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CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
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Dissemination Type

R	Document, report	X
DEM	Demonstrator, patent filing, videos, etc.	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
O	Other	
ETHICS	Ethics requirement	

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Executive Summary

This report summarizes the implementation of the VIRT-EU project to achieve stated project goals. Our project objective over the past three years has been to secure a place for societal concerns in the generation of new technologies. As a project with roots in responsible research and innovation (RRI), ethics and ICT practices, we want our interventions, both through design spaces and ethics impact assessment, to be empirically grounded, and widely adopted. The research we have conducted to lays the foundation for deeply researched and well-informed interventions. The present document presents findings from across the consortium, demonstrating our achievements and outputs.

VIRT-EU is a highly interdisciplinary project deliberately designed to ensure interdependence of outcomes. Thus achievement of project goals required collaboration between different disciplinary and methodological approaches. As such, we have organised our reporting in such a way that these distinct contributions can be discerned, and their points of intersection explored in detail. This reports is structured around the four main objectives of the project, demonstrating how we were able to fully achieve all of our objectives and to produce cutting edge theoretical, legal and empirical scientific work as well as practical applications of these insights resulting in freely available and usable tools oriented towards IoT designers and developers for ethical reflection and for convening conversations about ethics in different ways.

Our first objective required an empirical investigation of how European IoT developers understand and enact ethics. To achieve this we leveraged large-scale quantitative social media research and deep ethnographic engagements with IoT developers and designers across Europe. The two typically distinct methodologies informed each other and produced substantial insights, allowing us to benefit from the depth of ethnographic understanding, while tempering it with the high level overview of the European communities from quantitative analysis. We identified that social values for IoT developers are based within a project-based moral order. Our research found that developers engage with social values from positions like the Idealist, Pragmatist and Disengaged, which indicate how they feel able to act in relation to ethical issues. All of these subtle and contextual actions are positioned within overall spaces of social engagement that have been quantitatively defined.

Our second objective was to support the development of a Privacy, Ethical and Social Impact Assessment (PESIA) framework based on legal and qualitative research. To do this we first articulated a common stance within the project, thus developing a practical theory of ethics in action. We also researched myriad legal and regulatory requirements that are relevant to IoT development but go beyond the familiar data protection and privacy concerns. We then summarized the legal research and operational decisions that underpinned the development of the PESIA. The PESIA questionnaire itself represents an achievement of legal scholarship, but in order for this instrument to become usable by developers and designers, it needed to be adapted. Thus we present our efforts at adaptation of the legal instrument to a non-professional context.

The third objective of the project was to co-design with IoT developers' self-assessment tools for reflecting on ethics as a process. In order to proceed here, we first needed to

review already available tools in this space. We identified and analyzed over 70 existing ethics tools noting first the recent proliferation of these and, second, the many limitations. Most importantly we found that very few tools addressed value tensions and conflicts inherent in moral reasoning in technology development and even fewer offered a means to conduct ethical reflection consistently throughout the development cycle. We used PESIA as an inspiration but largely focused here on direct engagement with designers and developers through ethnographic investigations and design workshops. Our findings resulted in demonstrations and laid the foundations for fully functional paper and interactive online tool prototypes.

Our final and most ambitious objective was to contribute to building collective and social resilience against hyper-individualist notions of ethics. We had to acknowledge that, as a small EU project, we were not in a position to effect global change, but we were in a position to produce a foundation for future action by creating deeply researched and well considered tool prototypes for self-assessment and for convening conversations about ethics. We spent most of the final year of the project making these tools a reality and we are proud to present a fully formed Service Package that involves interactive tools and myriad other resources including an ethics primer, a review of relevant regulations, workshops and educational resources, an impact assessment, as well as research tools.

Overall, VIRT-EU produced research results that demonstrate how ethical questions can or should be addressed within the development process. Components of each of the disciplinary approaches, from design to legal review, assisted us in engaging closely with practitioner interlocutors, and in our overall goal of proactively positioning ethical self-assessments in the development of IoT technologies. Not only were we able to produce output of significant interest to our respective academic communities, we have also been able to create practical tools to help people think and talk about ethics in new and hopefully more productive ways.

The final portion of this report reviews our dissemination efforts and our approach to project management, noting both the successes and the difficulties we have encountered.

1. General overview of the project

The ambition of the VIRT-EU project is to set the groundwork for a more ethical European ICT innovation environment by employing state-of-the-art interdisciplinary Social Sciences and Humanities (SSH) and Computer Science (ICT) empirical research in combination with legal scholarship and design research. By studying how developers, individual designers and startups in the Internet of Things (IoT) field discuss and share knowledge, we explore how ideas and ethical values develop and travel in Europe and beyond. As part of this effort we have developed a VIRT-EU toolbox rooted in a practical approach to ethics through blending ethical theories and ethnographic engagement, as well as employing design methods and broad stakeholder engagements to connect them to everyday practices of developers and innovators. The VIRTEU toolbox includes an innovative privacy, ethical and social impact assessment (PESIA) tool as a means for developers and professional assessors to be able to go beyond mere risk assessments and informational and individual privacy concerns and so that they can systematically consider the broader ethical and social implications of their technologies. Our toolbox also offers the Ethical Stack – a suite of tools designed to support the full development life cycle of the IoT innovation process by offering different approaches to reflection and recalibration of expectations and decision-making practices. As part of our service package we offer materials for different ways of convening conversations about ethics from running formal workshops to using educational materials, multi-media content and paper tools for exercises in classrooms, board rooms or informal gatherings.

Within VIRT-EU, we conceptualize ethics as values in action taken in contexts – within power relationships and constraints. We believe that ethics as a process must include the acknowledgement of responsibilities for power because ethics should be both a concern and responsibility for developers of emerging technologies. This is because technologies created today not only influence the way we live and experience the world, but also have an important bearing on how the future comes to be enacted. We stress power relations because we acknowledge that technological or otherwise, decisions are not taken in a continuum but are shaped and re-shaped by the structural and cultural circumstances we are embedded in. The strength of our approach lies in an inherent acknowledgement of these power relationships and how these relationships reflect on the technologies that get designed and created as a result. Such a positioning forces us as researchers to reflect upon and negotiate our own disciplinary differences in conceptions of ethics as we engage with different ethical stances and worldviews of IoT developers, designers and entrepreneurs.

This deliverable is organized around the objectives of our research project and we describe how we have met these objectives through developing research-based tools, processes and communication strategies. Our research involved over 1000 people from dozens of small companies and startups across Europe with whom we co-created different processes for decision-making and action for ethics in practice. We have

consciously and actively created a range of different tools including workshops, videos, paper tools, interactive digital tools, an ethics primer and an animated film, in order to intervene at a fundamental level in the ethical conversations taking place in small companies, startups and maker-spaces across Europe and beyond. The long-term significance of our project is grounded in its empirically validated and theoretically grounded approach to changing conversations, practices and decision-making processes, and in the variety, novelty and quality of our diverse range of outputs for thinking otherwise in technology development.

1.1 Overall Project objectives

Objective 1: Empirically investigate how IoT developers understand and enact ethics in practice

In discussions of technology ethics and values have become popular concepts, but what is meant by these is not clear. If we are to affect change in how technologies in general and IoT technologies specifically are designed, we first need to understand how the people that create these technologies think about values and enact ethics. Thus an empirical investigation of what values and ethics look like in IoT design and development practice formed the foundation of our project and was key to the connection between research and innovation within this action.

The VIRT-EU project was constructed as an interdisciplinary endeavor, where large-scale quantitative data analysis was productively combined with qualitative, ethnographic research, grounded in the idea that in order to follow ethics as values in action, we must be able to observe and follow values and how they are acted upon across both physical and digital spaces. We empirically identified how local culture and networked society influence the understanding and movement of particular social values among technology developers, designers and entrepreneurs, and investigated what impacts local differences and networked commonalities might have on the development of ethical subjects using data mining, social network analysis (SNA), qualitative inquiry and design methods. This diversity of approaches was necessary to influence the design and development of other project results. Grounding decisions about co-design strategies and the development of tools that will outlive the project in high-quality empirical research increases the applicability and long-term value of these tools.

As our project unfolded we moved from mapping discussions and communities of practice to seeking ways to influence individuals, organizations and social structures through a range of tools and modes of engagement. Our empirical work identified the circumstances in which ethical discussion and ethical decision-making take place within our target group of small companies, startups and maker-spaces across Europe. These motivated our development of design tools, workshops and other resources for a broad audience of IoT innovators. The empirical process is described in detail in Section 2.

Objective 2: Development of a privacy, ethical and social impact assessment framework

While a deep empirical engagement with the field of IoT is necessary to understand how developers enact ethics[1], any intervention into developer practices required theoretical and conceptual development. Where assessing what kinds of ethical standpoints are being enacted in IoT developer communities required a general approach to notions of ethics, as a project we also needed to develop and clearly articulate an ethical framework of our own to guide the development of interventions we might envision. As Kurt Lewin had said, there is nothing so practical as a good theory[2] and we delved into the diversity of ethical frameworks, exploring ways to bring together the initial orientation of the project towards virtue ethics with more communally oriented frameworks [care ethics] and those that acknowledge human diversity [capabilities approach].

Technology development happens in increasingly regulated environments, especially in Europe and we also paid particular attention to myriad of standards and regulations that structure and shape the IoT field. Notions of ethics and legal compliance are often connected in discussions about technology, thus a deep understanding of the existing thicket of relevant regulation was paramount. Hence, we studied the relationship between the regulatory environment, the public statements made by many IoT companies on their websites and in their privacy policies.

At the same time, we used state of the art legal research that leveraged empirical data obtained in the fulfillment of Objective 1 (Section 2), to develop a Privacy, Ethical and Social Impact Assessment (PESIA). Impact assessments are currently the tool of choice where technology regulation is concerned. They represent a familiar mode of engagement between technology developers and the regulatory framework. The intention of PESIA is to broaden the scope of concerns from strict considerations of legal compliance. After all, given the fact that IT-related and, most importantly, data-related regulation is currently rapidly evolving, at any time what might be considered legal may not necessarily be ethical per se. PESIA is designed to empower developers and other stakeholders to reflect upon, evaluate and take into account both data protection, security and privacy aspects of new technologies, as well as ethical and social concerns embedded within them. We investigate how these pose challenges to individual and collective autonomy and freedom. This theoretical, legal, philosophical and conceptual development is described in Section 3.

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[1] Here we use *enactment*, instead of *social construction* to denote the performativity of ethical action to stress the possibility of multiple ethical positions but also to acknowledge that not all ethical positions

[2] Kurt Lewin. 1943. Psychology and the Process of Group Living. *The Journal of Social Psychology* 17, 1: 113–131.

Objective 3: Co-designing self-assessment tools for reflecting on ethics as a process

While it may seem that integrating ethics into design and development processes is simply a matter of educating those who are making new technology on ethics, our project adopted a bottoms-up approach and instead worked to understand what exactly "ethics" means in this context. As such, our first intention has been to understand the kind of values and principles that developers, designers and entrepreneurs in the field of IoT hold and then develop strategies for how we might support them to start to "think" ethically. We found that we needed to find ways to:

- Explain the theories identified in the VIRT-EU Ethical Framework (virtue ethics, care ethics and the capabilities approach) [detailed in Section 3] for equipping developers with a different ethical imaginary than consequentialism
- Demonstrate how the Ethical Framework relates to the practical work of designing connected devices
- Enable creators to not only relate but also integrate the Ethical Framework into their own work

As a result we developed a range of approaches, interventions and tools. Our tool prototypes are intended to enable creators of connected technologies to get an overview of their product across its siloes of focus and align with their teammates about their ethical values and vision for the product's future. Trying to build a product ethically is hard, especially if you don't have an in-house "ethicist." Throughout the project, we co-created, co-designed, tested, iterated, and deeply researched the very question of how to bring ethical reflection into the creation process for the developers and designers of connected products. In other words, we tried to develop an ethics-by-design approach, instead of the common practice of postponing to deal with ethical questions until a problem arises.[3] In the end, we have built a suite of prototype tools to help those who are creating new technologies to uncover and deal with their product's ethical challenges, gain awareness about the social and ethical impacts of their products and learn ways to address them practically.

Through our research it became clear to us that we need to develop tools that can help integrate the practice, training and understanding of ethical decision-making and reflection into the design process. Our tools are inspired by the PESIA framework and designed by CIID based on ethnographic and quantitative insights gathered from empirical research conducted by LSE, ITU and UU. Our intention was to go beyond an individualistic understanding of responsibility and instead equip developers, designers and entrepreneurs with ethical reflection throughout their decision-making processes. The tools are designed to provide a language, a structure and the necessary legitimacy

[3] Ustek-Spilda, Funda. 2019. "Do-Ers v. Postpon-Ers: How Do IoT Developers Respond to Ethical Challenges?" https://blogit.itu.dk/virteuproject/2019/02/08/do-ers-v-postpon-ers-how-do-iot-developers-respond-to-ethical-challenges/

to articulate concerns but also to establish a position for proposing other ways of thinking and doing in technology development. As such, the tools can be used in internal meetings of companies and organisations with different power dynamics, as well as with external stakeholders where power relationships might be also asymmetric and not always clear. Consequently, the prototypes we created provide a flexible collection of tools for different stages of IoT development projects. Section 4 details our development process, while the final prototypes released to the developer community are described in Section 5.

