



# JRC CONFERENCE AND WORKSHOP REPORTS

## Internet of Things: Implications for Governance

*Report*

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## **Abstract**

This JRC report summarizes the contributions and discussions of the 4<sup>th</sup> DigiTranScope workshop, held in Ljubljana, Slovenia, on March 13 and 14, 2019. Participants from academia, industry, consultancy firms and public sector attended the workshop, which examined the Internet of Things and its implications for governance. This is the second theme of the DigiTranScope project which concerns the challenges for governance of the massive connectedness of people, objects, and devices capable of sharing information, data and resources and interacting with the surrounding environment. The relevance of the theme emerge from the significant role played by the IoT in the context of what is often referred to as smart or intelligent government, which is considered a highest modernization phase of the public sector. Therefore, all over in the world, governments look at the IoT as a source of growth and innovation, trying to tap its potential to improve the use of public resources and increase the effectiveness of public services.

The two-day workshop consisted of three topical sessions which were meant to provide an exchange of information and experience on the following themes:

1. Agency of the IoT Network and Locus of Control
2. Shifting the Balance and Change of Data Ownership
3. New Forms of Governance – Looking Forward

From the presentations and the discussions held during the workshop, we have identified the emergence of four major challenges for governance arisen from the implementation of the IoT:

1) The IoT can radically change the relationships between humans and the interconnected devices, giving objects autonomy towards humans. To prevent this risk from materializing, governance interventions are necessary to address and regulate the ethical challenges that the IoT/enabled AI applications potentially bring with them, issues including autonomy, safety, equity, accountability and lack of fairness.

2) The role that EU regulation should play is critical. With respect to businesses working in the field of IoT, participants discussed whether this regulation was more a hindrance than a support for them. While regulation was deemed necessary, the concern was that it does not help European businesses to succeed, while other countries raise barriers to prevent competitors from taking market shares. However, it was also noted that regulation should not just play the role of fixing market failures

but also that of orienting technological development and generating public value.

3) From a business perspective, it was noted that Europe needs a system which is better at fostering innovation and tolerating failure. The existing model of public procurement was seen as unsuitable for the processes leading to innovations. For example, too many criteria are established in advance, which hinder innovation. Many public tenders define the "how" functions should be designed, instead of focusing on the "what" the application should achieve.

4) The participants noted that small scale/local context is "where everything happens" nowadays, but the European level is extremely important too. Opportunities of using IoT data for solving social issues (e.g., aging, health) and improve citizens' quality of life arise in small scale contexts, because it is easier putting people into the equation and couple local communities with technology. The local context support innovation better as well.

Participants concluded that the technical features of the IoT can have significant public policy implications and strong divergences emerged about the role of European regulation during the workshop. This is because, on the one hand, regulation protects human rights such as users' integrity, security and data protection rights; on the other hand, it also affects other stakeholders, including companies conducting business on IoT, whose economic concerns also need to be taken into account. Building trust in the IoT and its governance is crucial to tap the potential of the IoT as a source of economic growth and innovation. While the innovation potential of the IoT should be maintained with a stronger support of the public sector, regulatory interventions should also be taken to protect identified public interest objectives such as to ensure the respect for human rights, fundamental freedoms and democratic values as well as linguistic and cultural diversity and care for vulnerable persons.

## 1 About DigiTranScope and the JRC CAS

The workshop was the fourth event of the project **DigiTranScope: Digital Transformation and the Governance of Human Society** (2018-2020) at the **JRC Centre for Advanced Studies**. In this introductory section we would like to provide some brief information about the specific project in which the workshop was developed, the DigiTranScope Project. This project has been developed to:

- Reflect, and respond to, Commission policy challenges about the future governance of a digitally transformed European society in a global context;
- Bring together key researchers and thinkers from around the world to explore the deep transformations triggered by the adoption and adaptation of digital technologies in public and private institutions at multiple levels, and in the organisational fabric of society;
- Undertake robust scientific research to raise understanding of the dimensions, directions, and implications for the governance of human societies which often are in different stages of digital transformation.

