. We're based in New Zealand and were founded last year. This year, we founded our European entity, which I'm heading.. What we focus on is really trying to disrupt the geospatial or location data intelligent space. So, we have two areas that we focus on. One of them is geospatial artificial intelligence and the other one is geospatial business intelligence.

In terms of AI, the big driver for us is several applications or several problems that we've been solving or working in for quite a few years. But we have been solving them with more, or different, methods than AI. And we're trying to bring AI into the geospatial domain to solve the problem of extracting data from imagery. The reason why this is important is that there's a real lack of automation in terms of extracting data from satellites. There's an exponential increase in the amount of data that's being created every year. Just in the last year, there was a 60% increase in the number of satellites launched, so there's a year-on-year growth of between 50 and 60% over the last five years. It means that there's a huge amount of new data. The majority of that is optical imagery, and so we try to focus on analysing those images to extract all the different information. That's then applied to doing things like urban progress tracking, disaster relief, environment monitoring, agriculture, and looking at water. Also, what we're doing quite a bit more of, and I spent some time this year in Africa (...working in this area), is mapping things that have never been mapped before. That's one area that's really interesting.

The other area that we're working in is geospatial business intelligence. The idea here is to bring geospatial or location data and story telling into business intelligence, and the purpose is to really try to help the public sector engage with their citizens better. There's a huge drive towards open data and being more transparent. However, most of that data is released for more of a technical audience, and the majority of the citizens or customers of the public authorities are not technical. They just really want to explore and know the story. So, the idea is to make that really easy to do, and this is an area where we work with public institutions or funding authorities and also large enterprises where they have their, for example, CSR campaigns, to tell their story in a better way for their customers.

Erich Prem: Great. These have been three examples that have taken inspiration from the focus topics we have in our project, where I think it's evident that some form of collaboration makes sense. Let us continue with the AI question and switch to the policy level. What I would like to do is offer my seat here to Stefan Winkler, who is from AI Singapore. He said he would be a good bridge because he's also a researcher. But really, now you are with a funding organisation, AI Singapore, and you told me a little bit of that also goes towards international collaboration.

Stefan Winkler: That's right. The first slide is really just a pretty picture, but I wanted to share a little about what Singapore is investing in the AI space and how we spend the money. We've only just started. AI Singapore was created last year and received funding of about SGD150 million (which is approximately 100 million euros) from the National Research Foundation to really shape and structure a programme in the artificial intelligence space. So, we're a national initiative; we're open to all the universities and the research institutes, and we work with all of them as well.

The way we're structured is that we have three pillars. The first one is AI research, which is really traditional research funding that goes to academics in domains focusing on AI algorithms, AI techniques, AI methodologies. The second one is AI technology, where we focus on more applied, more targeted research problems, and research statements. One of the things we do is design grand challenges. Most recently we've launched one in health – it's our first one – AI in Health. We're also working on other grand challenges in different domains, for example, finance, urban solutions, education – these are some of the domains that we're thinking about. But again, it comes down to specifying very

clearly, what the grand challenge is that we want researchers to solve, and then how to structure the programme to fund them in a way that makes sense and is likely to produce good results for them and for us.

Finally, we have the innovation pillar, which really works closest to industry and to translating research, where we have industry projects – or are supporting industry through project funding, as well as training programmes for different types of demographics. It's 100 experiments: it teams up industry with researchers, and we provide some resources, some manpower for these projects. These are short-term projects of about a year or so, to support industry in implementing AI into their business processes. We combine this with an apprenticeship programme, which is also interesting because we don't have much of that in Singapore, where we provide manpower through apprentices and through training these apprentices alongside the industry experts.

We also do a few other training programmes for students, for example, for professionals and different groups to equip them better to understand the AI world and understand the capabilities and the limitations of AI.

There's a couple of other things I'd like to mention here briefly before I finish: some initiatives that also exist in Singapore that are not directly linked to AI Singapore. We have an Advisory Council on Ethics - which is essentially high-level business leaders, government leaders and academics - to come up with guidelines, recommendations for, again, governments and businesses on how to use data and AI ethically. We also have, related to that, a centre for AI and data governance that looks at legal aspects of data use and AI, so mostly the law faculty are working on this programme.

The last thing I want to highlight here, but because it's very timely, is that NRF also now has an AI fellowship. These NRF fellowships are pretty generous, so if you or any of your colleagues are interested in this, the deadline is coming up in two weeks. You may still have time to prepare your application.