Objective 4: Building collective and social resilience against hyper-individualist notions of ethics

Hyper-individualist notions of ethics are endemic in computer ethics given this fields' reliance on Moore's notion of just consequentialism[4]. The melding of initial hacker idealism of the early Internet age[5] with the powerful drive towards commodification of the Silicon Valley[6] pitted the idea that technology is essential for promoting human flourishing against the constraints of justice and regulatory frameworks. Clayton Christensen's notion of disruptive economics[7] gave technology innovators a reason to focus on risk and impact assessments, leaving behind what many saw as out-dated regulatory regimes and firmly establishing the dominance of consequentialist ethics as central to moral reasoning approaches among technologists. This thinking is evident in conversations about efficiency, optimization, and cost-benefit analysis when making an ethical decision[8].

The criticism of overly focusing on the individual to the exclusion of collective social arrangements extends to contemporary technology regulation efforts as well[9]. The GDPR, for example, has been heavily critiqued for overlooking the issues of group and collective privacy almost entirely[10]. The notion of informational self-determination, while representing a positive humanist ideal, has resulted in the overuse of consent

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[4] James H. Moor. 1999. Just consequentialism and computing. *Ethics and Information Technology* 1, 1: 61–65. https://doi.org/10.1023/A:1010078828842; Walter Sinnott-Armstrong. 2015. Consequentialism. In *The Stanford Encyclopedia of Philosophy* (2015th ed.), Edward N. Zalta (ed.). Metaphysics Research Lab, Stanford University.

[5] Castells, M. (2011). The rise of the network society. John wiley & sons.

[6] Healey, K., & Woods Jr, R. H. (2017). Processing is not judgement, storage is not memory: A critique of Silicon Valley's moral catechism. Journal of Media Ethics, 32(1), 2-15.

[7] Christensen, C. M. (2013). *The innovator's dilemma: when new technologies cause great firms to fail*. Harvard Business Review Press.

[8] Edmond Awad, Sohan Dsouza, Richard Kim, Jonathan Schulz, Joseph Henrich, Azim Shariff, Jean-François Bonnefon, and Iyad Rahwan. 2018. The Moral Machine experiment. *Nature* 563, 7729: 59–64. https://doi.org/10.1038/s41586-018-0637-6

[9] Whitley, E. A. (2009). Informational privacy, consent and the "control" of personal data. Information security technical report, 14(3), 154-159.

[10] Taylor, L., Floridi, L., & Van der Sloot, B. (Eds.). (2016). *Group privacy: New challenges of data technologies* (Vol. 126). Springer; Mantelero, A. (2017). From group privacy to collective privacy: towards a new dimension of privacy and data protection in the big data era. In *Group Privacy* (pp. 139-158). Springer

mechanisms to the point where consent had become a meaningless exercise where data collection is concerned[11]. It is unclear whether current regulatory efforts to rehabilitate consent can even make a difference.

The VIRT-EU project ambitions were to go beyond offering critiques of such individualist orientations and instead to develop tools and approaches to allow different ways for technology startups and small organizations to explore ethical questions and apply different ethical practices in their IoT design work. Our empirical and co-design research evidenced deep desires from people working in IoT development to engage with ethical practices at a deeper level and, in some cases, to foreground ethical engagement in the development of a business, but lacking the time, language or other structural capacities to do so.[12] Against this background, we developed methods and approaches that effectively integrated our knowledge on communities of practice, identifying dominant practices and the opportunities to shift them.

Rather than imagining that our small project by itself could shift the dominant discourse and suddenly lead to better and more ethical technology development, we focused on developing prototypes for tools that can be used to engage with ethics collaboratively in practice, to change orientation from relentless individualism [and consequentialism] to broader concerns that take into account collective needs and dynamics, to convene the necessary conversations that must happen if we want a better future together. These practical tools emerge from a strong foundation of empirical research, conceptual development, theoretical innovation and philosophical explorations. While our prototypes mark just the beginning of this journey, the foundation we have created offers ample opportunity for further development in the future.

In the course of the project we developed strong relationships with expert civil society partners such as the Ada Lovelace Institute, Alan Turing Institute, the Digital Catapult, NESTA, the Association of Nordic Engineers, engaged closely with design and developer collectives such as Dyne.org, ThingsCon, The Things Foundation, a social venture accelerator programme, the Better IoT project, Central Research Laboratory, and the Women of Wearables network, SMEs, makers, advocates and other stakeholders. We brought our interactive workshops, demos and tools to a variety of venues with the dual purpose of gathering feedback and inspiring small changes in how the IoT field thinks about ethics. Our tools offer ways to work towards alignment with the changing European data protection landscape and build collective and social resilience in an age

[11] Mantelero, A. (2017). The Guidelines of the Council of Europe Data Protection Committee on the Protection of Individuals with Regard to the Processing of Personal Data in the Big Data Context. *Eur. Data Prot. L. Rev.*, *3*, 88; Barocas, S., & Nissenbaum, H. (2014). Big data's end run around anonymity and consent. *Privacy, big data, and the public good: Frameworks for engagement*, *1*, 44-75.
[12] Ustek-Spilda, F., Powell, A., & Nemorin, S. (2019). Engaging with ethics in Internet of Things: Imaginaries in the social milieu of technology developers. Big Data & Society, 6(2), 2053951719879468.

of individual subjectivity. We ourselves have become known across the European IoT community as offering a valuable perspective and we continue to leverage this position.

Thus the final substantive section of the report offers an overview of our activities and presents the final tools that we have created to offer to the European IoT community and relevant stakeholders. There is a great sense of uncertainty with respect to the role of technology in designing our future among developers as well as European societies more generally. The VIRT-EU project has firmly stepped in to this conversation to offer a perspective that, rather than reducing uncertainty, offers ways to embrace it productively.

The sections below provide an overview of our activities over the past three years, detailing our achievements and pointing to relevant prior deliverables, publications and other content that we have produced. Sections 2-5 detail how the project has achieved each of our four primary objectives. Section 6 details our dissemination efforts and outcomes. Section 7 provides an overview of project management activities and data management approaches.

2. Empirical investigation of ethics in practice

This section describes activities from WP2 (tasks 2.1, 2.2, 2.3 and 2.5), WP3 (tasks 3.1, 3.2, 3.3 and 3.4), and WP6 (Task 6.4) in service of fulfilling Deliverables 2.2, 3.1 and 6.4.

Both quantitative and qualitative methods informed our project's investigation of ethics in practice. The *quantitative study* of the European IoT community included a preliminary analysis of the popular online data and platforms IoT developers, designers and entrepreneurs participate in. We developed this analysis on two complementary levels. On the one side, we explored ethnographically whether the digital platforms that we had initially assumed to be relevant for the community of IoT developers were actually used in practice. On the other side, we evaluated the technical feasibility of the data collection and designed the technical infrastructure to host and support the analysis of the data. As a result, we focused on two relevant platforms for data collection - Twitter and MeetUp.[13] Over the course of the project, we developed a suite of online

[13] It is important to mention here that during the course of our project MeetUp was a hugely influential platform for announcing, organizing and holding meetings related to tech. MeetUp was acquired by WeWork in 2017. After WeWork was bought by SoftBank in 2019, they went into restructuring the startups in WeWork's portfolio, including MeetUp. As a result of restructuring, WeWork announced a round of layoffs. As a reaction, several MeetUp organizers [including London IoT Meetup] decided to stop using MeetUp and moved their networks to alternative platforms, such as attending.io. This decision, however, came after we have already concluded our qualitative and quantitative analysis of the platform and the organizers of IoT meetups. More information about the restructuring of MeetUp can be found here https://techcrunch.com/2019/11/04/wework-owned-meetup-confirms-restructuring-layoffs/ and more information about London IoT Meetup Group's decision to move to another platform can be found here https://www.meetup.com/iotlondon/events/265295822/ Accessed 23 December 2019.

research tools that allowed us to automate data collection from these online sources and carry out an exploratory analysis of the collected data.

The quantitative analysis of online discussions provided an overview of how IoT is thought of and discussed broadly online, but did not allow us an in-depth inquiry situated in particular geographies. In order to address this and deepen our understanding of the field[14], we leveraged insights and contacts gained in the course of ethnographic and physically situated fieldwork to seed the overall #IoT dataset and focused our analysis on a more geographically situated sample. In this way, we attempted to map the existing IoT community in Europe geographically and temporally, using social media activity as the main data source.

This mapping was complimented by the *qualitative research efforts,* which began with a broad ethnographic domain mapping and identifications of informants in European centers of IoT innovation. As a first step to mapping the European IoT scape, our project team attended events across ten European countries in London, Geneva, Lyon, Torino, Copenhagen, Bled, Malmö, Berlin, Amsterdam and Barcelona engaging with large IoT conferences and smaller MeetUps. We also conducted an analysis of responsible technology and IoT manifestos produced by designers and developers, mostly in Europe[15]. This work has led us to focus on two particular field sites for in-depth engagement.

We employed London as a geographical field where it was possible to develop a number of field sites based on different aspects of our target communities, including startups and small companies: London's accelerator programs and co-working spaces influenced how businesses in this area were built and how influential 'tech for good' organizations became, as discussed below. This choice was validated by the quantitative analysis of both Twitter and MeetUp data we collected in the first year. To balance the dominant influence of London's accelerator and startup ecosystem we chose a second geographical field, Amsterdam, where we had observed a strong concentration of alternative perspectives on IoT development. Despite its relatively small size in numbers (in comparison to London for example), Amsterdam is home to many distinct efforts to rethink IoT from hardware, software, design and engineering angles. We have also engaged with a border-spanning field site of the Better IoT certification mark development, following the ground-up developer and designer-driven process of the creation of an IoT standard with very particular ethical concerns underlying it. Although this effort originated in London, it engaged with actors from across Europe.

[14] Throughout the report, we take up Bourdieu's concept of field to denote the social spaces, knowledge production practices and ethical imaginations IoT developers engage with. This concept particularly fits well with our research because it acknowledges the hierarchies of social arrangements and the actors within them. As such, a field is an arena of conflict, negotiation and deliberation, weaved around constraints and struggles for position. See DiMaggio, Paul. "On Pierre Bourdieu." (1979): 1460-1474.
[15] Fritsch, E., Shklovski, I., & Douglas-Jones, R. (2018). Calling for a revolution: An analysis of IoT manifestos. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems. ACM

Alongside these concentrated ethnographic efforts, we have also spent some time exploring much smaller sites of IoT development such as Copenhagen, Denmark and Malmo, Sweden in order to compare the kinds of concerns and questions that emerge here with those that are under discussion in highly active and dynamic environments. In order to connect with smaller communities of practice and to validate the later co-design methods used to create and validate our findings we attended DesCon hackathon events in Belgrade, and IoT community development workshops and conferences including CivicHub Mieres in Catalunya and ThingsCon in Rotterdam. We did consider undertaking fieldwork in Barcelona and conducted initial fieldwork visits with an accelerator located there. However, gaining access to and becoming embedded in the startup ecology in Barcelona or in Spain in general, was limited by the geographic placement of our research teams and budget concerns.

The sections below summarize the results of the empirical investigations conducted as part of VIRT-EU and illustrate the key features of the social values shaping and constraining the work of small companies and startups in the IoT field.

2.1 Methodological considerations: Mixed Methods Approach

We employed two types of social research methods to identify and study the social values and ethical thinking that is present in the IoT field in Europe, as explored in Deliverable 2.2 and 3.1. Our iterative approach enabled us to validate our findings and ensure that we do not exaggerate or lessen their importance.

The quantitative analysis of online discussions provided an overview of how IoT is thought of and discussed broadly online but did not allow us an in-depth geographically situated inquiry, which could explain and substantiate the values and principles IoT developers held and sought to represent in their products. In order to address this problem we leveraged insights and contacts gained in the course of ethnographic and physically situated fieldwork to seed the overall #IoT dataset in order to focus our analysis on a more geographically situated sample. In this way we attempted to map the existing IoT community in Europe geographically and temporally, using social media activity as the main data source. Over the course of the project we developed a suite of online tools to allow the automated collection of data from these online sources and the exploratory analysis of the collected data. This quantitative data validated our decisions to source field sites in two geographic locations as well as to pursue targeted contact with field sites across Europe.

Our qualitative research specified the field of IoT design and development by exploring how values were expressed through product design and business processes, and our co-design based research processes also acted as a way to communicate our research findings in practical and applicable ways (building from Deliverable 3.2). We

investigated two aspects of IoT design processes: the social milieu of technology development, comprising the social relations observable within organizations, and the broader moral economies that IoT startups are embedded in. The importance of business development became clear to us during the second phase of our research, as our analysis of the social milieus indicated that IoT actors took design and technology development decisions through their potential impact on their businesses and investment opportunities. We also identified avenues for change through ethical certification processes, although we note that these can still be constrained by the overall business environment and the available investment and funding opportunities for startups.

2.2 Values in Technology Design

The primary goal of our qualitative fieldwork was to develop a research approach that focuses on the collective contexts in which IoT products are developed and where, in particular, IoT designers and developers meet and discuss their shared concerns including ethical issues. During the first year of the VIRT-EU project, ethnographic teams from ITU and LSE sought to map out the IoT field in Europe. Initial approach focused on desk-based research and attending key IoT events and conferences across Europe (as reported in Deliverable 2.2). In the course of this work, we noticed a proliferation of technologies, applications and approaches to IoT and tried to understand the diverging and converging characteristics of the field. In this period, we also started collating the values developers, entrepreneurs and designers of IoT expressed as driving their developments.