The project looks at the transversal issues that will be important in the future development of European society. The **overarching research/policy challenge** is “How can a deep understanding of digital transformation help policy-makers address the challenges facing EU society over the next decades?”.

The project addresses these four themes:

- Changing flows, ownership of data and strategies to maximise European benefits;
- Key policy challenges of the agency of the Internet of Things (IoT);
- Skills needed to live fulfilling lives in a rapidly changing world;
- Assessment of the appropriate models, structures, and scales of governance in a digitally transformed society.

More information about the project and all the presentations of the present workshop can be found in the project's website: <https://ec.europa.eu/jrc/communities/community/digitranscope-digital-transformation-and-governance-human-society>

DigiTranScope is carried out in the JRC Centre for Advanced Studies (JRC-CAS) has been established to enhance the JRC's capabilities to meet emerging challenges at the science-policy interface.

Within an interdisciplinary environment, the centre collaborates with leading universities and research institutions across the EU and worldwide and performs cutting edge research to explore topics of societal importance. Research is carried out in thematic areas of relevance to EU policy, including areas of a long term strategic nature. By specifically addressing ideas and knowledge in emerging fields across different scientific and technological disciplines, the centre will become an incubator for activities providing new insights, data, projections and solutions for complex and long-term challenges for the EU and our societies as a whole.

## 2 Rationale and Goals of the Workshop

This workshop covered the second theme of the project which concerns the challenges for governance of the massive connectedness of people, objects, and devices capable of sharing information, data and resources and interacting with the surrounding environment. IoT governance has been referred to as the "*development and application by Governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet*"<sup>1</sup>.

The massive network of people, objects and devices, combined with the capabilities of Artificial Intelligence based on big data, can permeate every aspect of our daily life, from waste management to mobility and personal health. Smart phones, cloud computing, RFID (radio-frequency identification) technology, and sensors are converging to make possible a new generation of embedded and immersive technology. The challenges posed by this phenomenon are enormous, and the public sector appears to be a promising application area for the IoT. The IoT plays a significant role in the context of what is often referred to as smart or intelligent government, which is considered a highest modernization phase of the public sector. Therefore, all over in the world, governments look at the IoT as a source of growth and innovation, trying to tap its potential to improve the use of public resources and increase the effectiveness of public services (Wirtz, Weyerer, & Schichtel, 2019).

The workshop consisted of three topical sessions which were meant to provide an exchange of information and experience on the following themes:

4. Agency of the IoT Network and Locus of Control
5. Shifting the Balance and Change of Data Ownership
6. New Forms of Governance – Looking Forward

The two-day workshop involved presentations from ten invited experts about ongoing cases of the implementation of IoT, as well as conceptual reflections and considerations. Plenary discussions and two break-out sessions allowed all participants to raise questions, and share ideas and insights around the main topics of the workshop. A rapporteur reviewed the main points and the lessons learnt at the end of each break-out session. The main part of this report provides a summary of the presentations, and the key issues and lessons learnt emerged from the

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<sup>1</sup> Definition used by Florent Frederix, Head of 'RFID' Sector INFOS D4, European Commission, in his presentation on an IoT governance roadmap given on June 30, 2011, Brussels, Belgium.



discussion and the two break-out sessions. Summaries of the presentations are introduced by the rationale for the session in which they were given.



### 3 Summary of the Presentations

#### 3.1 Agency of the IoT Network and Locus of Control

IoT is an evolution of machine-to-machine communication (M2M) – machines connecting to each other via communication networks without human interaction (e.g., metering, ATM/ and POS devices). What was mainly a communication network has now become a network of smart devices embedded into material things we interact with in our everyday roles. An IoT massive ecosystem is emerging, in which all devices and real-world objects can "act" as intelligent agents, communicating, exchanging data, interacting with people and creating knowledge. This ecosystem becomes an "actor" in its own right, as the capacity to act is distributed across a wide array of objects and devices. This invisible web of data operates according to human design but without human intervention. For example, self-regulating appliances can communicate with other self-regulating appliances across a specialized network, sharing information about their processes to minimize energy consumption. This situation opens questions relevant for governance. We focused on two interconnected issues: agency and control.