All right, I will stop here for the moment. Thank you.

Erich Prem: Thank you, Stefan. Usually advertisements cost a little bit of money, but that's fine. Thank you so much.

I know that it looks like this is all perfectly organised because I know that the Australian Government is about to publish their strategy on artificial intelligence, and Alex Cooke, who is the S&T representative of Australia in Brussels has the details.

Alex, please.

Alex Cooke: Thanks, Erich. So, I'm the Science and Technology Counsellor based in Brussels and covering all of Europe and covering digital economy policy issues, as well in the OECD Committee for Digital Economy Policy. So, we are quite strongly active in multi-lateral forums and within Europe in terms of trying to support Australia's interest in ICT. We have huge strengths in the area of ICT and the digital economy, and we recognise how important it is for Australia. 12% of global goods trade is conducted via international e-commerce. So, there's a huge interest in terms of our global trade prospects. Digital flows now exert a larger impact on GDP growth than trade in physical goods. We are actively supporting international regulatory cooperation and

harmonisation of international standards that underpin ICT through our engagement in international forums like APEC and the G20, and working with ASEAN countries on a digital trade standards initiative which will promote the development, adoption and use of international standards within our region. So, we're very keen in pursuing a regional focus for Australia within our neighbours. We hope to be able to align efforts with the EU in terms of that work so that we can connect in to what Erich said about the European internet, as it were.

We commenced a free trade agreement negotiation with the EU earlier this year and we hope that this will be an ambitious agreement that will cover innovative and cutting-edge provisions around e-commerce and digital services. We're hopeful that this will create an investment environment and a collaboration environment for Australian and EU researchers.

I wanted to do a very quick whistle-stop tour of a few of the initiatives that are going on. Unfortunately, I can't give you any details around the artificial intelligence work that has not been released. That's the prerogative of our minister. But I can refer to some of the budget announcements that we made earlier in the year. We announced \$29 million to build capability and support the responsible development of artificial intelligence. We've got a few deliverables that will be coming in this month and early next year around a CRC project, so we have a cooperative research centres programme which is collaborative research. This is a small level project underneath the auspices of that, which we will announce in the next few weeks. An AI ethics framework is being developed by our Data61, an ICT research centre under the auspices of our Commonwealth Scientific Industrial Research Organisation, which is like all of the Fraunhofer institutes brought together under the one banner. That ethics framework will use a case study approach to explore issues surrounding the development and use of AI. The approach that we're taking is that it's an indication of what expected norms and behaviours would look like around the use of artificial intelligence.

We're also developing an AI standards roadmap to explore the likely economic impacts by industry, as well as the workforce challenges and opportunities and implications for education and training. This will also include detailed industry case studies illustrating the policy implications to be considered, which we will then use to continue our conversation with government.

Finally, hopefully this year as well, we're realising our digital economy strategy, which will be a broad Australian Government policy statement regarding our position on digital. So, I've got here Australia's international cyber engagement strategy, which is our international outlook on cyber. I also wanted to just finish up by pointing to one of our industry growth centres, which is called AustCyber. The reason I'm pointing to that is because it released its sector competitiveness plan last week. It outlines the priorities for Australia in our industry growth areas, covering particular opportunities for collaboration and where we think that there's avenues for investment.

AustCyber does our, let's say, non-civil activities and more secret squirrel sorts of things, but one of the big focuses of AustCyber is to create enabling conditions and security layout for businesses to operate, so supporting secure Internet of Things activities and that kind. I will point you to this website – have a look at the sector competitiveness plan there and look at some of the opportunities. They just got two years of additional funding

guaranteed by the government last week, so they're very much looking forward to engaging cooperatively with people.

Erich Prem: Thank you so much, Alex. This was probably the shortest summary of Australian ICT policies that I've ever heard.

Last but by no means least, would be Jean-Yves Roger, who is our project officer, who has the burden of dealing with a lot of countries, including our project with Australia, New Zealand and Singapore, and I'm sure you have a lot to react to. So, please, have a seat.