By mid-2018, the qualitative teams achieved a broad understanding of the field and the key actors in Europe. We then started narrowing down our focus, following the networks of key actors and organizing fieldwork activities around themes. We followed the work of networks such as Women of Wearables, Better IoT, Central Research Laboratory in London, DesCon Belgrade, Civic Hub Mieres, ThingsCon Rotterdam and Berlin and a social venture accelerator program in London. We also visited several co-working sites and maker spaces in London to understand how IoT startups are formed and what their everyday working life looks like. We also organized co-creation workshops with the participation of key actors in the field and took every opportunity to hear how actors in the IoT field in Europe talked, approached and engaged with discussions on ethics, responsibility and accountability in general. We also participated in the NGI4 Next Generation Internet network's activities, both contributing to their ongoing work but also connecting with those who are imagining the future of internet for Europe.

Below we illustrate our process for mapping out IoT communities in practice quantitatively and qualitatively throughout our project. We first describe our expectations from our empirical queries, and then provide a brief analysis of our

findings. We show that values in IoT development are enacted through both identifying individual values and purposes in the field, but also acknowledging and learning to navigate the inherent collective values and existing cultural, administrative and regulatory structures.

2.3 Quantitative Mapping of IoT Communities of Practice

The main role of the quantitative team of the VirtEU project has been to:

- develop tools (software and methods) for the collection and analysis of online data and
- perform a quantitative analysis of selected online data sources complementing the work of the qualitative team aimed at understanding the European IoT field.

This section includes a description of our collection and analysis of Twitter data, a description of our collection and analysis of MeetUp data and a summary of our output, innovation and critical reflections. More details about this research is provided in Deliverable 3.1 (Quantitative Technical Report), for what concerns the developed methods and the analysis of Twitter and MeetUp data, and in Deliverable 6.4 (Prototype for Ethical Data Research Practices), for the critical reflections about ethical and legal research based on online data and for a technical description of the software developed in the last part of the project.

Twitter analysis permitted us to to characterize what IoT looks like in the European context from a social media point of view. In assessing the structure of the European IoT community, we asked (i) who is central to discussions about IoT in Europe, (ii) what kinds of geographical clusters emerge, (iii) what topics are used to describe IoT and finally, (iv) what kind of concerns developers, designers and entrepreneurs discuss online. Collaborative work between the quantitative and the qualitative units enabled us to show how various actors imagine IoT through discussion and debate on social media[16]

We also carried an analysis of MeetUp data as our ethnographic research indicated that many events related to IoT were organized on the platform. We have compiled a separate dataset comprising of all IoT meetups in Europe and analysed this dataset both qualitatively and quantitatively. In general, although organizers of the events did not usually add long texts for describing the prospective events, they used keywords as placeholders for introducing the topics of discussion and concerns in general. Our analysis included both a textual analysis of all the texts written by the organizers but also these keywords. Below we present our findings briefly and our current thinking on the subject.

[16] Vega, Davide, Matteo Magnani, Luca Rossi, Funda Ustek-Spilda, Sebastian Lehuede, Alison Powell and Irina Shklovski "A Twitter-based Study of the European Internet of Things". Under submission, *Information Systems Frontiers*.

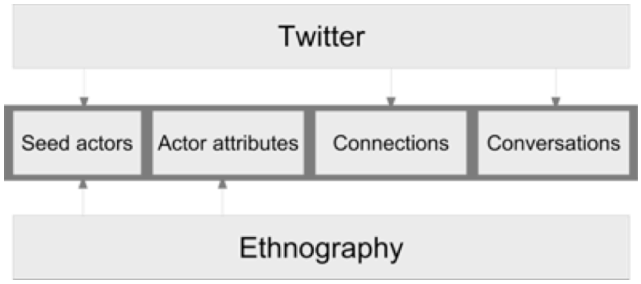
2.3.1 Twitter data and integration with qualitative approaches

We used our qualitative research to develop a seed dataset of European actors who were considered particularly important in the IoT field. The rationale behind this choice was that these actors could be used as "seeds" to capture the discourse about the IoT in Europe. The data about the seed actors was subsequently enriched where possible using multiple sources, including social media handles, geographical location, design or engineering background, type of activity within the IoT field, and if the actors had shown interest in ethics in IoT.

Using the Twitter screen names of the seed actors, built a directed network of the Twitter space surrounding our initial set of qualitatively selected seeds. We then defined three derived networks:

- The full network containing all the followers and all the followees of the 103 initial Twitter users from the consolidated dataset.
- A reduced network containing all the initial users from the consolidated dataset and the followers or followees connected with at least two of the initial users.
- A consolidated network containing only the users from the consolidated dataset and the connections among them.

Figure 1: Empirical data sources



Finally, we used the public Twitter API to retrieve interaction information. As interactions happen by tweeting, we could exploit the text of the tweets to observe whether the interactions concern specific topics. More in detail, we collected the latest tweets produced by our seed actors. Some of these tweets contained hashtags, some of which we used as an indication of topics of interest based on manual inspection. More than 400 hashtags were selected and classified, in order of frequency. These selected hashtags were also grouped into a hierarchy of larger topics. The following is an example of category and sub-category:

- Ethics; security; #cybersecurity
- Ethics; security; #iotsecurity
- Ethics; privacy; #gdpr
- Ethics; privacy; #dataprotection
- Ethics; womenintech; #womenintech
- Ethics; womenintech; #femtech
- Ethics; womenintech; #girlsinstem
- Ethics; trust; #trust
- Ethics; ethics; #ethicaltechnology
- Ethics; ethics; #responsibletech
- Ethics; sustainability; #sustainability

- Ethics; sustainability; #zerophone
- Ethics; open; #opensource
- Ethics; open; #opendata

Main results

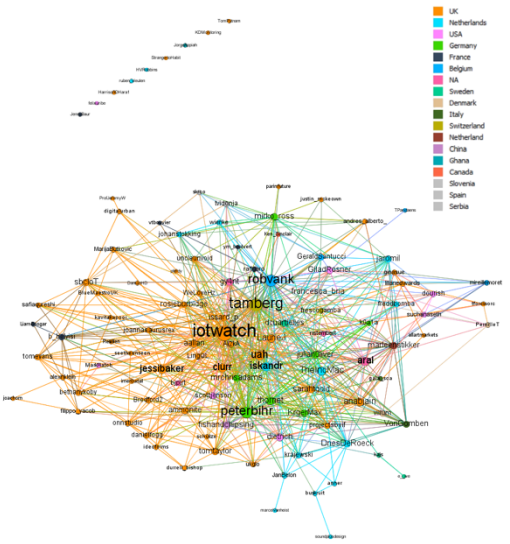
Using the online interactions between the seed actors and their attributes we tested three hypotheses:

H1: Geographical proximity is an indicator of the presence of mutual interests between online IoT actors: users from the same geographical context will be more likely to be connected online than users from different geographical contexts. This hypothesis would result in a significant positive value of nominal assortativity, if confirmed. Nominal assortativity refers to the expectation that similar nodes in a network would be clustered together.

H2: Complementary background is an indicator of the presence of mutual interests between online IoT actors: users with complementary background (e.g. one in Design and one in Software development) will be more likely to be connected due to the added value of their complementarity for perspective business opportunities. This hypothesis would result in a negative value of nominal assortativity, if confirmed.

H3: Ethical interest - the participation in the online discussion about ethics and IoT - is an indicator of the presence of mutual interests between online IoT actors: users who participate in the ongoing online discussion about IoT and ethics will be more likely to follow other users equally vocal on the issue. This hypothesis would result in a positive value of nominal assortativity, if confirmed.

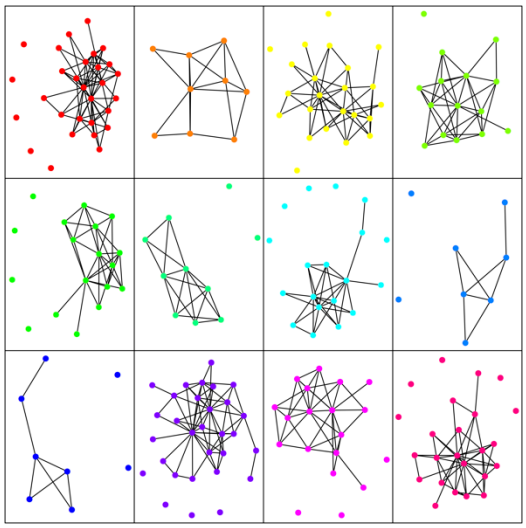
Figure 2: Follower/followee network with geographical information



Our data suggest that between the three hypotheses of possible social drivers behind online connectivity only geographical proximity is weakly supported. Professional background does not show an assortative (or dissortative) behaviour, suggesting that the reason to be connected on Twitter lies beyond the complementarity or similarity of the professional profiles. Similarly, the level of activity on the online ethical discussion about IoT does not play any role in the connection process, suggesting that ethics, even if valued on an individual level, does not act as a discriminant for online connections. Put simply, ethics does not seem to be a concern that shapes the reasons for which IoT actors connect online. The only attribute that is, weakly, positive is the geographical proximity suggesting that even if there is a European IoT scene, geography still matters with the local context acting as a force driving online connectivity. This

supports our approach in supplementing and deepening our quantitative study with more in-depth, local fieldwork into major IoT spaces in Europe.

Figure 3: Online interactions between seed users on twelve IoT-related topics



In addition to the topological structure of the following/follower relations discussed in the previous paragraph we also studied the actual interactions between the seed actors and their online audiences. All topics of discussion from our categorization have a single component containing edges, in addition to a few disconnected nodes in some cases. This suggests a common conversation involving multiple users rather than isolated discussions. However, the actual overlap between the users participating in the various topics/layer is rather limited with the exception of the general #IoT topic that shows consistent overlap with almost all the other hashtags. This peculiar structure suggests the existence, within the IoT umbrella, of multiple sub-domains with relatively little overlap. This insight was important for our qualitative inquiry as we noted how some of the main actors in the European IoT field were differently connected, some surprisingly weakly and some more strongly. This informed the questions that we asked and who we sought out to interview as we identified new clusters of developers throughout Europe.

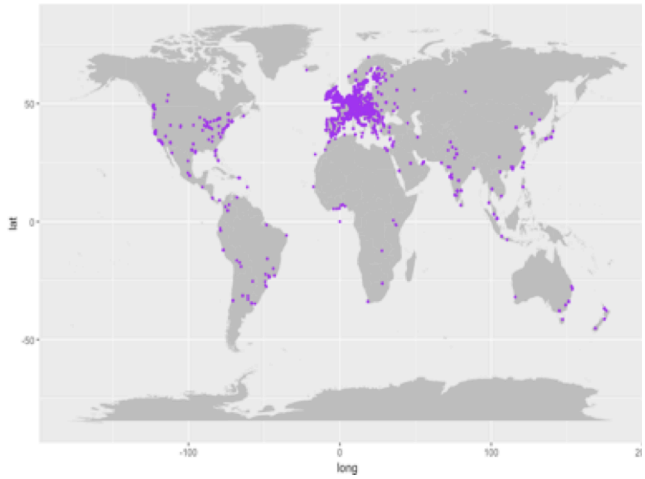
2.3.2 MeetUp Data: Multi-method understanding of community relationships

To start mapping the MeetUp IoT field we have inspected all the MeetUp groups found searching for IoT (and related keywords) and filtering the results for European groups. If the groups matched the expected criteria they were added to our dataset. This resulted in 220 MeetUp groups. Using the MeetUp APIs, for each group in the dataset several information items were retrieved (geographical location, list of members, self-provided description of their topics of interest, and creation date). Additionally, for each event created by the groups, we gathered additional information (expected number of participants, venues, date) as well as for each member of the groups (name, topics of interest and geographical location). The final dataset consists of 220 groups, 32967 members and 2386 events from 2011 until Jan 2019.

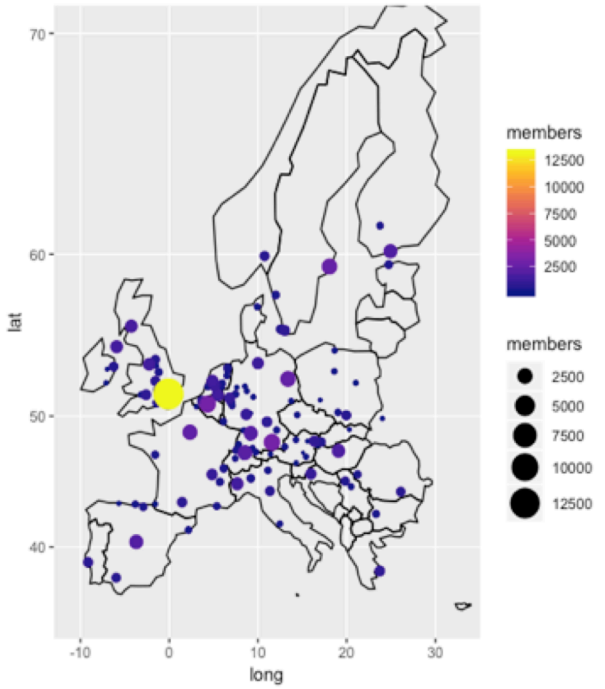
Results

The analysis of the geographical information associated with the MeetUp data confirms the complexity of drawing national or continental borders around tech-development. If it is reasonably easy to identify the IoT-related events that took place in Europe, the map of the users who attended these events shows an international crowd.