The four presentations during this session were:

1. *(Human) Agency in the IoT: Ângela Guimarães Pereira*, EU Joint Research Centre, Ispra, Italy.
2. *Better IoT: A Bottom-up Framework for Better #IoT development for startups*: Alexandra Deschamps-Sonsino, Designswarm, UK.
3. *Physical Twins?* Egon Milanic, Ministry of Public Administration, Republic of Slovenia.
4. *Massive Data Integration for Service Gain: IoT and the Smart City*: Peter Lloyd, Peter Lloyd Associates, and Michael Blakemore, Ecorys, UK.

As the IoT blurs the boundaries between humans and technologies, **Ângela Guimarães Pereira** emphasized the importance of an ethical analysis of the IoT. As personal information and data will be increasingly located, identified and monitored through even mundane technologies, such as a dishwasher, for example, Guimarães Pereira argued that this situation raises several ethical issues. Such issues include explicit and maleficent dual use; unconsented and concealed surveillance and data transactions; algorithmic or human decisions taken on behalf of people, or decisions based on unverifiable data collection; possibility for discriminatory treatment of people targeted; and lack of proportionality between costs and benefits.

In her talk, she presented power and control as two dimensions of the imaginary of techno-scientific innovation: they are expressions of what techno-science makes it possible to achieve through the manipulation of tangible and intangible resources and the enhancement of intelligence and capacity to act effectively in our surrounding environment. She emphasised the importance of *interrogation* about the design of IoT, asking questions about the ethics we wish to have embedded "by design in technological artefacts". Specifically, interrogation is deemed important when humans cannot fully control the intentionality of actions delegated to technologies and see their integrity and freedom potentially compromised by that uncontrolled intentionality. The "incompetence trap" was presented as another concern for interrogation. This happens when technologies do what people could do themselves, de-skilling them and making them more dependent on experts and tools (Guimarães Pereira, Benessia & Curvelo, 2013).

Aspects concerning the design and development of the IoT technologies were examined by **Alexandra Deschamps-Sonsino**, who presented the case of BetterIoT. BetterIoT is a community-led effort to make a free, accessible and open assessment tool aimed at startups and SMEs to help them design better IoT. The BetterIoT community promotes a set of principles addressing product manufacturers who wish to make responsible, secure, and well-designed connected products. Aware of the potential risk IoT technologies carry in terms of delivering a totalitarian control society and making users powerless, an assessment tool was developed based on the Better IoT principles. These address some critical issues for IoT products, such as privacy, licensing provisions, openness, interoperability, lifecycle, permissions, transparency, data governance and security. The assessment tool is ready for anyone to use, is free and available online at <https://betteriot.wordpress.com/tool/>. Deschamps-Sonsino also observed the short lifecycle of most small IoT startups claiming that 80% of businesses producing connected products fail in 2 years, or they are acquired by big high tech corporations.

In their presentation, **Peter Lloyd** and **Michael Blakemore** focused on IoT and the development of Smart Cities - with Artificial Intelligence (AI) as a core underpinning both of them. They pointed to the dramatic shift in data production away from governments to the commercial sector, the shift of agency from humans to automated devices, and the supra-national character of security threats to data and identity, as data flows

