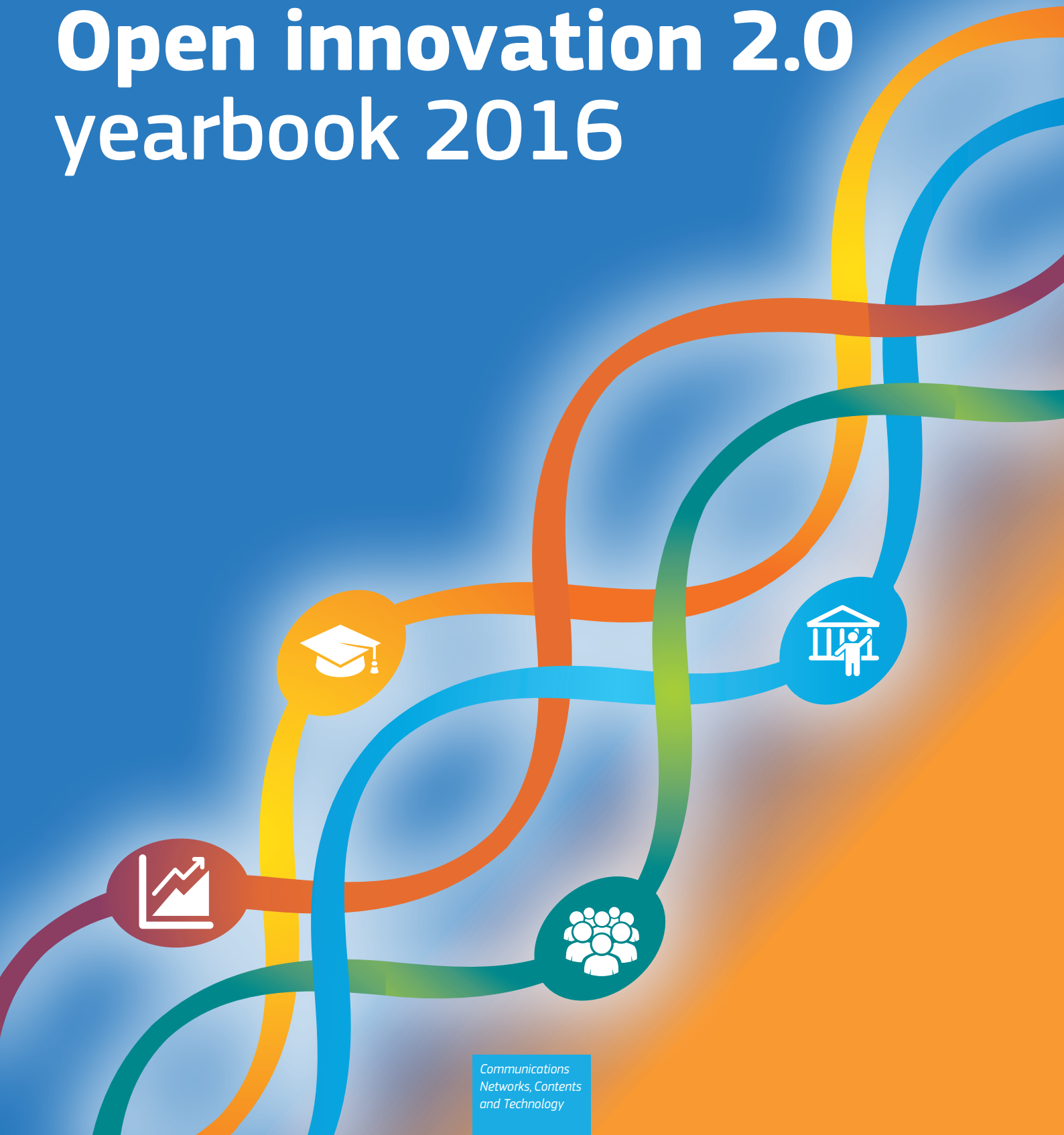




# Open innovation 2.0 yearbook 2016



## Designing a smart society

### *From smart cities to smart societies*

The awareness that cities need to react to new, disruptive transformations and become smart and sustainable is being put into practice. More and more cities are applying the Open Innovation 2.0 (OI2) principles as a new approach to today's innovation challenges [1]. These are caused by the digitisation of society and the associated disruptive technology solutions, forcing us to reconsider how technology can best be applied to create a better quality of life. Redesigning the city for the digital era means redesigning society at large, engaging citizens and other stakeholders in innovation, and actively seeking new connections between sectors [2]. In brief, this means redesigning in co-creation, going far beyond technical solutions alone.

### **Redefining 'smart'**

'Smart' is not just about technology. Although technological development enables new facilities that were not available before, smart solutions also improve liveability and contribute to a vibrant and sustainable city for citizens. But most of all, smart solutions enable citizens themselves to actively produce societal value, instead of simply being passive consumers of services provided by the government. Redefining smart cities with a focus on creating quality of life for and by citizens implies creating a smart society. This transformation poses a new design challenge: how to engage all citizens so they use the new facilities and actively take part in creating a higher quality of life for themselves and others?

Resilience is an important factor in the smart city philosophy. Instead of believing that everything can be engineered and controlled, we have to accept uncertainty. This affects the (new) solutions and systems that we design, but it also affects the citizens themselves. Future city residents have to be prepared to deal with unexpected, disruptive events; they must be able to consciously adapt their behaviour, and they must value personal development. The challenge lies in giving *participating citizens* the space and opportunities to become enthusiastic, and to be involved. This requires smart systems, offering and co-creating human-centred, personalised services. These should meet people's needs, using a shared platform that contributes to economic resilience. But it also requires rethinking the participation process, to ensure the support and active involvement of all citizens in the transformation process.