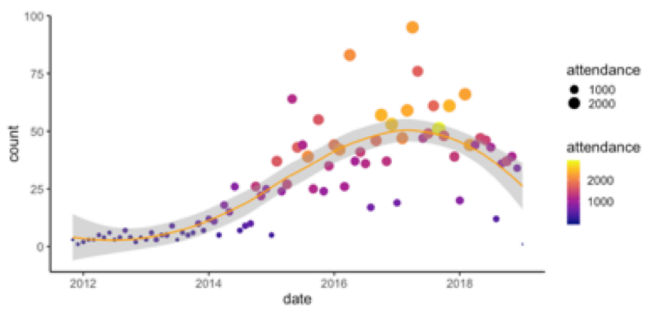
Figure 4: Geographical & Temporal Distribution of IoT MeetUps



Geographical distribution of IoT MeetUps



Location of European MeetUp groups



Temporal evolution of IoT MeetUp events

The longitudinal nature of MeetUp shows the emergence of IoT as considerable topic able to attract a considerable amount of interest. Visualizing the date and the expected number of participants of IoT events from the group we have identified shows how from 2011 to 2014 events were relatively few (less than 20 per month) and were expected to attract few people. This dramatically changes after 2015 when we see the emergence of many big events. A final aspect that is possible exploring is the thematic evolution of the IoT field. Thanks to the topics of interests listed by the IoT-related groups when they are created, we can visualize the evolution of "proximal" topics of interest. Specific keywords emerged strongly during recent years (e.g. Cryptocurrency) while others that were present in the early years have largely disappeared (e.g. Arduino) suggesting the internal evolution of that we now call IoT and the concerns of organizers and participants.

Beside the actual possibility of mapping both the interest and the internal composition of interest-driven meetings at an unprecedented scale, the analysis of MeetUp data proved valuable when triangulated with the ethnographic observations. On the one hand they confirmed, providing quantitative support, the validity of research decisions (e.g. the choice of London as a central hub for IoT development in Europe), on the

other hand provided new insights into longitudinal dynamics (e.g. the thematic evolution of IoT-related events) that are often impossible to get in the *hic et nunc* of ethnographic data collection.

Many meetups do not have a lot of text describing the schedule or the speakers. So, the quantitative study needed to be supplemented by qualitative desk research into these people and their projects. Our analysis indicated that topics often diverged based on the interests of the speakers and participants, as the organizers of the events were open to new topics to be suggested by the participants or to even participants' suggesting themselves as speakers for prospective events. For instance, throughout the course of our observations, we have observed that events organized by the Women of Wearables network grew significantly in terms of both the number of attendees as well as the geographical locations of where the events are held. As the network grew, the interests of participants became more and more reflected on the events that were held in 2019. Whereas in 2018, most events were related to wearables, various application of wearable technology to different industries, in 2019, the events were more curated towards femtech and investing/raising funds for women-led startups.

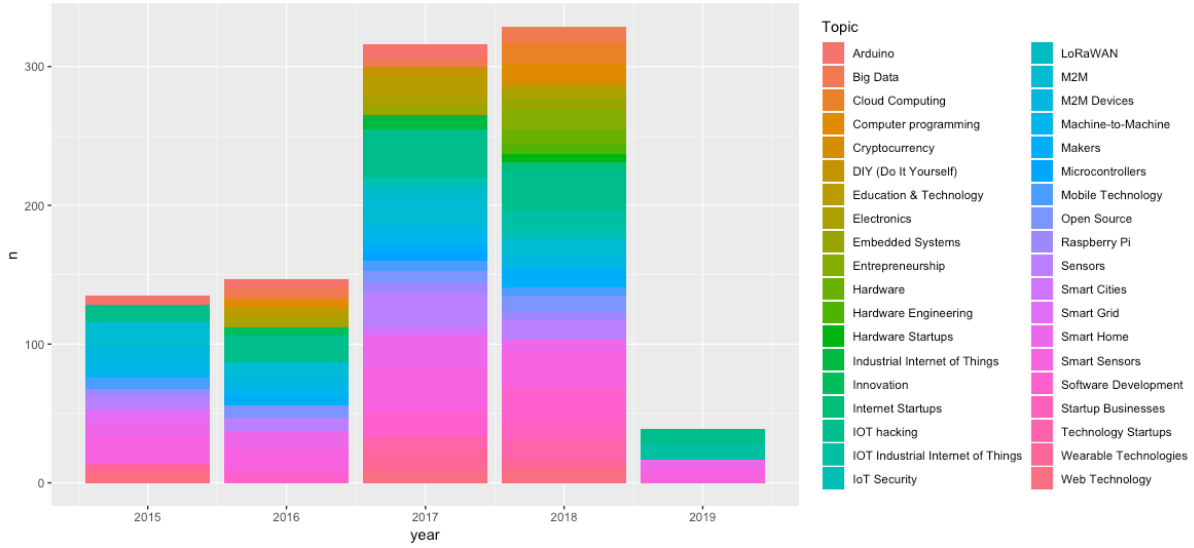


Figure 5: main IoT topics, temporal evolution

2. Values in IoT Development Ecosystems

From the meetups we began to understand how IoT communities of practice positioned and discussed values – often in relation to their business development or to technical design features ('things'). Our research specified the field of IoT design and development by exploring how values were expressed through product design and business processes. We analyzed this in relation to two social aspects: the social milieu of technology development, comprising the social relations observable within organizations, and the broader moral economies that businesses are embedded within. The importance of business development became clear to us during the second phase of our research, as our analysis of the social milieus indicated that IoT actors took design and technology development decisions through their potential impact on their

businesses and investment opportunities[17]. We also identified avenues for change through ethical certification processes, although we note that these can still be constrained by the overall business environment.

2.4.1 Values and Things

We have observed that discussions about ethics often revolve around security and privacy and focus on software only. Nevertheless, the materiality of IoT introduces various complexities to how technologies could be designed responsibly and ethically.[18] For instance, choosing a network to transmit IoT data demands important decisions from the side of the developer, as it has important implications for the overall connectivity of the product, its security as well as sustainability.[19] Similarly, decisions to add a camera or a microphone to a product are not merely design decisions, but play an important for what kind of values the product represents[20].

To gain a deeper understanding of the materiality of IoT and its implications for thinking about ethics, we followed hardware developers, maker communities and participated in hackathons including DesCon 2018 and 2019; Hardware Pioneers showcase events, Central Research Laboratory showcases and Women of Wearables events. Participation in these events also ensured the high impact of our project on the community within which it is embedded.

2.4.2 Social Ventures

In the IoT development field, good products and 'doing good' are often conflated. In other words, if the technology (and/or business) in question was built with a purpose, the resulting product/ technology was considered to be a good/ethical/responsible product. In order to be able to engage more critically with this assumption, we participated in a social venture accelerator program in London over four months in 2018. We followed three companies, which were funded by a social venture capital firm,

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[17] Ustek-Spilda, Funda, Alison Powell and Selena Nemorin (2019) "Engaging with Ethics in Internet of Things Design: Diverging Imaginaries in the Social Milieu of Technology Developers" Big Data and Society.
[18] Urquhart, L., Reedman-Flint, D., & Leesakul, N. (2019). Responsible domestic robotics: exploring ethical implications of robots in the home. Journal of Information, Communication and Ethics in Society; Colman, F., Bühlmann, V., O'Donnell, A. and van der Tuin, I. (2018). Ethics of Coding: A Report on the Algorithmic Condition [EoC]. H2020-EU.2.1.1. – INDUSTRIAL LEADERSHIP – Leadership in enabling and industrial technologies – Information and Communication Technologies. Brussels: European Commission. 732407,https://cordis.europa.eu/project/rcn/207025_en.html. pp.1–54, Barad, K. (2007). Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning. duke university Press.
[19] Ustek-Spilda, Funda (2019) "Ethics beyond data: How does IoT challenge our perspective on data ethics?" VIRT-EU blog https://blogit.itu.dk/virteuproject/2019/04/28/ethics-beyond-data-how-does-iot-challenge-our-perspective-on-data-ethics-2/
[20] Ustek-Spilda, Funda, Alison Powell, Sebastian Lehuede & Irina Shklovski (2019) Peril vs. Promise: IoT and the Ethical Imaginaries, Proceedings of the CHI 2019 Workshop on New Directions for the IoT: Automate, Share, Build, and Care, May 4-9, Glasgow, the UK.; Lehuede, Sebastian. 2019. "When things shape values: Hardware components and energy power in Internet of Things." VIRT-EU blog. https://blogit.itu.dk/virteuproject/2019/02/08/when-things-shape-values-2-3-hardware-components-and-energy-power-in-the-internet-of-things/

as they worked on their products and business development. This unique access to the program enabled us to also reach the materials that were shared with the participants, attend seminars, personal and business growth workshops. Being embedded in these processes ensured our resulting findings and tools connected with the values, principles as well as concerns shared by the community. Our in-depth introduction to social ventures revealed that 'business talk' about market shares, customer retention or equity percentages had significant bearings on how startups thought about and discussed the limits to holding onto their values or their initial ideas about their products[21].

2.5 Social aspects of ethical decision making

Findings from our ongoing work indicated that people had an interest in acting ethically but often could not understand how to connect their own individual motivation to do well with the constraints of the social environment they found themselves in: this is part of the "moral economy" of technology development[22]. We examined two levels at which the social aspects of this moral economy played a role, with the outcome of this research contributing to the project's practical theory of ethics as well as shaping the design of the tools. The social aspects we examined included the political economics of IoT, the social milieu of developers, and the moral rationale for operation in specific ways within the market.

2.5.1 Ecosystems: Political Economy of IoT

Political economist Robin Mansell advocates focusing on social imaginaries, or "how things are understood" and how they enact a moral order which tells us what rights and obligations are with respect to each other"[23]. She isolates three sets of ideas and social imaginaries for emerging technology. The first is the market-led diffusion model whereby technological change in the digital world is considered to be emergent and unpredictable. She notes that any redistribution of resources, such as information, money and skills, for justice or fairness remains outside the framework of this model, as any intervention in the commercial market is presumed to increase the risk of unpredictable incomes. The second is a state and market-led diffusion model. Here, the social imaginary considers state intervention in the market as essential for the welfare of citizens and for upholding the "rights and obligations we have as individuals in regard to each other"[24]. The third and last one is the digital mediation in generative

[21] Ustek-Spilda, Funda and Alison Powell "Moral Orders in Social Ventures" Prepared for submission to *Communication, Culture and Critique.*

[22] Hesmondhalgh, David. 2017. "Capitalism and the Media: Moral Economy, Well-Being and Capabilities." Media, Culture & Society 39 (2): 202–218, Powell, Alison (2018) "Moral Orders in Contribution Cultures" Communication, Culture and Critique, Volume 11, Issue 4, Pages 513–529, https://doi.org/10.1093/ccc/tcy023

[23] Mansell, Robin. 2012. Imagining the Internet: Communication, Innovation, and Governance. Oxford: Oxford University Press.

[24] Mansell, 2012. p. 43.

collaborative commons, where civil society and various members of technical communities are ensured through peer-to-peer collaboration I the commons. The main premise is that through non-market participation and good will are generative of individual collective agency in the digital world.[25]

In the IoT field, we have also observed three ethical imaginaries in line with Mansell's framework[26]. We refer to these as follows: 1) Technology will sort itself out 2) More regulation is needed 3) Conscious consumers and developers will push for ethical IoT. In the first imaginary, which we called "technology will sort itself out" the main proposition made by IoT developers and designers is that it is because IoT technologies are still relatively new and there are many technological aspects that need to be figured out, that the ethical risks associated with it are high. Once the technology matures, it will sort itself out, that is, in the long run, what come to be associated as ethical risks, including privacy and security risks, will no longer constitute problems because there will already be technological solutions for them. This perspective, however, assumes that there will come a point in time where technological development will mature and stall, and there will not be any 'unknown unknowns' left to be discovered. It also runs the risk of assuming it is possible to fix everything through technology, and disregards the problems technology might cause along the way, such as environmental, social and economic issues that we face today. In the second imaginary "more regulation is needed", more state involvement is considered to be necessary. Some developers argued that because regulation is seen as stalling technological development, IoT companies [and other technology companies in general] will not regulate themselves, unless they have to because if they do so, they would lose their competitive advantage over companies which do not spend their resources on this and instead only focus on developing their products.

The General Data Protection Regulation (GDPR), for instance, is seen as a step forward in this regard, which pushed the companies to pay more attention to issues of privacy. Developers, however, also acknowledge that regulation is unlikely to be able to keep up with the speed of technology, so there will always be a lag between technological risks and regulations that protect individuals. The third imaginary focuses on conscious consumers and developers who would like to challenge the existing system and create a better one. IoT Manifestos[27], open software, open hardware movements, trustmark, trademark and other interventions for ethical certification of IoT technologies as well the demand from consumers for environmentally, socially and economically 'conscious' products, are considered as examples.

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[25] Mansell, 2012. p 44.

[26] Ustek-Spilda, Funda, Alison Powell, Sebastian Lehuede & Irina Shklovski (2019) Peril vs. Promise: IoT and the Ethical Imaginaries, Proceedings of the CHI 2019 Workshop on New Directions for the IoT: Automate, Share, Build, and Care, May 4-9, Glasgow, the UK.

[27] Fritsch, E., Shklovski, I., & Douglas-Jones, R. (2018). Calling for a revolution: An analysis of IoT manifestos. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (p. 302). ACM.

2.5.2 Social Milieu of IoT development

Our findings indicated that the social milieu of technology development, being strongly focused on innovation, attracting funding, corporate reputation and market share created challenges for explicit engagement with ethics. This, we argued, holds a major constraint to systemic change in the field. From our analysis, we developed three action positions to illustrate points of engagement with ethical and moral concerns. These positions are the Disengaged, the Pragmatist and the Idealist[28].