are massive, corporate and global. As multinational private platforms own and control much of the data produced, some main concerns are about where data resides, who 'owns' it, who has rights to use it, and how to derive value from it. Lloyd and Blakemore used the example of Smart Cities as an area where the potential benefits deriving from the massively assembled and integrated data arising from the IoT are regularly trumpeted. While acknowledging the enormous possibilities offered by the IoT to improve the performance of urban services, such as energy, transportation and utilities, to reduce resource consumption, and to enhance the quality of living for its citizens, the presenters also suggested a critical perspective. In line with the critical debate developed around the notion of smart cities, and following Calzada (2018) - they questioned the "one-size-fits-all, smart-city-in-the-box paradigm" which does not take into account the diversity of contexts. They also explored the critique that the smart city can look like a corporate project primarily responding to profit interests (cfr. Kitchin, 2014; Hemment & Townsend, 2013; Luque-Ayala & Marvin, 2015). An important component of the presentation (see the paper presented for the workshop) was to highlight the growth of a number of cities seeking to assert greater control for citizens - both of the data sources and of the purposes to which they are put. The DECODE Group - including Barcelona, Amsterdam and New York - was described as an instructive example where the undoubted benefits of the smart city concept can be captured but without the raising the same concerns about loss of control. They concluded by exploring a number of technical and governance approaches to capture the right balance between enhanced productivity and service efficiency and democratic participation.

**Egon Milanic** pointed to the "black box problem" of AI. As algorithms are capable of learning from massive amounts of data, once data is internalized, algorithms are capable of making decisions experientially or intuitively like humans. This means that computers no longer just execute detailed pre-written instructions but can find solutions to problems based on patterns in data that humans may not even be able to perceive. The implications of this inability to understand the decision-making process of AI are profound. If an AI program is a black box, it will make predictions and decisions as humans do, but without being able to communicate its reasons for doing so. In his presentation, Milanic asked whether it would be possible to add risk management to augment the black box.

### 3.2 Shifting the Balance and Change of Data Ownership

IoT and Artificial Intelligence have increased the abilities of businesses to capture, store and analyse large amounts of data every day, from consumer behavior to predictive analytics. Businesses use several sources to capture and process customer data, from socio-economic data to behavioural data. One example is location-based advertising, which uses an internet-connected device's IP address (and the other devices it interacts with) to build a personalised data profile. This information is then used to target users' devices with personalized advertising. Since so much real-time consumer data is captured and analysed every day, most of the public sector data seems now superfluous for the private sector. Another controversial topic concerns the ownership of the massive amount of data created via the IoT. The three presentations during this session were:

1. *My Digital Footprint: How to Open and Share It?* Aleš Veršič, Ministry of Public Administration, Republic of Slovenia.
2. *Location Intelligence and IoT: What is Needed.* Michael Bueltmann, HERE Deutschland GmbH.
3. *IoT: A Geospatial Industry Perspective.* Marc Melvies, Hexagon, Belgium.

**Aleš Veršič** talked about the notion of digital footprint, which could be defined as the aggregated data assigned to an individual derived from his/her traceable behaviour and online presence (Micheli, Lutz & Buchi, 2018). He presented a digital footprint cycle, from data creation to use, sharing and destruction. He addressed the audience with several questions, such as where all our data go, what device providers do with the data we produce, whether we should give consent to device providers to share our data and whether we should have a platform for sharing the data we produce.

As a Managing Director of HERE, **Michael Bueltmann** pointed to the seemingly limitless possibilities his company, which has more than 30 years of experience in mapping and location technology, sees in the development of IoT. In his presentation he touched upon two areas: automation, and location intelligent services. Regarding the former, he made it clear that the products they create would not be possible without edge computing sending them back data produced by IoT devices. For example, their traffic service is produced from live data from phones and cars, among other devices. In the near future, every single service they offer will be built on maps sustained with feedback loops like this.

Regarding the latter, location intelligent services, organisations are using location data to unlock value and tackle big societal problems and can now plan against a world they know better than ever before, layering their own data on top of it. Bueltmann gave the example of supply chains to show how HERE helped supply chain managers tackle long-time problems by combining their global map with their positioning technology. The company created tracking technology able to allow accurate tracking even under the most challenging conditions as well as in factories, warehouses and parking garages where GPS cannot reach. He concluded that, as in everything in IoT, ensuring customer privacy is critical. Therefore, in his company, they think about privacy from the very beginning of designing and developing the technology.