Jean-Yves Roger: Thanks, Erich. I think there were several interesting points during those presentations, but I would first like to say a few words about what we are doing in Europe in terms of AI in particular, which is one of the core topics that we discussed during this session. As you may be aware, last April the Commission presented a communication on AI, which takes a tripartite approach. So, first is to enhance the capacity of Europe in AI. Second is to prepare Europe for the changes that AI will have on our workforce, but also re-skilling and adaption of the workforce to those changes. Finally, it's about making sure that we have the right legal and ethical framework. So, these are the three pillars which we have defined in our communication.

We pay great attention to making sure that AI is deployed in all sectors and in all regions of Europe, that's why we put in place GTR innovation labs, which are focusing on AI in all parts of Europe. That's something which is quite important for us. In terms of co-policy, of course, the ethical and legal framework is of vital importance, and you can see that many countries are having their own ethical guidelines, like Australia, of course, but also Japan, Canada and France, for example, have issued their recommendations on the ethical guidelines. We do the same. We have set up a high-level expert group with 52 experts, who are working on defining those ethical guidelines. They will issue their recommendations by March of next year. This high-level expert group is not a closed group, so we have, as observers, also representatives from non-EU countries like, for example, Japan or Singapore. They will also issue recommendations in terms of policy by mid-2019.

In terms of other opportunities for international cooperation, we are also setting up an AI on-demand platform, which is there to test and validate AI technology, and we hope, of course, that many organisations from academia and the private sector are able to join on this platform, which is open, as I said, to European and non-European countries.

I would like to say a few words about data flow, which was also mentioned. As we all know, there is the GDPR. Since this November, we also have a very important regulation about free flow of data within the European Union for non-personal data. So that's something which is not conflicting with the GDPR, it's rather complementing it. And just to mention that we pay great attention to free flow of data. It's something we have been supporting in all communication at G7 and G20. We really do the maximum so that we have a free flow of data all over Europe, and we are also putting in place one aspect which would allow member states to have access to data even in other member states, so that they will accept this free flow of data within the whole European Union.

Also, perhaps a word on platforms, because that's another area where we have international cooperation. We have made recommendations -- a communication last April on platforms also about the role of platforms, and the interaction between platforms

and businesses, and particularly SMEs, because, as with many platforms, there's a lack of transparency. People are not too aware about the exact law which is applicable when they sign a contract with a platform. They don't know the process of delisting, how the algorithms are working so that they appear on the first or low part of the search engine. So, for all of that, we have put in place guidelines. Let's say that we are set up to ensure that the environment is more transparent for SMEs. That's an area in which we have a lot of interaction with our international partners, because that's something on which Europe, let's say, is leading on.

I think that's all I have to say. I think, as was mentioned too by Alex, Singapore but also, of course, Australia and New Zealand, are important partners for the European Union, so we have FTA negotiations with Australia and New Zealand, and for Singapore it's done. That's why cooperation also in research activities is very important for us, and we are looking forward to having new ideas that we could implement. Thank you.

Erich Prem: Thank you, Jean-Yves. One question, maybe to all of you, is when listening, it seems like the topics sounded so similar. So, it sounds like this is a huge opportunity for improving collaboration, but then you also look at some of the global conditions, with some countries becoming more difficult for collaboration, some leaving the club even. Do you think we are experiencing a positive environment for this kind of -- this is not trans-Atlantic, this is trans -- I'm not sure -- trans-Indian collaboration?

Jean-Yves: If you talk about AI, for example, I think there are a number of countries which share similar values: Australia, New Zealand, Singapore and also Canada. On AI we are I think more or less on the same path for the definition of ethical guidelines from policy aspects, so I think that there is a clear opportunity. Of course, AI is very, very fashionable and every country wants to have its AI guidelines. You have meetings next year or taking place nearly every month or every week on AI guidelines, so I think we need a bit of streamlining in those activities. For sure. it's an area where there could be a much closer cooperation, and we will do some announcements based on the communication -- we will issue, in fact, tomorrow, on this particular aspect of closer cooperation with our international partners.

Alex Cooke: Yes, just to say I think we are seeing a reconfiguration of the global order at the moment. It's not just digital; I think there's a range of different actions that are happening. This is a good model or lens to look through to see where this is happening, around the way rules-based economies apply regulation into what is a brand-new domain. So artificial intelligence is effectively a new regulatory environment that people are trying to figure out what to do to support. As Jean-Yves said, we are extremely likeminded. We all follow a rule-based approach and have an open democratic and ethical orientation. Based on that equal footing, I think there is quite a lot of opportunity for the countries involved to look at how to facilitate that.