Within the Disengaged position, many IoT developers remained ambivalent about the 'use' of ethical reflection and discussion beyond compliance with existing regulations; concentrating their attention more on issues relating to business and financial stability. To illustrate, within the nearly 90 meetups held by IoT London Meetup Group held in the last ten years, our analysis indicated that ethics as a topic featured only once, at the meeting where VIRT-EU team made a presentation on our ongoing work[29], while GDPR emerged as a topic that was mentioned often.

The Pragmatist position places ethical concerns squarely in relation to business interests but is not necessarily subsumed by them. We found that ethics was referred to in its relation to new and emerging market opportunities and allowing businesses to limit financial liability.

An Idealist position on the other hand, advocated action on values and principles by incorporating them directly into business ventures and social networks. A series of IoT manifestos advanced some of these perspectives[30] and some developers we interviewed also positioned themselves and the trajectories of their ventures along these lines. A strong identification with 'we' rather than 'I' and separation of individual and collective subjectivities in relation to ethical concerns as well as an active engagement with the responsibility for producing ethical technologies (and futures) were shared among these individuals.

Our analysis demonstrates that the extent to which individual subjectivity can influence engaging in ethical action may depend on the organizational environment technology developers are embedded in. This means that constraints (financial, structural, social or other) are not merely external issues to be overcome for ethical action to take place, but rather intrinsic to the social milieu technology developers are part of. We use this insight to target our workshops and engagement to the milieu.

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[28] Ustek-Spilda, Funda, Alison Powell and Selena Nemorin (2019) "Engaging with Ethics in Internet of Things Design: Diverging Imaginaries in the Social Milieu of Technology Developers" Big Data and Society.
[29] Lehuede, Sebastian. 2018. "Ethics in IoT" London IoT Meetup #81 https://www.meetup.com/iotlondon/events/254987351/ Accessed 23 December 2019.)
[30] Fritsch et al. (2018)

Moral economies and ethical actions

We observed a strong trend towards development within a 'tech for good' paradigm; 'technology with purpose' or 'social ventures' as it is sometimes referred. We consider this paradigm to create an opportunity for change and a community through which our work may have impact. This "tech for good' paradigm also aligns with what social theorists Luc Boltanski and Eve Chiapello refer to as a 'project-based regime' where social life is oriented towards flexible, constantly shifting entrepreneurial actions[31]. Our research identifies that these actions not only reproduce social values but that they have moral qualities in and of themselves[32].

The rapid evolution of networked information technologies in the last two decades has shifted the organization of economic and social activity as powerful actors have sought to define and channel flows of information, development of new technologies as well as management of those technologies to their ends.[33] Hence, the prevailing vision of technological solutionism is a social imaginary that it can find solutions to all social problems. If we think about this from the perspective of social imaginaries presented above, social ventures and projects *imagine* that social problems can be solved with technology and they can be done so at a scale; benefiting both businesses (and simultaneously investors) and greater number of people with greater impact.

We see examples of this across the public and private domain. For instance, in 2018 the Mayor of London's Civic Innovation Challenge invited "innovative tech firms" to "develop solutions to some of the capital's most pressing social and environmental problems" including but not limited to climate change, air pollution, access to housing, dementia and social isolation"[34]. Moreover, there are now accelerator programs that define themselves as 'tech for good', venture capital firms that fund only technological ventures which are "committed to making a positive impact on society"[35] and private investors who support 'profit-with-purpose businesses" [36]. The interest in social ventures is also apparent in the increasing investment to projects in this space. According to a recent article in the Financial Times, in 2016 alone, $22.1bn was invested in social impact projects and this figure was expected to grow by 17% in 2017[37].

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[31] Boltanski, Luc, and Eve Chiapello. *2005. "The New Spirit of Capitalism."* International Journal of Politics, Culture, and Society 18 (3–4): 161–188.
[32] Ustek-Spilda, Funda and Alison Powell "Moral Orders in Social Ventures" Prepared for submission to *Communication, Culture and Critique.*
[33] Cohen, Julie E. 2012. Configuring the Networked Self: Law, Code, and the Play of Everyday Practice. Yale University Press.
[34] Mayor of London. 2018. "Mayor of London's Civic Innovation Challenge." Mayor of London's Civic Innovation Challenge. 2018. https://www.civicinnovation.london/. Accessed 23 December 2019.
[35] Chowdhury, Hasan. 2017. "'Tech for Good' Investors Find They Can Also Make Good Returns." Financial Times, September 26, 2017. https://www.ft.com/content/3e97b128-81c2-11e7-94e2-c5b903247afd. Accessed 23 December 2019.
[36] Chislett, Tamsin. 2016. "Tech for Good Ventures Are Fast Becoming a Staple of Manchester's Startup Scene." January 7, 2016. https://www.clearlyso.com/tech-for-good-ventures-are-fast-becoming-a-staple-of-machesters-burgeoning-startup-scene/. Accessed 23 December 2019.
[37] Chowdhury (2017).

The marriage of social good and profit raises important ethical concerns in relation to questions about how social good comes to be established. More specifically, defining social good within a business perspective requires us to also ask questions such as: Can the problems that will not yield profit be ignored or Can social issues that affect only minorities be overlooked- if the technological solutions are not scalable and thus profitable? Based on this starting point, we examined *regimes of justification*[38] and *operational pragmatics*[39] to be able to attend to the moments of conflict between justifications for doing good and justifications for the good of the business. We looked at *justifications* for what is social good and the *moral ordering* that takes place between various social problems and the proposed technological solutions. Our findings reveal that what is at stake is not simply social good is being framed within a *spirit of capitalism*[40] but that competing justifications of means and ends [and values and projects] co-exist to make doing good sustainable in an environment that is increasingly shaped by a spirit of capitalism.

In this spirit, social ventures can bring together individuals who would like to *disrupt* established financial, educational or labor market systems with the technologies they are building with investors who see a profit potential in these technologies. This positioning considers profit and social good as complimentary works in so far as the individuals setting up the companies are passionate about the causes and investors see a *business logic* in investing in them. The moral justification for starting a business (and continuing it) gets harnessed with the spirit of capitalism thanks to motivations for social good of the developers who may dislike accumulation for accumulation's sake, but see the potential of capitalism to build, grow and transfer the technologies they are building, with the help of capitalist accumulation. In other words, once the stress is put on *doing good* instead of capitalist accumulation, the means and ends of setting up the business get blurred, even when capitalist accumulation continues to be the main purpose.

2.5.3 Gender Diversity Issues in IoT Development

Our final theme emerged from our observations of the Women of Wearables (WoW) network, where we regularly participated in their monthly meetups and with whom we co-organised events and workshops. During the events we participated in, we observed that while ethical questions did come up throughout the discussions, most participants of the events were interested in learning more about women funders, funding opportunities for women (co)founders and developing femtech products. Technology development communities of practice are not representative of the populations for

[38] Boltanski, Luc, and Eve Chiapello. 2005. "The New Spirit of Capitalism." International Journal of Politics, Culture, and Society 18 (3–4): 161–188.
[39] Powell, Alison (2018) "Moral Orders in Contribution Cultures" Communication, Culture and Critique, Volume 11, Issue 4, Pages 513–529, https://doi.org/10.1093/ccc/tcy023
[40] Boltanski, Luc, and Eve Chiapello. 2007. The New Spirit of Capitalism. Verso.

whom they design: in particular they are notoriously male-centric and do not represent the population as a whole. Although there is no evidence that technologies developed by women are less effective[41], the gender difference in the number of men and women continues to persist and this is especially pronounced in the tech sector[42]. As such, throughout the project we paid particular attention to gender because inherent gender differences within IoT developer communities can manifest in communication patterns, relational processes and design practices that in turn reconfigure the kinds of social and ethical values dominant in these communities[43]. Discussions we observed in WoW events about ethics revolved not only around establishing and protecting privacy in wearables, sustainability of the product (and the business), but also about systemic bias towards women founders, women investors and women developers. Such discussions were rarely, if ever, brought up in more traditional and male dominated IoT environments of IoT meet-ups, accelerators and joint ventures. As a result, supporting women-led companies emerged in and of itself as a social activism and an ethical stance. As social ventures, our observations in the WoW network also demonstrated that discussions of ethics are tied closely to social, economic and political structures in which women developers operate.

2.5.4 Ethical Certification Projects

Throughout 2018 and 2019, we continued our participation at the IoT Mark, which in 2018 December was re-named to "Better IoT Mark" [44] as another IoT certification project was announced by ThingsCon Rotterdam and Mozilla Foundation, called the 'Trustable Technology Mark'. We followed the developments of both of the certification schemes and interviewed the key individuals behind them.

In the last year, Better IoT Mark announced a self-assessment tool for certifying IoT products that are currently in the market or under development. It is a free, web-based tool where developers are asked a series of questions to reflect on the key values of the IoT Mark, which were established through various co-creation workshops since 2016). These values are privacy, security, interoperability, life cycle, transparency, ownership and openness. At the end of the assessment, a report is provided along with some guidance as to how some of the misalignments in values can be resolved.

During the course of our observations, IoT Mark project pivoted from being an ambitious certification mark project to a self-assessment tool. One of the most

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[41] Gry Agnete Alsos and Elizabet C. Ljunggren, "Does the business startup process differ by gender? A longitudinal study of nascent entrepreneurs," in eds. P.D. Reynolds et al. Frontiers of Entrepreneurship Research 1998 (Wellesley, MA: Babson College).
[42] "Google for Entrepreneurs," Google, https://www.google.com/entrepreneurs/.
[43] Ilie, Virginia, Craig Van Slyke, Gina Green and Hao Lou. "Gender Differences in Perceptions and Use of Communication Technologies: A Diffusion of Innovation Approach," Information Resources Management Journal (IRMJ) 18 (2005): 3; Guadagno, R., & Cialdini, R. (2007). Gender Differences in Impression Management in Organizations: A Qualitative Review. Sex Roles, 56(7-8), 483-494;
[44] https://betteriot.wordpress.com/ is the new website of IoT Mark. Reports and minutes of all previous meetings, and discussions could be found on the website. Accessed 23 December 2019.

important reasons for this shift is resource limitations. The mark has been set up as a collaborative, open access initiative and throughout the co-creation workshops, it emerged that setting up a certification scheme would be very costly, in terms of both financial resources but also because of the time it requires for people who currently engage with the project on a voluntary basis. Moreover, throughout its life course, the mark's ambition for responsible and ethical IoT development was narrowed significantly. This is because participants who had startups or were part of IoT businesses drew attention to the 'doability' of some of the early principals of the mark. As one developer put it in a meeting in May 2018, one can create so many ethical principles, but if nobody can follow them, they would be pointless. Introduction of such a practical approach, however, ended up lessening and narrowing the ambition of the IoT mark as the final assessment tool measures more the legal liability of certain design decisions in IoT (e.g. GDPR), rather than providing a new horizon for thinking otherwise and developing better technologies.

2.6 Summary of Empirical Findings

We identified that social values for IoT developers are based within a project-based moral order. So, values such as sustainability, flexibility and creativity are broadly important across the entire process of technology development. Designing businesses with an explicit focus on 'technology for good' is also an emerging finding of our research. As such, the social milieu of IoT developers provides opportunities and constraints, where developers act on values in relation to the business logic that they absorb from collective discussions and influential actors like accelerator programs. Our research found that developers engage with social values from positions like the Idealist, Pragmatist and Disengaged, which indicate how they feel able to act in relation to ethical issues. All of these subtle and contextual actions are positioned within overall spaces of social engagement that have been quantitatively defined.

2.6.1 Why care about values?

Our project focuses on empirical study of values and the contexts in which they are embedded because **values are ideals.** Through the values we identified and the value maps we created, we studied the European legal landscape and investigated how larger legal and policy frameworks shape and get shaped by the social and business milieux IoT developers occupy. Throughout our research, we held that values set the framework for any ethical thinking and ultimately, regulations. Here, we were not only concerned about values individuals hold, but paid attention to **values that come from a collective and social position,** as we studied technology developers within the social, economic, cultural and political structures they are embedded in. Studying values this way enabled us to move away from relativistic understandings of ethics, where it changes from person to person, era to era or geography to geography.

While acknowledging the multiplicity of ethical positions, we stressed throughout our interactions with IoT developers, designers and entrepreneurs that there are morally right and wrong positions. Hence, our aim for building an ethical framework has been to find ways to help people trying to do better. Consequently, based on the values we

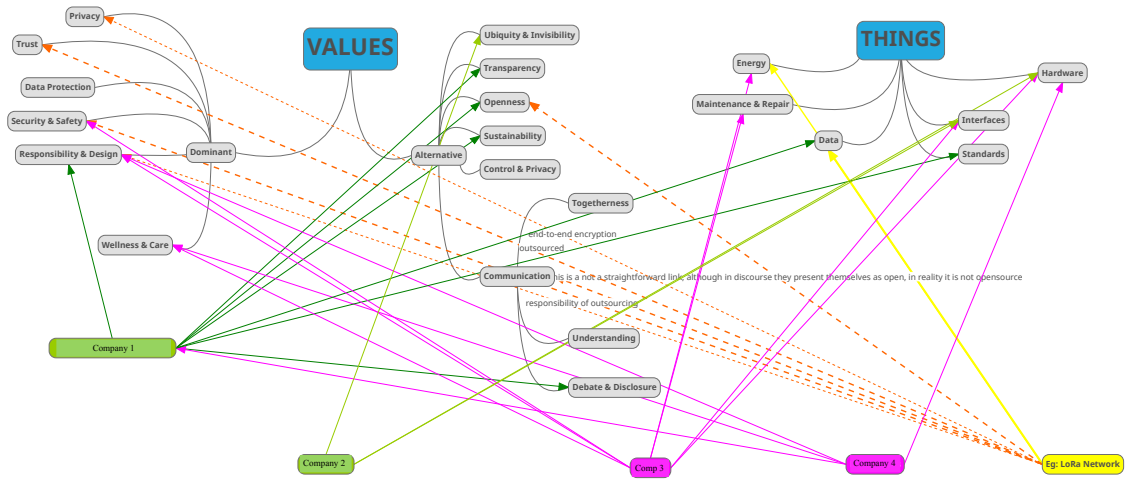

Figure 6: Values and things map derived from ethnographic work

identified throughout our quantitative and qualitative investigations, we have sought to develop an ethical framework which can **support ethics as an actionable framework**, and stay away from positions that could justify or legitimise watered down versions of ethics, or worse, ethics washing[45].