Another business perspective was presented by **Marc Melvies**, who talked about the requirements for designing and developing safety-critical software for the defence sector at Hexagon. He mentioned that, while humans only see point "A" and the destination point "B", machines collect data as they move for their own navigational needs, with millimetric precision in 3D. In this example, data is only required in real time by the vehicle. However, the data could eventually also be stored for later retrieval and use. He pointed out that at Hexagon they have more data and information than they can actually handle, and there is not a client that needs all the information they can provide. He ironically defined this circumstance as "having solutions without problems".

Hexagon designs applications with open API and follows open standards, as they believe today businesses cannot afford to have their own standard ("if we each continue to speak different languages this will all collapse very quickly"). However, Melvies claimed that it is difficult to make profit out of open data alone. Whilst open data is a must, open data by itself does not create added value. And it is added value that enables a business to invest in R&D, hire more employees, and do marketing. It was remarked that the model of open data does not help companies to grow and depends too much on the political side. It was concluded that the only way to make profit out of open data is to combine data from different sources ("fusing data"), hence integrating it with privately-held data, or other kinds of data.

### **3.3 : New Forms of Governance – Looking Forward**

The impending reality of the IoT affecting our daily lives opens questions related to future forms for governance. New approaches to privacy and

security will be needed, as intelligent devices embedded in the fabric of everyday life will move data to the Internet continuously without control of the data "owners" and/or subjects. This situation raises issues related to approaches to be taken, either regulatory (e.g., GDPR "privacy by default" and "right to be forgotten"), technological, or a mix. Other questions concern the quest for decentralized forms of network governance for a trusted IoT, accompanied by decentralized architectures offering more autonomy and better security.

The three presentations during this session were:

- *Cities as Platforms for IoT and Data Enabled Services*. Hanna Niemi-Hugaerts, Forum Virium Helsinki, Finland.
- *SynchroniCity: an IoT Digital Single Market for Europe*. Paolo Fosci, Municipality of Milan, Italy.
- *Urgent Upgrade: Safeguarding Public Values in the Digital Society* Dhoya Snijders, Rathenau Instituut, Netherlands

**Hanna Niemi-Hugaerts** presented the idea of the city as a platform rooted in openness. She shared her work at Forum Virium Helsinki, an innovation unit within the Helsinki City organisation that develops new digital services in cooperation with companies, other City of Helsinki units, and residents. The Helsinki region launched its open data catalog in 2011 and started to develop engagement activities in 2012. Forum Virium has been in charge of implementing the strategy of the city of Helsinki by promoting openness, democracy, and inclusion through open data. A number of creative apps and services have been developed in collaboration with citizens, and through open interaction between public authorities and citizens. At the same time, open data was also used to develop business opportunities. The plethora of newly initiated projects and platforms reflects the strategic plans of the city to make Helsinki a smart city. Some of the innovation platforms Helsinki is known for include Smart Kalasatama and intelligent transport pilots. The Smart Kalasatama Energy system, built in the Kalasatama (Fish Harbour) quarter of Helsinki is expected to be the world's smartest energy system. The smart energy system uses local solar power, an infrastructure that supports electric vehicle use, energy storage facilities, and energy-efficient building automation.

Niemi-Hugaerts also mentioned the MyData principles, upon which most of the work in the city of Helsinki is based. The MyData Global Network is a non-profit organisation whose mission is "to empower individuals by



improving their right to self-determination regarding their personal data" (<https://mydata.org>). Members of this community promote a human-centric paradigm for personal data management, based on trust and empowerment. The MyData approach aims at strengthening digital human rights while also opening new opportunities for businesses to develop innovative personal data based services built on mutual trust. She concluded presenting some key areas Forum Virium will focus on in the future, such as the identification of best practices, business & investment models, policies and legislation for smartening up the infrastructure and ensuring connectivity, empowering citizens and ensuring "business and innovation friendliness", among the other areas.