### **Redesigning the 'rules of the game'**

To make sure the new technology solutions are people centric and technology enabled, and not

just technology driven, we need to define the 'rules of the game'. When the digital and real world are blended, with the aim of improving the quality of life for citizens, we need to reconsider issues like standardisation, handling of data, privacy and openness in the public space from the perspective of societal value and ethics. We will need new instruments and frameworks to link the digital and physical spaces. In the same way as municipalities are responsible for safety in the public space, the new virtual layer on the public space also has to be designed with the principles of inclusiveness, openness, safety and accessibility in mind, to ensure the public interest, and at the same time as a prerequisite for active citizen participation.

In brief, the aim is a future scenario in which citizens live together well and unwanted developments are avoided. But how can we achieve this? How can we safeguard public interests? How can we deal with resistance to new technology, and protect people from undesirable commercial interests? How can we drive innovation and build an attractive economic climate in smart cities? And how can we achieve shared, efficient use of resources in the public domain to create higher societal value?

### **Redesign the approach**

Nobody knows what the future will look like, but it will most probably be disruptively different. We are going through a change process in which the traditional control changes from leadership to orchestration [3]. It may be tempting to wait until we have more clarity on the new solutions and the required approaches. In the city of Eindhoven we do not want to wait until things are clear, because by then, consciously or unconsciously, the rules of the game will have been set. This is urgent, because experiments have already started. So we have decided for collaborative experimentation. We believe that the path to the desired future can be reached by mixing innovative technology with creative design. So we adopt a design approach; starting from a basic vision, experimenting in different settings and collaborating with a number of stakeholders. This is what we mean by iterative co-design of the smart society.