3. Development of privacy, ethical and social impact assessment framework

This section describes activities in WP2 (Task 2.4), WP3 (Task 3.5), WP4 (Tasks 4.1, 4.2, 4.3, 4.4 and 4.5) and WP5 (Task 5.4) in service of fulfilling Deliverables 2.2, 4.1, 4.3, 4.4 and 5.4.

Our second objective of the project was to support the development of a PESIA, a Privacy, Ethical and Social Impact Assessment framework developed based on legal and qualitative research. To address this objective we first present a practical theory of ethics in action, and then summarize the legal research and operational decisions that underpinned the development of the PESIA.

3.1 Developing a practical theory of ethics

Our research into the developer communities of IoT in Europe revealed that developers sought a moral approach, that was sympathetic to the constraints and capabilities they

[45] Ben Wagner. 2018. Ethics as an Escape From Regulation: From "Ethics-Washing" to Ethics-Shopping? In *Being Profiled*, Emre Bayamlioğlu, Irina Baraliuc, Liisa Janssens and Mireille Hildebrandt (eds.). Amsterdam University Press, 84–89. https://doi.org/10.2307/j.ctvhrd092.18

had, but still provided them with guidance to do better. We refer to this moral approach as 'practical theory of ethics in action'. We developed this theory through merging three schools of thought in ethics: virtue ethics, care ethics and capabilities approach. This practical theory of ethics has been extracted into an ethics primer, after workshop-based research revealed that technology developers and designers working in small startups often wanted more information about different ethical positions and their implications, compatibilities and incompatibilities[46].

3.1.1 Virtue Ethics

Virtue ethics claims that there is a kind of 'final good' which represents the desirable aims of someone's life, and against which these aims can be evaluated. All questions attached to right action are assessed against this final good - known as *eudaimonia*. This means focusing on excellence, virtue, and eudaimonia, instead of duty, rights, and obligations, which were the typical concerns of popular consequentialist and deontological approaches. More recently Vallor[47] applied a version of virtue ethics to the problems of technology, calling for a concerted collective effort to develop "technomoral virtues" that can guide the nature and direction of technical innovation in this rapidly changing world to ensure human flourishing. Virtue ethics draws with significant concern on the moral action of the individual and the role of community. Such an approach also offers a methodological opportunity to justify engagement with individuals and their articulations of values and principles as a legitimate pursuit.

Yet in terms of identifying values, virtue ethics presents an interesting challenge. We have identified that the social milieu of (especially commercial) IoT development provides many constraints to people's ability to act in ways that they might think of as ethical[48]. In particular, the idea of competing in a market or being subject to market pressures provides a particular constraint, which some people talk about transcending through their own personal work or actions or through the creation of alternative organizational structures such as technology trustmarks or manifestos. Part of the difficulty with virtue ethics however, is precisely its tendency to individualize the responsibility for virtuous action even if there is a role for communities in this process. According to MacIntyre[49], a virtuous agent knows the correct way to act in various contexts while also desiring to act in such a way.

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[46] Powell, Alison, Funda Ustek-Spilda & Irina Shklovski (2019) Virtue, Capability and Care: Beyond the consequentialist imaginary. Ethicomp 2020 - Paradigm Shifts in ICT Ethics: Societal Challenges in the Smart Society. La Rioja, Spain, 17-19 June.

[47] Vallor S (2016) Technology and the Virtues: A Philosophical Guide to a Future Worth Wanting. Oxford: Oxford University Press.

[48] Ustek-Spilda, Funda, Alison Powell and Selena Nemorin (2019) "Engaging with Ethics in Internet of Things Design: Diverging Imaginaries in the Social Milieu of Technology Developers" Big Data and Society.

[49] MacIntyre A (2007) After Virtue: A Study in Moral Theory. 3rd ed. Notre Dame, Indiana: University of Notre Dame Press.

3.1.2 Capabilities Approach

In trying to understand how ethics manifest as values in action in the contexts of hierarchy and power, we have been increasingly concerned with the questions of what leads some individuals/groups to choose to act in a certain way and what might shape or constrain that choice of action. One important attempt to elaborate on this question has been provided by Amartya Sen in his capabilities approach[50]. Sen[51] explains that "a person's 'capability' refers to the alternative combinations of functionings that are feasible for her to achieve. Capability is thus a kind of freedom to achieve alternative functioning combinations." As such, merely paying to attention to individual's internal capabilities is insufficient and we must also consider the possibilities created by a combination of internal capabilities and the structural conditions defined by the particular social, economic and political environment within which the individual attempts to act[52].

This recognition that personal principles may need to be compromised to cope with structural constraints point to the importance of understanding what these constraints are and what influence they might exert. Furthermore, technology developers are in a curious position of both having to make decisions within the structural constraints of their context and having to acknowledge that the design decisions they make will result in producing structural constraints and possibilities for their users. Thus for developers to "do good" it is important to not only evaluate how existing constraints affect design but also to consider how these constraints are translated into the design and how these might be mitigated to offer more or different possibilities to the users.

3.1.3 Care Ethics

The capabilities framework augments the internally oriented focus of virtue ethics on the moral capacities of the individual, by adding the importance of structural constraints. However, in both of these philosophical approaches decisions are made by individuals (even if within a social milieu) and it is individuals that must take responsibility, accounting for the constraints imposed by the broader social, political and economic contexts. Developers and designers of IoT technologies, just like everyone else, are certainly not alone in making decisions and in facing the consequences. Thus, we bring in *care ethics* to account for the value stemming from relational practice in considering different points of view as well as the possibilities of negotiating conflicts that arise between them. This enables inclusion of different points of view than the dominant discourses; such as those made by women or marginalized persons who have otherwise been excluded from the ethical discussion. It also makes it possible to consider the ethics of practices, such as caring, which have been absent from other

[50] Hesmondhalgh D (2017) Capitalism and the media: moral economy, well-being and capabilities. Media, Culture & Society 39(2): 202–218.
[51] Sen A (1999) Commodities and Capabilities: Amartya Sen. New York: Oxford University Press.
[52] Nussbaum MC (2011) Creating Capabilities. Cambridge, Massachusetts & London, England: The Belknap Press of Harvard University Press.

ethical positions. Joan Tronto[53], for example, rejects essentialisms in gender and moral thought and advocates for contingent and historically situated definitions of moral values and capacities.

Individuals are always entangled in a diversity of relations that hold contradictory values and conflicting demands. We bring these differing and at times conflicting demands in focus to illustrate both the complexity of the contexts in which decisions about emerging technologies are made and acted upon; but also how rather than the consequences, the infrastructures, relations and individual and community values shape the way these decisions come to be made.

3.1.4 The VIRT-EU ethical framework

Our collective derivation of a practical framework of ethics from relevant philosophical perspectives and empirical observations connected with legal research on existing impact assessments and set the groundwork for communication tools and workshops where ethical reflection tools were co-designed.

Combining virtue, care and capabilities approaches in dialogue with ethnographic insights allows us to consider how and why designers and developers make decisions and do what they do. The rhetoric of technological innovation often privileges individual principles and virtues as primary drivers for generating change. While such rhetoric aligns with the principles of virtue ethics, complimenting these with care ethics and capabilities approaches allows us to take into account the structural constraints, responsibilities and obligations that designers and developers have to work with. Such a framework provides a basis for designing tools to help developers consider the ethical concerns and implications of their practices.

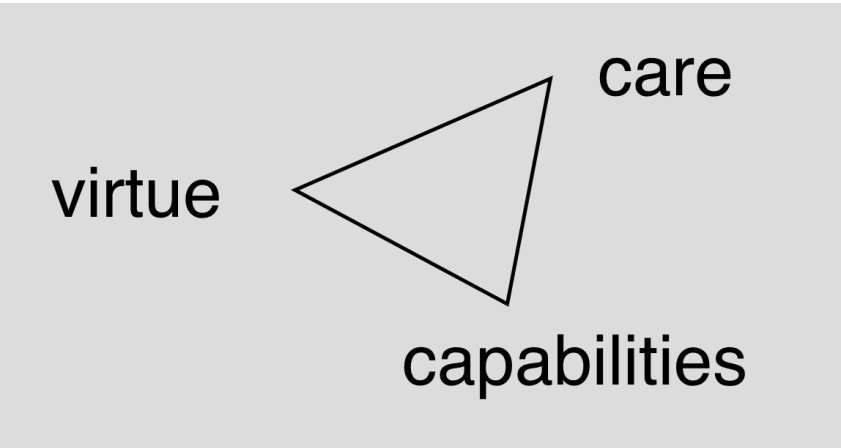

Figure 7: The VIRT-EU ethical framework

[53] Tronto JC (1993) Moral Boundaries: A Political Argument for an Ethic of Care. London: Routledge, Chapman and Hall Inc.

Our quantitative and qualitative empirical research specified the field of IoT design and development. We also employ legal approaches to consider the role of ethics by relying on the common ethical values recognized by international charters of human rights and fundamental freedoms. Legal requirement and mandates seek to balance the interests of the data subject and other stakeholders involved in the development and provision of products and services. However, rapid changes introduced by technological innovation have resulted in a multitude of ethical challenges that are not addressed by the law.

There are parallels between the opportunities and constraints imposed by the existing regulatory context in Europe and the capabilities framework, which explicitly acknowledges the importance of these strictures. The principle of informational self-determination that underpins many aspects of the GDPR[54] is an exemplar of virtuous thinking, where decisions and their consequences are the responsibility of the autonomous individual. At the same time, the principle of proportionality requires considerations not only of the particular structural constraints but also of the relations involved in any particular situation. Where notions of fairness, transparency and autonomy speak directly to the moral character in virtue ethics, the addition of accountability as a common legal frame shifts the discussion again towards ideas of care. In this way, our ethical framework provides a usable set of concepts to engage with the legal frames of the project as well.

Based on this research, a practical theory of ethics in IoT development emerged, grounded in philosophical research and validated through consensus reached in the consortium's analytic seminar and subsequent iterative analysis of empirical material and direct engagement with designers and developers through co-design and development workshops described in section 4.1. This theory of ethics in practice lays the foundation for VIRT-EU's overall impact strategy, comprising a suite of tools also integrating PESIA as part of the VIRT-EU service package.

3.2 Analysis of relevant regulations for IoT

Although privacy and data protection are paramount issues when it comes to regulatory compliance in IoT innovation, there is quite a lot of other standards and regulatory requirements that IoT developers must take into account as well. In the realm of privacy we had identified compliance as a baseline on which to build extra features. If we looked at ethics more widely, we also understood that designers and developers needed to comply with other types of regulation that touched on areas such as safety. As such we created an extensive report on IoT relevant standards and regulations as aprt of Deliverable 2.2. In our research we found that there is no such comparable document available. As such, we have created a stand-alone downloadable version of the report,

[54] European Parliament and of the Council. 27 April 2016. Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)

made available to IoT developers and designers as part of the VIRT-EU service package (D6.3).

The report briefly placed the regulatory framework of the EU in relation to those of the US and China, the two other main regions of the world where IoT is being developed. A common theme is the reluctance to regulate in detail while the technology is not well understood. We continued with a survey of standards relevant to IoT. We covered the work of various international bodies – ITU, ISO/IEC, W3C among others – that are producing new standards very relevant to the sector. There is a proliferation of telecommunications standards around machine-to-machine communications. The W3C is doing a great amount of work on wireless standards for sensor data and devices with limited resources. The other standards covered in the report are those specifically created for IoT, in some cases by private industry consortia. These include LORA, Sigfox, onem2m2 or Zigbee. We found issues with interoperability and a confusing landscape that is likely to baffle consumers.

Technical regulation affecting IoT is quite broad. As electronic devices, any IoT system in the EU will be subjected to one of the product directives. The likely default will be the Radio Equipment Directive, but in some cases there are specific regulations, for example for toys. Any product that is sold in the EU must have CE mark product conformity. There are also various regulatory issues affecting IoT in the telecoms regulatory space, and we provided a short discussion on each: numbering, roaming, spectrum, etc. The reports also covered other non-technical regulations: consumer protection, environmental and labour regulations, and intellectual property. Finally, we surveyed the main IoT security framework and guidance, although since the time the report was written there have been some important advances in this area with the UK government consulting on mandatory labelling measures.

3.3 Overview of privacy policies by IoT startup companies

As part of D 4.4 Open Rights Group (ORG) analysed the contractual agreements such as terms of service, privacy policies, marketing documents and service agreements, of fifty EU-based companies working in this area of Internet of Things products. The aim was to understand whether it was possible to extract information about the ethical values held by companies from these outputs. The analysis was carried out against the ethical values identified in the ethnographic work by LSE and at Politecnico di Torino in data protection regulator decisions across the European Union.