**Paolo Fosci** presented SynchroniCity, a project funded under Europe's Horizon 2020 programme created to help cities simplify the adoption of new services that tackle urban challenges using Internet of Things (IoT) and data technologies (<https://synchronicity-iot.eu/>). The core of the SynchroniCity project is the adoption of the Minimum Interoperability Mechanisms (MIMs) defined by the Open & Agile Smart Cities (OASC) network. MIMs consist of adopting common shared data-models, common access APIs and a common platform model to publish data. The involvement of Milano into the SynchroniCity project revolves around two main goals: (a) Developing internal pilot application on the following use-cases, such as Human-centric traffic management, multi-modal transportation and community policy suite, (b) financing a 3M€ open call to select SMEs to develop new applications and IoT services of interest for citizens.

Fosci illustrated the pilot project conducted in Milan and mentioned the several issues encountered during its implementation. He mentioned technical issues, such as converting data from original sources into a new data model, but he stressed that organisational issues, both internal and external, were indeed more hindering than technical ones for the realisation of SynchroniCity project. There is still some sort of resistance in sharing data both from internal departments of the Municipality and from external operators. Reasons range from GDPR related issues to data governance aspects, but in general there is a lack of vision by the data-providers of the benefits deriving from sharing and integrating different data.

**Dhoya Snijders'** presentation revolved around the societal and ethical issues raised by the digitization of society and the possibilities to shape the current governance landscape around such issues. In this regard, he

mentioned a study conducted by the Rathenau Instituut following a request from the Dutch Senate to chart the societal and ethical issues - privacy, autonomy, safety and security, human dignity and balance of power - around the digitization of society and explore to what extent these issues are embedded in Dutch institutions. As a result of this study, the Senate concluded that the unstoppable development of the IoT *"will present opportunities for society, but also poses threats and considers that the impact of this digital development on society is not just technological, but also societal, socio-legal and socio-psychological."*

Regarding policy implementation, the Rathenau Instituut examined how regulators and review committees ensure that the rules, standards and laws set forth by policy makers and politicians are enforced. Snijders presented several actions to be taken to strengthen the role and position of supervisory bodies, that is, government-appointed, independent and impartial institutions that supervise compliance with legislation and regulations. An action recommended was drawing up a 'Digitization Agreement' formulating the commitments and responsibilities of businesses, government, and civil society actors with regard to safeguarding public values in the digital society. It was also recommended the appointment of a working group charged with shaping a government vision on how to deal with the societal and ethical significance of digitization, and with ensuring coordination in the political-governance domain.

## **4 Analytical Overview**

Through presentations by experts, discussions and two break-out sessions, the workshop aimed at developing an initial understanding of the governance challenges for the IoT, as well as the opportunities that the IoT can create for new forms of governance, including the private and the public sector and civil society. This section presents an analytical overview of four main themes that emerged from the workshop.

### **4.1 Developing a Human-Centric IoT that Puts Societal Needs First**

As IoT, combined with the capabilities of Artificial Intelligence based on big data, will become more sophisticated and autonomous, data collected by IoT devices can be misused and lead to unfairness and potential discriminations against users. There is also a risk that the algorithms and models driving the activity of the interconnected objects make important decisions on our behalf. IoT, like all technology, is not neutral, reflecting the goals and intentions of designers. A warning had also come from the European Group on Ethics in Science and New Technologies (2012), an independent advisory body of the European Commission, which asserted that the IoT can radically change the relationships between humans and the interconnected devices, giving objects autonomy towards humans. To prevent this risk from materializing, governance interventions are necessary to address and regulate the ethical challenges that the IoT/enabled AI applications potentially bring with them, issues including autonomy, safety, equity, accountability and lack of fairness (Kankanhalli, Charalabidis, & Mellouli, 2018).

From the analysis, the following key elements emerged, which are relevant for the design of a human-centric IoT:

- *We should always ask who benefits from technological innovation and what interests are being served.* Attending to societal needs implies thinking about the characteristics of social groups targeted by the IoT. For example, the next IoT for cities and urban planning should identify and take into account target groups and the impact IoT will have on them, such as IoT urban services beneficial for disadvantaged groups. The cases of Milan and Helsinki were provided: in Milan, the project Synchronicity runs a pilot on human-centric traffic management involving multi-modal transportation and the development of a traffic navigation tool for disabled people capable to inform users about specific facilities. In Helsinki, a service has been created to inform about places available on buses for children in strollers and disabled people.