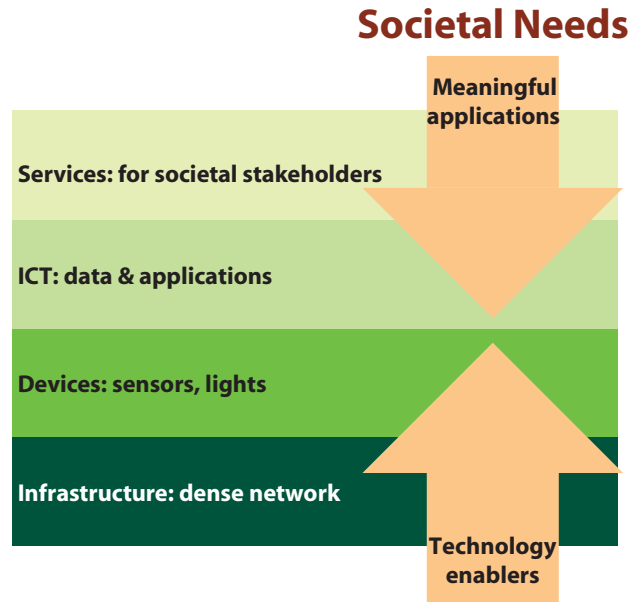
In the *Open Innovation 2.0 — Yearbook 2015* we describe the practical challenges in the paradigm shift to OI2 based on experience gained in real smart city projects [4]. This year our contribution — again in a cooperation between Eindhoven University of Technology (TU/e) and the Municipality of Eindhoven — continues along the bumpy path of innovation towards a smart and resilient society.

**The transition: from hardware to services via data**

In earlier contributions we emphasised that smart solutions use technology to create new applications.

These then become meaningful only if they address relevant societal needs. To explain the architecture of such smart systems, we introduced a four-layered model (Figure 1) [5; 6].

Figure 1: A four-layered model of smart systems [6]



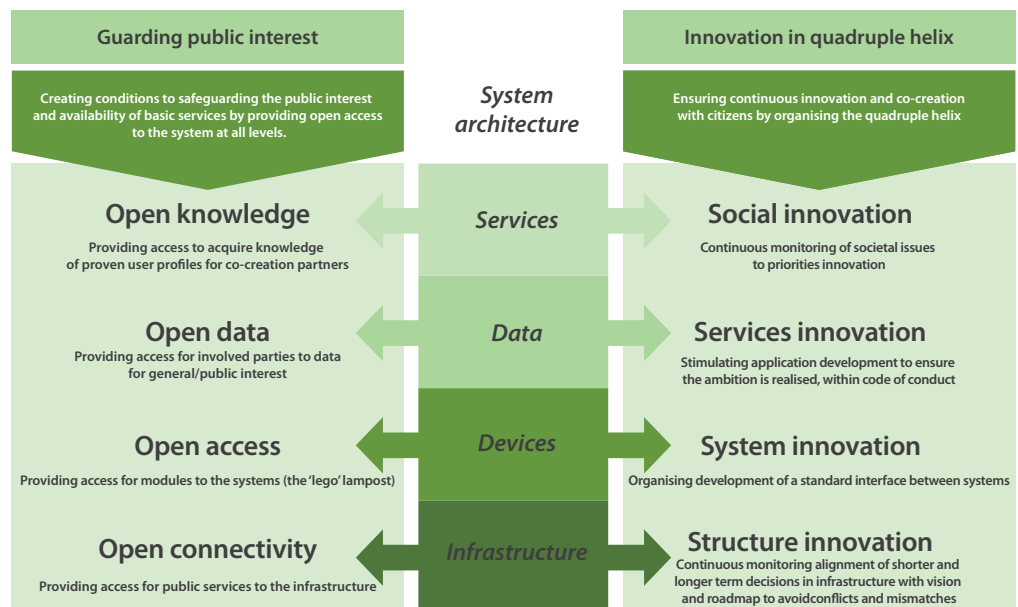
We argued that in the coming years innovation will take place at all four levels of this model (see Figure 2). Innovation can take place in the separate layers, but each layer also enables innovation in the levels above. To ensure innovation through the entire system, two aspects need to be addressed.