Non contractual document such as marketing materials and companies' websites have been more fruitful in terms of getting an insight of a company's ethical thinking, but there are important caveats to this. Because the content on companies' websites is, to a large extent, marketing, it does not necessarily reveal the ethical values of the company.

A number of companies selling consumer IoT products celebrated self-surveillance and relied on detailed data collection by the company to enable the customers to monitor themselves. In many of these cases, surveillance was presented as being good for the user. Finding ethical values within the websites of companies whose business model relies on sales to business is particularly difficult. The predominant proposition by such 'b2b' companies is efficiency: lowering costs, saving time, optimising use of space, increasing employee productivity.

The research of contractual documents such as privacy policies found that several of the companies in the list did not make privacy policies available at all, even when they included analytics software such as Google Analytics on their website. This situation leaves consumers unable to make purchasing decisions informed about how data about them will be used if they buy the product. When companies do publish any contractual agreements, the text within the documents is often generic and repetitive. For the most part, ethical values were not particularly evident in the text of these documents. Occasionally, the terms of use documents state that the user is not allowed to reverse engineer the software that runs on the IoT product. It is clear from our research is that it is relatively rare for IoT companies to communicate how they will collect and use data from the products they sell to potential consumers prior to purchasing.

In order to demonstrate these issues in a more accessible manner to the public at large, project partners LSE, ORG and ITU conceptualized and created YouTube unboxing videos where we unboxed selected IoT devices, while discussing their privacy policies, data practices, the effort required in learning about data practices associated with each devices as well as the responsibilities allocated to the users through these documents. These videos are discussed in detail in section 6.4.3.

3.4 The PESIA model: concept and design

Since the proposal stage, POLITO has suggested to develop a new model of privacy impact assessment to include ethical and social issues in the design of IoT devices and related services. This model represented a novel approach in dealing with data and technological devices, as existing experiences and legal requirements were mainly focused on legal issues, and the PIA (Privacy Impact Assessment) models developed in the context of data protection dealt with data security and data quality, without addressing ethical and social issues.

In this regard, the article written by the PI at POLITO in 2016[55] as the background study for the development of this new approach, highlighting the broader impact of IT technologies in the context of large-scale data processing and pointing out the importance of a broader impact assessment encompassing ethical and social issues.

[55] Mantelero. 2016. Personal data for decisional purposes in the age of analytics: From an individual to a collective dimension of data protection. 32(2) Computer Law & Security Review 238-255

This approach was adopted in the design of the project tasks and deliverable, where the development of a Privacy Ethical and Social Impact Assessment (PESIA) became one of the main expected results of this project. POLITO's research activities throughout the entire project covered the design and development of this model, leading Task 2.4 and the entire WP4 on Law & Policy, the latter devoted to the development of the PESIA model.

3.4.1 The PESIA architecture

The PESIA is a questions-based model, like PIA and DPIA models, to better guide IoT developers in adopting a design oriented towards privacy, ethics and socials values. Using a questionnaire, it is possible to segment a complicated assessment into different thematic sections and sub-sections focused on each of the different value domains considered here. Since IoT developers may not have a specific background in the legal and socio-ethical fields, this values-based approach makes the assessment easier. Developers are progressively led through the different issue related to the considered values.

For this reason, the PESIA model is divided into two thematic sections, focusing on privacy/data protection, and on ethical and social issues respectively. In line with the project description, the concept and development of these sections is based on the theoretical and empirical research carried out in the first twenty-four months of this project by Politecnico di Torino (M01-M24). In this regard, the PESIA model has been realised in D4.3 on the basis of this research, including a contribution drawing on ethnographic analysis provided by London School of Economics and Political Science (D.4.3, pages 48-52).

The first thematic section of PESIA is the least innovative one, since it is based on the existing PIA/DPIA models. However, this section provides a common scheme in a regulatory context were several different models are available at national level, making it difficult for developers to understand the differences between one model and another, and decide which one should be adopted. In this light, this section on data protection can contribute to the harmonisation of the GDPR-based assessment practices, which is a key issue in today's regulatory debate in Europe.

The section concerning ethical and social issues is the most innovative, since data controllers are not used to addressing these issues in the PIA/DPIA models and due to the fact that this section focuses on values that are not already defined by the law. To better support developers in addressing the novelty of the proposed approach in this section, the PESIA model not only provides a series of questions, but also some introductory cases which provide examples of the societal challenges faced by the different groups of questions. These two different sections form the PESIA model provided in D.4.3.

In the last three months of WP4, this model was partially refined by Polito and ORG (D4.4) by adding explanatory comments to the questions of the Privacy section of PESIA, in line with the different models of data protection impact assessment available at national level. For the socio-ethical section of PESIA, the cases – which are the core element of this section – have not changed in the updated version and are the same as developed in D4.3, but questions have been added to the questionnaires, which follows each of them.

Compared to the PIA/DPIA models, the PESIA model does not have a threshold, in terms of risk severity and probability, since this is a self-assessment model and thresholds can be hardly defined regarding ethical and social issues, due to the lack of consolidated measurement criteria in these fields. In addition, the comparison between DPIA models (see D4.1) and the PESIA shows the broader scope of the latter, which could foster an ethically and socially oriented development of IoT devices and services. In this regard and in terms of responsible approach to data use, PESIA provides a concrete answer to the growing emphasis of policymakers, industry and communities on the value of personal data as a key resource in the digital economy, also addressing the concerns about the centrality of information to our society and the decision-making processes.

3.5 Methodological considerations: Innovations in Legal Research and PESIA Design

PESIA development also constituted a significant methodological contribution of this project to legal research. The main improvement concerns the empirical legal analysis conducted by POLITO, since empirical legal studies are largely underdeveloped in Europe and mainly in continental civil law countries, such as Italy or Spain. For this reason, the main results of this project concerning the legal reach have also been published in Italy and Spain[56] and presented at conferences organised in those countries[57], where this kind of methodological approach narrowly used by legal scholars in the field of private law.

The methodology of empirical legal research has been used in this project with regard to the development of the PESIA model and, more specifically, to identify the values that should underpin this model. To this end, the POLITO team has carried out an empirical analysis of the jurisprudence of the main Data Protection Authorities in the EU and of

[56] See Mantelero, A. 2017. Towards a big data regulation based on social and ethical values. The guidelines of the Council of Europe. 41 Revista de Bioética y Derecho 67-84; Esposito, M. S. 2018. L'impatto del trattamento sui diritti e le libertà delle persone fisiche: una valutazione alla luce della giurisprudenza delle autorità garanti italiana e spagnola. In Mantelero, A., Poletti, D. (eds). Regolare la tecnologia: il Reg. UE 2016/679 e la protezione dei dati personali. Un dialogo fra Italia e Spagna (Pisa: Pisa University).

[57] XI International Seminar on the Universal Declaration on Bioethics and Human Rights (UNESCO): "Big Data in Health", Barcelona, 2017, and L'entrata in vigore del Regolamento (UE) 2016/679: la riforma alla prova della prassi in Italia e in Spagna, International conference, University of Pisa, Pisa, June 8-9, 2018.

the European courts (ECJ and ECHR). Similarly, the different DPIA and PIA models have been comparatively analysed.

In this regard, the main methodological achievement was the development of a legal analysis that went beyond the traditional categories of data protection and focused on the role played by several values, including fundamental rights and freedoms, in decisions whose main arguments rely on data protection and its legal categories. These findings, in terms of values that underpin legal decisions, made it possible to identify the list of legal and societal (i.e. ethical and social) values that should be used as benchmark for the PESIA model.

A further contribution to the legal analysis concerns the definition of the boundaries of the legal, ethical and social values and the understanding of the existing relationship between these different realms. As recently demonstrated in the on-going debate on AI, with regard to several guidelines on AI and ethics, there is a certain degree of confusion and overlap between the ethical and the legal guidance in the regulatory debate. In this context, the analysis developed by POLITO has contributed to identifying the different issues and values concerning both law and ethics, without confusing these neighbouring realms. Based on this methodological approach, the research result (the PESIA model) is clearly divided into two sections, one focused on legal assessment and the other on the socio-ethical assessment. This choice not only steam from the different sets of values identified in the previous analysis, but also has an educational purpose, as it aims to raise awareness among developers about the different types of values and principles that should be considered.

The design of the PESIA model is also a further contribution to the methodological development of empirical legal studies regarding the design of operational instrument to increase legal compliance. In this regard, the addressed methodological challenges concerned, on the one hand, the variety of the exiting PIA and DPIA models and, on the other hand, the difficulties in facilitating the understating of ethical and social issues by developers.

To address these challenges, the privacy-focused section of PESIA has been built on the previous experience of the PIA/DPIA models, which provide useful reference points and are schemes that data controllers already known, creating a kind of meta-model. This choice characterised by continuity with the impact assessment schemes used in the field of data protection was also adopted to facilitate the adoption of the PESIA model by developers.

Regarding the assessment of the IoT development in relation to societal values, the PESIA model has abandoned the pure questionnaire-based model of PIA and DPIA to introduce some cases used to show, in a direct and immediate way, the potential impacts that may raise ethical and social issues. These issues have been addressed in

more detail by a series of questions for each case. In this manner, the assessment model has become an instrument that creates awareness and raises accountability.

3.6 Adapting PESIA to IoT context and stakeholder workshops

The original PESIA questionnaire was primarily developed by POLITO and delivered under D 4.3. This deliverable included the full research background used it build the questionnaire, such as the analysis of values in legal documents, and also the guidelines for developing the model. That deliverable also contained a series of scenarios that triggered social and ethical dilemmas and presented a series of context-specific questions which developers could ask.

For deliverable D 4.4, ORG took the results of D 4.3 and tested the questionnaire in a variety of contexts. ORG discussed and obtained feedback on the questions from a variety of individuals: staff not involved in the project, members of the advisory board, privacy researchers and advocates, and members of the public. ORG also presented the PESIA questionnaire at the stakeholder workshops conducted as part of Task 5.4. These are described in more detail below.

Overall, the feedback suggested that the language of the questionnaire was too technical and difficult to understand by non-experts. There was also a demand for ancillary text to explain and further develop some of the questions, as even with simpler language these were still difficult to answer. The stakeholder workshops deepened our understanding of the PESIA and other tools by consultation with a variety of actors.

3.6.1 Stakeholder workshops – London

Our workshop in London was attended by several policy specialists with experience in the intersection of data and ethics and IoT, representatives of consumer groups, academics and professional privacy officers. Workshop participants gave very positive feedback on the ethical framework. The exercises successfully showed a very diverse understanding of ethics and led participants to productive and engaged discussions.

The feedback on PESIA was that it was too abstract and too general and required ancillary exercises to be carried out before users were able to answer the questions. Most potential users would not be able to understand the context or the language. This has driven a simplification exercise. We had particularly useful insights around risk management and avoiding common pitfalls from a participant who worked for the airline industry, on the use of the so-called Bowtie model. We are now incorporating this approach into our tools (see section 5).

3.6.2 Stakeholder workshops – Amsterdam

A mixture of policy specialists, including two individuals who had previously developed tools for ethical assessment, and designers, attended the workshop in Amsterdam.

Participants were given an overview of the ethical framework and asked for feedback on one specific issue: how much do we explain to workshop participants and tool users the underlying ethical principles and approaches. The feedback pointed at the difficulties with engaging openly about ethics.

PESIA was discussed, particularly the difference between process-based tools and product-based and the importance of understanding at what point of the process the intervention is taking place. There was significant interest in the VIRTEU toolkit covering the full lifecycle of the product. This was followed by a discussion on the risk management approach we based on a modified Bowtie Model, from the previous workshop. The feedback on the risk approach and the questionnaire was very positive. These findings were carefully considered in the creation of the interactive VIRT-EU tool prototypes by ORG and CIID described in Section 5 below.

4. Co-designing self-assessment tools

This section describes activities in WP3 (Task 3.4), WP5 (Tasks 5.2, 5.3, 5.4) and WP6 (Tasks 6.1, 6.2 and 6.3) in service of fulfilling Deliverables 3.3, 5.3, 5.4, 6.1 and 6.2.

In order to achieve Objective 3, we used PESIA as inspiration to co-design a set of self-assessment tools with technology developers, who may not be able to anticipate the future use of their projects and future clients and partners. The tools are grounded in existing developer practices and based on quantitative, qualitative study and design research that identifies how ethics operate as a process. These tools include a range of materials developed and disseminated using a range of different strategies in order to influence the working practices and decision-making processes of our target groups.

Developing new tools for supporting ethical decision-making requires a deep understanding of what kinds of ethical tools might already exist. In fact, the proliferation of ethical tools for design has followed recent discussions about ethics and responsibility in the way of the EU promotion of RRI principles. The partners conducted an extensive overview of all available ethical tools, guidelines, codes of conduct and working group statements intended towards an audience of designers, engineers and developers. The VIRT-EU tools the project produces leverage existing knowledge in the deployment of tools in this space and addresses problems these tools have already encountered in their adoption and implementation. Although the gaps we identified in existing tools are not absolute - some tools try to address one or the other - few tools address any one of these gaps with the thoroughness it requires.

We analyzed over 70 different ethics tools finding that overall the existing tools tend to lack the ability to truly take into account change and input over time. We note that there has been a considerable increase in the number of ethical tools since 2016. Most tools are organized as toolkits or cards but there are also significant increases in the various

principles, codes of ethics/practice as well as a number of trustmark certification development efforts.