- *Relevance for people.* We collect massive data but do we need it all? A critical stance on the usefulness of IoT data would help assess whether it can help solve or improve a societal problem. Will data actually be helpful or other non-technological measures could be more effective? In this regard, the example of smart TVs was brought up. Data collection on smart TVs can show if a person is isolated spending all day watching TV. This evidence could be useful for social services, but they are not in a position to get this data. As remarked by one participant, there is a lot of discussion about aging and using technology at home, but putting more technology is the least thing to do. Multigenerational households should be encouraged instead, or other measures, not necessarily technological, may be more helpful. "Opportunity costs" were also mentioned. For example, smart cities focus on making traditional networks and services more efficient with the use of digital and telecommunication technologies. Smart cities focus more on technology than societal issues the solutions of which would improve citizens' quality of life. In such a case, a question can be whether public money is well spent. One answer to this question was that "We should be very clear of our objectives", as time spent for smart service is not spent for other public tasks.
- *Privacy is not just about protection, but also about giving control to citizens.* It was acknowledged that privacy means more than protection of personal data, as it implies that citizens should have control over their data and decide how data is used. An example of data governance along these lines is the City of Helsinki, which is committed to MyData principles (<https://mydata.org/finland/>), an approach that combines privacy protection with citizens empowerment and societal benefits.
- *Building confidence.* It is necessary to build trust with citizens as they have started to develop awareness and scepticism. Compared to the findings of similar studies conducted ten years ago, a Rathenau study on citizen perspectives on the use of sensors (e.g., facial recognition) found that citizens are now more aware of these issues and talk more about how data is being stored and handled. In the Netherlands, the city of Eindhoven decided not to run a pilot project on tracking bike rides to avoid possible criticism, as citizens have become increasingly aware of issues related to tracking.

Building connections and increase accountability are necessary to get citizen trust back (see also Jameson, Richter & Taylor, 2019).

#### **4.2 Need for a Supportive System for Innovation**

This point of discussion is closely related to the previous one. From the analysis, the following key elements emerged:

- *Regulation should support companies.* One of the main points of discussion was the role that EU regulation should play. With respect to businesses working in the field of IoT, participants discussed whether this regulation was more a hindrance than a support for them. While regulation was deemed necessary, the concern was that it does not help European businesses to succeed, while other countries raise barriers to prevent competitors from taking market shares. Participants were divided on this topic as they were wondering whether the EU overregulates some matters while under-regulate others. However, it was also noted that regulation should not just play the role of fixing market failures but also that of orienting technological development and generating public value. In this regard, there is a big debate led by Mazzucato (2018) on the role of public policy and the importance of the public sector to redefine how we measure value in our society.
- *Breaking down silos.* Because every organisation in the public sector has its own budget, there is a dominant silo culture in public procurement that hinders innovation. Overcoming this culture is difficult. Estonia was cited as a good example of how to overcome it by appointing a Government CIO who is the same for enterprises and the public sector. This element ties well with previous studies on IoT acknowledging the importance of partnerships between governments and the public sector and IoT suppliers, including software developers, hardware producers and data analysts (see, for example, Dijkman, Sprenkels, Peeters, & Janssen, 2015).
- *Critical view of open data.* Open data was considered good for innovation but not for developing sustainable businesses, unless it is combined with other data. From a business perspective, open data were seen as valuable but unhelpful to grow and make profit. They provide services but cannot provide added value which enables businesses to invest in R&D, hire more employees, do marketing and so on. The model of open data was seen as too dependent on the political side. It was said that if the state takes interests into this model, then half the problem is solved. The only way to make profit out of open data is to combine different sources of data. The

experience of Forum Virium Helsinki brought up a similar view, noting that open data can provide business opportunities and not only applications. Forum Virium has 100 business cases that show that open data can be good to do business, although open data per se is not sufficient, *“but when you combine it with or buy other data that’s where the sweet spot is...”*. Other types of data businesses need include real-time data, personal data, and new types of data.