- The openness of the system (the left column in Figure 2) to ensure transparency and safeguard

public interest at all levels of the system. This requires innovation beyond contemporary business models, which in many cases are based on ownership of (parts of) the system.

- The orchestration of innovation (the right column in Figure 2) by organising the collaboration in the quadruple helix structure (consisting of citizens, industry, knowledge institutions and municipalities).

Figure 2: Prerequisites of innovation [5]



In the context of smart society innovation, municipalities have an important role in establishing the preconditions for innovation. By setting the right criteria in tenders for solutions to be implemented in the public space, they can safeguard public interest, cyber-safety and the availability of the basic services by providing open system access at all levels: connectivity to the public services infrastructure and access to the devices, to the data for public interest and to acquired knowledge. Municipalities can also decide not to invite tenders based on available solutions, but instead to use innovations or even a continuous innovation process in co-creation with citizens. By using the quadruple helix structure, innovation can be ensured at all levels of the system, together with the development of solutions for societal challenges that citizens regard as important.

In last year's contribution [4], we described several smart city projects and indicated the challenges in the transition to open innovation starting from societal needs. During 2015 we continued these projects and identified the crucial role of data. Measuring and monitoring systems in public spaces or social contexts generate data in the public space, which is not in itself a new phenomenon; traffic counts have been used for years. What is new is that intelligent technology enables applications beyond the specific goal for which the data is gathered. Secondly, until now data collection was limited to actions taken for public purposes, whereas nowadays public parties initiate sensoring in public space. And yet, this data plays a vital role in the transition to a smart society. So far, there has been little regulation of data collected in the public space. As a result, many companies design their business models around the collection and ownership of data, just as they do in other domains. But the public space is a different context in which people do not have an 'opt out', and privacy is a major concern. New business models are needed that respect privacy and give users of public spaces control of their own data.

Several studies of the future of smart and sustainable cities of 2050 [7; 8] indicate a desired future scenario in which ambient networks provide connectivity for (wireless) access to data and energy. These studies emphasise that citizens should be able to choose freely from a range of available options. The system ensures the privacy and security of users, who are always in control. Those systems are user focused: that means users can understand how the systems work, and there is a range of available solutions that plug in directly to the city's open platform. Cities offer a good balance in the quality of neighbourhoods and infrastructure, with affordable services for all income

levels. Experts interviewed in these studies indicate the need for democratised systems based on open data. Democratised means that the systems are open, bidirectional, multipurpose platforms on which (renewable) energy and energy management services are available to all.

Smart cities need a smart infrastructure. This 'Internet of Things'-like infrastructure serves a range of functions and aims. It enables the development of new services and empowers people as owners of data. But unfortunately we encounter challenges in current projects. These mean the roles and responsibilities of all the innovation partners are changing, so we have to redefine the rules of the game together while we are playing it. We recognise the need for a shared framework, and especially for data to ensure open, multipurpose, democratised platforms.

### **Creating new frameworks: open data principles**

Because developments in (open) data are still very new, regulations at national or European level are not yet available or are still insufficiently detailed. Most commercial companies now focus primarily on gaining ownership of data as a new business model. Most people are not yet aware of how this strategy will affect their privacy, and how it will limit the availability of services in their daily lives. Achieving Eindhoven's ambition of co-designing an open, multipurpose, democratised platform requires a clear position in relation to the ownership, openness and use of data gathered in the public domain. The aim is to safeguard public interest and to maximise value for society as a whole, rather than for individuals or companies.

The Municipality of Eindhoven has developed a set of open data principles, which serve as a first attempt to deal sensibly with data in the public space (see *Table 1*) [9]. These principles follow the policy that all data collected (unconsciously from the people), generated or monitored in the public space remains public property, and they prevent that data from being monopolised by any party or parties. Clear agreements about how data is managed benefit trust, transparency and acceptance of new technologies by citizens and businesses in the city. In this way, citizens are assured that their data will not be misused, and that the public interest is safeguarded.