Yes, artificial intelligence is a massive fad word. We spent six months trying to come up with a definition of it in Australia and we gave up. I think most other countries have given up too. So, we look at things like machine learning and the practical applications, taking a case study approach as a way of making it concrete and real and trying to take some of the fear out of it. I noted with interest the Japanese Director General talking earlier this week about how there's a conversation about shared views of artificial intelligence, but we have different societal reasons to be grasping with this. They have a future of work challenge that the European context doesn't have. It's a bit dynamic in Australia as well.

We don't have quite an ageing population. I think there's different challenges we need to be mindful of when thinking about how to collaborate.

Erich Prem: Thank you. Any questions from the audience? Stan, do you feel left out in this discussion because of your research focuses or do you see still opportunities to go ahead? Because you mentioned that the phenomena that you talked about are, without any doubt, global.

Stan Karanasios: For sure.

Erich Prem: You even went so far as to say that maybe in the future we need ambassadors to the companies.

Stan Karanasios: That's the discussion we had yesterday. But I agree totally with what the other speakers have said. As academics, for us, I think often we are married to the discipline. And being married to a discipline, we find ways to circumvent barriers that may exist for international collaboration. That is true for us. But having said that, having agreements in place with European institutions and frameworks makes our life a lot easier, and make our collaborations a lot more fruitful as well, which I think is important for some of the challenges that we've been discussing.

One point I would like to make is: yesterday I was speaking over dinner with a colleague from Germany who made the point that because Australia is small, and our cities are small, that it's very difficult to collaborate with organisations. And I thought to myself, that's a bit strange. So, I went home and did a Google search. If Australia was in the EU, the largest cities in the EU would be London, then Melbourne, then Sydney, then Berlin. So, we have quite big cities: 4-5 million people, which means that there is a concentration of firms, of excellence, of institutions for fruitful collaborations as well. So, I thought I'd like to put that straight.

Erich Prem: Thank you for that. I remember a conference in Wellington where they showed a picture of a big city where the traffic completely breaks down every morning. It was Wellington, and then everybody was laughing at the big city, but that doesn't mean that the traffic can't be bad, really. So, I think that's good.

Audience Member: I've heard so much about artificial intelligence. I'm from Hewlett Packard Enterprise, so my question is twofold: what about industry involvement because you're speaking more about research or collaboration, and what about cyber security instruments particularly?

Melon Gupta: My name is Melon Gupta from Eurescom. We are a private research organisation very heavily involved in the 5G PPP programme in Europe. My question is, is there any kind of collaboration in the 5G area with any of the countries here at the table?

Erich Prem: Difficult questions to end: 5G, cyber security? Sorry, what was the other one data?

Audience Member: Industrial involvement.

Erich Prem: Industrial involvement I can give to Peter, very quickly, as an example.

Peter Rose: What was the question exactly?

Audience Member: You talked a lot about research collaboration in industry; but what about industry cooperation?

Peter Rose: Most of our area is not so much research – probably only about 10% of our business. Most of it is actually applications for industry. In AI, we're focused on this area of Earth observation data, so drone, satellite and aerial imagery, extracting information from that to help industry, our customers, who are often the public sector, and public authorities to make better decisions. So, looking at change detection, looking at how much cities are growing is a big factor, and monitoring, let's say, competitors as well, so also monitoring outside countries - that's quite interesting for our customers.

Erich Prem: I think it's fair to say Thyssen Group is one of your customers in Germany, so there's no doubt about a good level of industrial collaboration.

Peter Rose: Yes, one of our customers is Thyssen Group. For them, we -- I don't need to tell you -- we use drones, so with them we do feature extraction from drone images. We convert the drone imagery to a 3-D mesh and we feature extraction from that, and we do that to automate progress tracking. They have very, very large construction sites. One of them that we've been working on, I think is the largest cement factory in the world. It's around a 1 billion euro build, and it's to automate the process of monitoring progress on that. So, automate the drone flight, automate the 3D modelling and the feature extraction from that and the comparison to the plan build and then completely -- the outcome is a progress tracking.

Erich Prem: Thank you, Peter. I'm sorry, we have to stop here. I suggest we take up the question bilaterally, because we still have time, but I want to release Jean-Yves, who must catch a plane. Some, I think, rather coherent topics have emerged, and I guess we're looking forward to still fostering the collaboration between the EU and the three regions. Thank you all so much for being here.