#### **4.3 The Role of the Public Sector in Governing IoT Data**

From the analysis, the following key elements emerged:

- *Accessibility and non-compliance with contracts.* Massive data of public interest is available but not accessible yet to public bodies. It was noted that there can be a struggle to get data from public-managed companies. The struggle indicates a conflict of views and responsibilities. For example, public-managed companies lament a general lack of vision of the single data-provider about the benefits deriving from integrating different data from different sources. Another reported problem was the non-compliance with data sharing agreements between the public sector and other actors. In Milan, it was noted that the private sector sometimes perceives the public administration as a competitor or does not comply with agreements.
- *Need for more flexibility from the public sector.* From a business perspective, it was noted that Europe needs a system which is better at fostering innovation and tolerating failure. The public sector should invest more in the private sector, similarly to what happens in the USA and Israel. It was recounted that in Israel, for each public dollar collected from the private sector, three dollars come from the public sector. The existing model of public procurement was seen as unsuitable for the processes leading to innovations. For example, too many criteria are established in advance, which hinder innovation (Senor & Singer, 2009). Many public tenders define the “how” functions should be designed, instead of focusing on the “what” the application should achieve. This is in total contradiction with the modern development methods such as the Agile method. To innovate one cannot have to set everything in advance, for instance while one develops a software, s/he may find better solutions that allow saving money but s/he cannot do it because such solutions were not set in the requirements. This view resonates with a recent study conducted in the USA indicating that the federal government has been strategic and forward-thinking in funding and partnering with sub-national governments and communities to promote the use of IoT technologies

and services to address problems such as energy costs and traffic congestion (Chatfield & Reddick, 2018, p. 355).

#### **4.4 Context Matters**

The key element here is that participants noted that small scale/local context is "where everything happens" nowadays, but the European level is extremely important too. Opportunities of using IoT data for solving social issues (e.g., aging, health) and improve citizens' quality of life arise in small scale contexts, because it is easier putting people into the equation and couple local communities with technology. The local context support innovation better as well. Some cities with a future-looking approach, such as Belfast and Tallinn, seem to have a stronger sense of urgency than others. Other cities like Helsinki and Leuven have become innovation hubs providing opportunities for both cities and companies to develop more innovative products and services with the help of the hub and the surrounding ecosystem.

While these examples show that we are good at thinking and acting locally, it seems more difficult to find ways to solve issues at a larger scale (especially national).

#### **4.5 Conclusions**

There is a decade long history of discussion done by the European Commission regarding the "good governance" of IoT (Frederix, 2011)<sup>2</sup>. This topic, however, has a new momentum today due to advancements in artificial intelligence and increasing collection of massive amount of data by private companies. During the two days of the workshop, the importance of data governance and an adequate understanding of the agency of humans and devices have been acknowledged. The technical features of the IoT can have significant public policy implications and strong divergences emerged about the role of European regulation during the workshop. This is because, on the one hand, regulation protects human rights such as users' integrity, security and data protection rights; on the other hand, it also affects other stakeholders, including companies conducting business on IoT, whose economic concerns also need to be taken into account. Building trust in the IoT and its governance is crucial to tap the potential of the IoT as a source of economic growth and innovation. While the innovation potential of the IoT should be maintained with a stronger support of the public sector, regulatory interventions

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<sup>2</sup> Frederix (2011) presented a timeline of the history of the European IoT Policy starting in 2009 with the Opinion of the European Economic and Social Committee on the 'Proposal for a directive of the European Parliament and of the Council on certain aspects concerning contracts for the supply of digital content' (COM(2015) 634 final – 2015/0287 (COD)).

should also be taken to protect identified public interest objectives such as to ensure the respect for human rights, fundamental freedoms and democratic values as well as linguistic and cultural diversity and care for vulnerable persons.

Please follow the developments of the project on:

<https://ec.europa.eu/jrc/communities/community/digitranscope>



## 4.6 References

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## 5 Annex 1. List of Participants

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