Opening up data aims to promote innovation and to help create an attractive economic climate in the new smart society. The essence is that everyone can make money by using data from the public domain, but the data itself remain in public ownership, so that other parties (both public and private)

can use and re-use it. The open data of the City of Eindhoven is freely available [10]. Innovative applications of data and healthy competition should ensure a sustainable and self-sustaining ecosystem. The sharing of data aims at more efficient use of the city infrastructure, for example in terms of network capacity and sensors. The (literal) physical space is limited, and opening it encourages shared use of the facilities that are already there. By keeping data as public property, the city aims to secure the (yet unknown) added value of data for the public interest.

The city is currently working on embedding the principles in legislation to create a legal structure, in which undesired developments in the use of (open) data can be prevented. Defining the principles is a step in the iterative design process; we expect that by applying the principles in practice we will be confronted by new and unexpected situations, and that we will gain progressive insights that will require us to review the principles. These principles provide a start for constructive dialogue with the quadruple helix partners, and they will be adjusted as and when necessary in the course of the design process.

**Table 1:** Open data principles by the city of Eindhoven [9]

- a. Data residing in the public space (further on: data) belong to everyone. These data are an asset of the public. Data that are collected, generated or measured (for example by sensors that are placed in the public space) should be opened up such that everyone can make use of it for commercial and non-commercial purposes. While doing so, privacy and security aspects should be taken into consideration.
- b. Data may contain personal information. These data can therefore impact the private life of individuals. The rules specified in the Personal Data Protection Act are applicable here. These data may only be opened up after they have been processed (for example, by anonymization or aggregation) such that there are no privacy threats anymore.
- c. Data which do bring privacy or security risks along may only be used according to the privacy legislation. Storage and processing of these data should be performed according to the existing legislation.
- d. Data that do not contain personal information (anymore) should be placed such that everyone can access these data in an equal manner (for example, through an Open Data portal). We call this "opening up" the data. There should be no technical or juridical obstacles that limit, discriminate or block access to data.
- e. Data are always opened up free of charge, without unnecessary processing (as much as possible in a raw form) and according to the functional and technical requirements that are yet to be defined.
- f. A distinction is made with regard to personal data (such as an e-mail address or payment information) that are collected with full awareness and after an explicit consent of the individuals. Use of these data is defined by an agreement between the parties involved according to the rules of privacy legislation (such as an end user agreement).
- g. The city authorities always have an insight into which data is collected in the public space, independently of whether these data can or cannot be opened up.
- h. The city authorities keep an ongoing dialogue with the parties that contribute to the development of data infrastructure in the city and strive to create earning opportunities and a fruitful economic climate.

### *Next steps for Eindhoven in becoming a smart society*

The challenge on the path to a smart society is to (re-)design the game and the rules of the game. The open data principles are a first effort to do this. These principles should be reviewed in use to see if they actually lead to more innovation and have the ability to prevent undesired business models in public spaces.

At the same time this is a huge opportunity to develop local solutions that answer questions with a global impact. The municipalities, the companies and the knowledge institutions have the ambition to not only regard solutions as a 'local pilot project', but also to seek ways to increase their scale. This is needed to enable companies to develop sustainable businesses, but also to speed up the development of the platform and smart society services.

Given its size, Eindhoven would not be an attractive market on its own, but can serve as a front-runner. Solutions that work for Eindhoven cannot simply be transferred to other contexts: they need to be tuned to meet the new and specific local needs. But a smart platform will enable added-value services in different contexts, using similar hardware modules but with different services, settings and usage scenarios. This also makes it possible to adjust the services and solutions over time.

In Eindhoven, stakeholders are already used to working together in 'living labs', which allow innovative solutions to be designed and tested. To actively seek entirely new connections and solutions, and to scale solutions across sectors, all parties are willing to look beyond the pilot stage. Living labs are the ideal context in which to jointly practice design: to prototype, to test, to learn and

to discover step by step which elements work. The next challenge for living labs will also be to learn about the concepts and requirements that facilitate success (the rules of the game) and to facilitate the adjustment and enrolment in new contexts, in a continuing iterative process. This aims at eventually up-scaling the solutions, creating a larger market and speeding the development of the platform and services.

Redesigning the city to become sustainable for the digital era indeed requires a shift from leadership to orchestration. In a quadruple helix collaboration, innovation is turned into a process of participation. This aims to create shared value by making the lives of citizens more enjoyable, with sustainable business propositions by existing and new companies. The municipality takes responsibility not only to promote and facilitate living labs, but also to ensure that this happens safely and inclusively, in the same way that security in public spaces is ensured. The virtual layer on the public space — the public data layer — has to be considered in the same way: dealing with openness, accessibility and security.

### Conclusion

The transition to smart cities is in full swing. To really become a smart society, we need to put citizens at centre stage. To really become a city with resilient citizens, we need to truly empower people. And to really get there, we need a different approach: a design approach.

Data play a vital role in the transition towards a smart society. We believe that if an open, multipurpose democratised platform is applied in the public domain, data can empower people to become active producers of societal value. And to ensure a strong foundation on which to build the smart society, we need to regulate at different levels.

Locally, the rules of the game need to be designed to facilitate innovation to the maximum possible extent. We need to avoid data monopoly and lock-in business models in the (virtual) public space, as well as safeguard the public interest and maximise social value over individual or commercial profit. Issues of ownership and privacy must be safeguarded, and cities must be aware of their public responsibility to facilitate and orchestrate the basic, local infrastructure to enable these processes in the best possible way. Eindhoven has developed open data principles as a first attempt to sensibly deal with data in the public domain. But this is still only a first step. How this will enable new business development and economic prosperity at the same time will also need to become clear in the following steps.

Collaboration with other European cities is necessary to ensure a market that enables sustainable development of the platform, the smart society services and the necessary frameworks and regulations. Dealing with open data in particular is still very new, and regulations at national or European level are not yet available or are still insufficiently detailed. A lot of progress has been made with the living labs in Eindhoven, but it is only through cooperation that we can learn which way is best and achieve the scale needed to guide the transformation process in the right direction. In the EU frameworks, regulations can be designed to promote a vibrant society and at the same time build a thriving economy.

In Europe we value human rights and have firmly secured a number of issues, such as openness, privacy and security. It is only through cooperation that Europe can compete with other international economic power blocs. The views, concepts and activities in Eindhoven as described in this chapter depend greatly on good contextual frameworks. EU citizens as well as local and national authorities have to be alert to maintain and promote their values.

For instance, the currently negotiated Transatlantic Trade and Investment Partnership (TTIP) [11] may underpin some of our European rights. TTIP does not cover data, although this will form the main basis for new business models. Critics have expressed concerns about a number of issues, including data protection and privacy [12]. In the current proposal, for instance, personal data of EU citizens could be transferred to any country trumping the EU data protection framework. There are also negotiations dealing with issues like mass surveillance and encryption. In its current form, this may subvert the democracy of actions and consequently directly limit potential local opportunities and solutions. We should prevent any provisions on data protection, any lock-in of existing data transfer agreements, and any form of standardisation of encryption or interoperability of encryption standards that could lead to a possible lock-in of those standards [12]. Although the protection of personal data now seems to be covered, the collection of other data in public space still seems to be poorly regulated.

Finally, we also recognise that we are exploring new territory on the path to the desired future, and we will have to constantly adapt to new and changing insights. The smart society will not happen by itself. Municipalities, institutions, companies and engaged citizens need to be involved and inspired to participate. In Eindhoven, we will continue with new forms of collaboration in our



current and future living labs. By integrating our visions and strategies, all the actors and stakeholders in the cities will contribute in some way (through regulation, knowledge, funding and feedback) to the city's power to innovate.

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