While there are many tools that focus on either ethical and moral decision-making or legal compliance, few combine the two. In some cases, business ethics are conflated with ethical design and development, and ethics as a term is used interchangeably with corporate social responsibility. Although ethics is used extensively as a concept it is rarely defined or substantiated. It comes to mean many different things, but the stress is typically on privacy and security (data) and doing no harm (to end-users). Value tensions and conflicts has been one of the major observations of VIRT-EU and it is central to the Value Sensitive Design approach[58] as well. However, across the tools we have reviewed, we found that conflict is generally not foreseen. Even when it is foreseen, it is either expected to be resolved easily (through discussion) or is left to the stakeholders to resolve them. Power dynamics are often not taken into consideration either, which is a concern given that ethical decision making necessarily happens in contexts rife with power relationships and constraints.

The majority of the tools are built by design studios, consultancy agencies and developer networks/communities. Most of the tools themselves are typically free to download and use (with few exceptions), but facilitation and further consultancy are paid and many of the tools do not provide additional content to support their use. Some of the existing tools are rooted directly in operational realities of technology development, while others focus on speculative outcomes and structured speculation. Few tools, however, successfully merge the two processes for a mapping of speculative engagement to the operational realities of innovation. This analysis is being prepared as an academic review article[59] and a tool report oriented towards the business community. Our database of ethical tools is publicly available and is a component of the VIRT-EU service package Deliverable 6.3.

Our ethnographic research highlighted that many IoT developers describe that their sense of ethics and company values often become more or less prioritized and even misaligned when they are choosing certain materials that compose their product or when they have meetings with investors and other stakeholders. Yet the current ethical tools do little to facilitate or prepare creators for the difficult discussions that will take place around the material and investor decisions. The VIRT-EU toolkit has sought to address these issues by designing tools that provide a flexible approach, offering a means to engage with questions of data protection and legal compliance while also enabling developers and designers to engage in structured speculation and simulations of decision-making.

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[58] https://vsdesign.org/

[59] Ustek-Spilda, Funda, Irina Shklovski, Alison Powell, Annelie Berner and Javier Ruiz Diaz "What's Your Ethics? A review of ethical tools for technology development. Prepared for submission to *First Monday.*

The VIRT-EU toolkit includes workshop and discussion scripts for collective discussions, stand-alone paper tools for individual and group explorations as well as interactive online self-assessment tools. Below we describe the process of tool development and testing, the resulting workshop scripts and, finally, the tools we have produced.

4.1 Translating ethnographic insights through co-design

In order to connect research insights from ethnographer partners with design concerns and begin understanding how these insights could lead to practical tools, CIID in cooperation with ORG, LSE and ITU held a series of co-creation workshops in London, Amsterdam and Copenhagen with designers and developers of IoT as part of Task 3.4. In each workshop, we facilitated a process with specifically designed paper tools that ranged from a more open and co-creative design to a nearly finished and self-facilitated design. Our goals were to try to understand how IoT creators see ethics happening in their product choices and design, as well as how and whether guiding our participants to speculate at a more system-level would open up uncovered ethical pitfalls. Initial outcomes of these workshops were reported in Deliverable 3.3 and resulted in the Bear & Co demonstrator presented at Ars Electronica and the ACM Human Factors in Computing (CHI) conference (described in the next section). CIID, together with LSE and ITU continuously refined the tools and facilitation we had designed for each location in order to achieve our goals.

The insights from our workshops allowed us to identify specific areas that would be ripe for intervention and integration of ethical reflection and social impact assessment.

1. Articulating ethical values and building processes of checking in on internal alignment with the values and the material decisions (“zoom in”).
2. Structured consideration of the people, places and time that may be left “out of the picture” when over-focusing on product development for launch (“zoom out”).
3. Working through the positive, negative and unexpected impacts when a product would launch at scale - through scenario writing and risk assessment models.
4. Laying out the dimensions of difficult decisions on both practical and ethical levels: visualize and structure understanding how decisions can change the product's alignment with its own stated values and with the various stakeholders in the company - from developers to business designers to investors and advisors.

Our tools have been designed to enable creators of IoT to articulate and structure possible gaps between their material choices and stated values - empowering them to map, question and discuss these gaps, as well as demonstrating to them when and how these "gaps" might lead to major legal and ethical repercussions.

4.2 Designing simulations

As part of the translation from insights of ethnographic research to tools for ethical reflection, we designed co-creation workshops and interventions to try to uncover how developers and designers can relate to, make use of, and find space for ethics in their work processes.

An iterative process drove our work, from co-creation workshops with developers to making prototypes. As a step between co-creation, translating the ethical framework developed by VIRT-EU and integrating PESIA, CIID, in cooperation with LSE, ORG and ITU, created the experience of "Bear & Co.", a role-play and rehearsal to help IoT creators articulate their hopes for their product and then experience and engage with the tensions and unexpected situations that will occur in the design process according to our project's research. The logic of the design started with a focus on the practical side of how sometimes complementary and occasionally competing values are expressed and enacted and negotiated through difficult decisions in designing, developing and deploying IoT. Bear & Co. was a demonstration for how we might integrate ethical thinking into the process of creating connected devices through simulation of potential problems and rehearsals of decision-making in search of solutions.

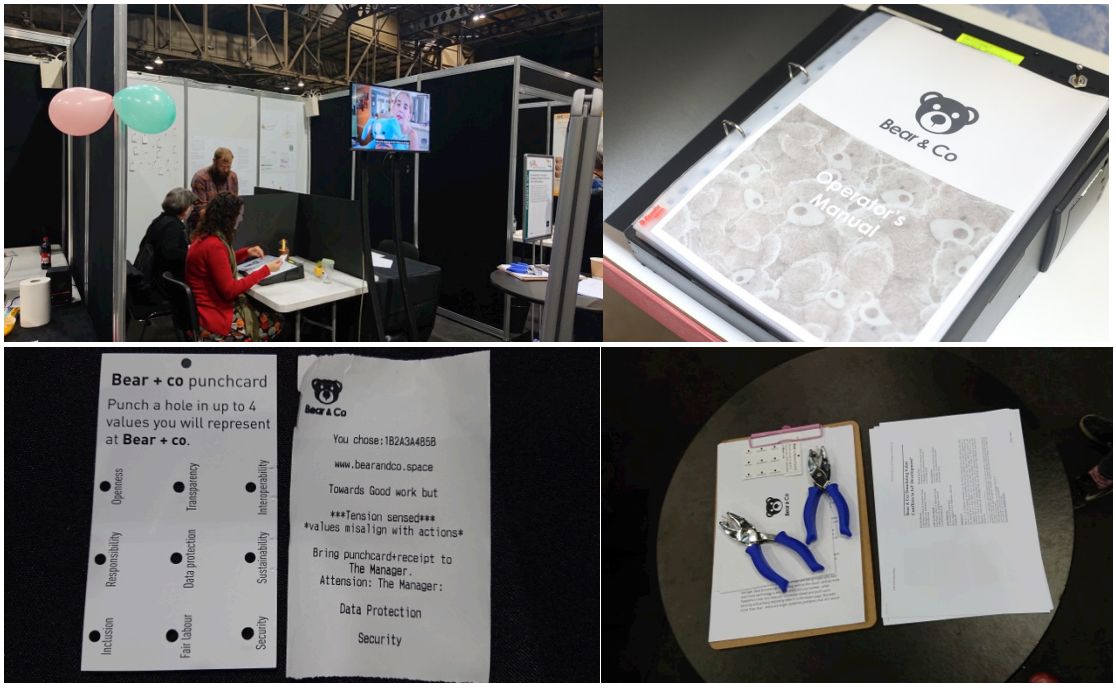


Figure 8: Bear & Co demonstrator at CHI 2019

CIID presented the experience at Ars Electronica Festival in Linz, Austria (September 2018) and then again at CHI in Glasgow, UK (May 2019)[60]. In each event, upwards of 100 people visited our booth, tried the experience and discussed their learnings with us

[60] Berner, A., Seyfried, M., Nordenskjöld, C., Kuhberg, P., & Shklovski, I. (2019). Bear & Co: Simulating Value Conflicts in IoT Development. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, UK). ACM

and each other. The audience at these events ranged from independent technologists, artists, developers and designers to academics and employees of major technical companies such as Google and Facebook. In fact, the Bear & Co. demonstration at the ACM CHI conference in Glasgow lead to in-depth discussions about ethics and moral decision making in the creation of technology with employees, designers, developers and researchers from small startups and medium enterprises as well as from Google, Facebook, Yahoo, Microsoft, Apple and others.

In Bear & Co., participants join a company that has come up with a service to send voice messages from a smartphone to a cuddly teddy bear - a way for parents to stay in touch with their children even when they are far from home. In this theoretical IoT Company, participants have to state their values in order to start work (a virtue ethics perspective). However, once they start work, their values are tested continuously as they try to solve dilemmas that have no right answer. At the end of the "workday", they receive a receipt of work done that evaluates whether the values they began with have held up against the decisions they made. The fictional company sounded harmless, but the potential for decisions to lead to harmful outcomes was high given the materials of IoT and the accompanying streams of data, remote servers and intimate domestic settings.

CIID Research worked with LSE, ORG and ITU to write dilemma books for participants. Each dilemma presents possible challenges to ethical values that stem from the Virtue Ethics tradition. The dilemmas include accompanying "stories" that hold more points of view than those typically covered, thus complicating a difficult decision even further. The stories connect with aspects of Care Ethics, a relational point of view. Finally, the decisions per dilemma are binary, therefore simulating an experience of curtailed agency for those working at our "company", which reflects the concept of the Capabilities Approach.

Bear & Co. was a way to rehearse, to practice ethical thinking and decision-making for a product, a kind of simulation or role-play. It was intended to engage researchers, designers and developers so that when they confront actual major and systemic problems, while working on their own products or projects, they might be better equipped to solve the issue - or at least to try to solve, and then try again. The novel contribution of this approach is in making evident the contingent and inevitable nature of value misalignments, produced as a result of decisions in technology design, through a material interface. The Bear & Co. experiences gave us insights into how to enable everyday people to understand and engage with the VIRT-EU ethical framework as well as identify the strongest dilemmas in terms of upholding values when developing IoT.

The Bear & Co installation, designed by the Copenhagen Institute of Interaction Design research group (CIID Research), won an honorary mention in the FastCompany 2019 Innovation by Design Awards in the Experimental category.

4.3 Tool iterations

Tools were developed and then iterated throughout the project. We developed tools at different levels from basic paper prototypes to fully functional interactive digital prototypes. The tool development process is described in detail in D3.3 and D5.3. Below we present a few highlights from the process and describe some initial prototypes.

4.3.1 First digital interactive prototype: Design challenge tool

As part of understanding this stage of intervention, CIID conducted focused interviews to identify specifically when, where, how and why creators of new devices take ethics into account, as well as what their various "processes" were. This research found that there is no one process, and that ethics is delayed or ignored more than anything. This insight was supported by ethnographic research partners' inputs. Therefore, we came to the conclusion that we need to insert ourselves into, and to some extent help to redesign processes of development.

Thus, in the Design Challenge, we structured the way in which our participants could integrate ethics into their work. Participants submitted an early "napkin sketch" of their idea and, if we deemed the idea clear enough, they passed to the "short-listed" phase, where they got a link to a tool to support them in their ethical reflection at that stage of the design process (stage of fidelity: they will only have passed from ideation into maybe low-fi prototyping towards a clear concept). They were asked to use our tool as support for completing the next stage of work: full materials of technical diagram and user storyboard.

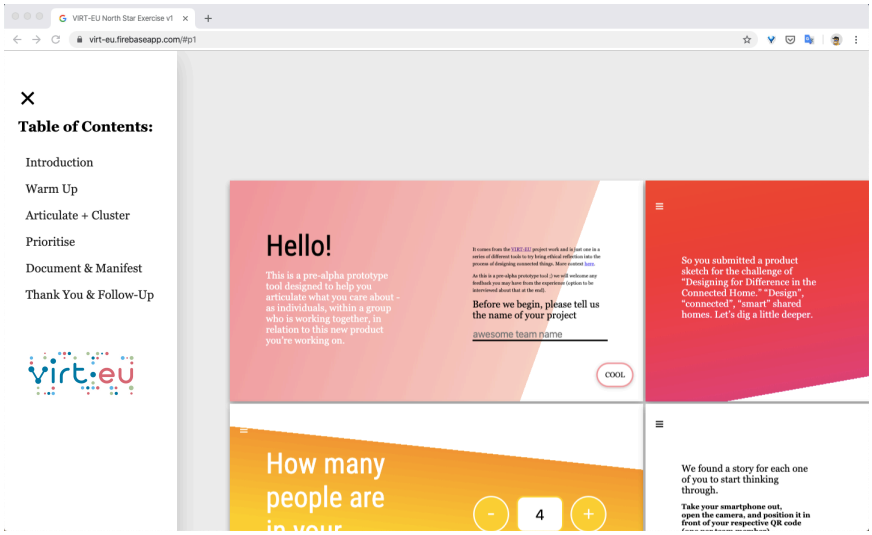
In order to support the respondents of the Design Challenge to focus on the ethical aspect of their ideas and concepts, we explored the experience of articulating ethical values in relation to the values that VIRT-EU partners had identified through fieldwork. According to our interviews with start-ups and small companies creating connected devices, the intention, or the "North Star", is a crucial concept to create in order to hire new teammates that will behave ethically and in order to maintain a high standard of ethical alignment throughout the messy process of product development. Therefore, we chose to create a tool to enable the respondents of the Design Challenge to clearly state their principles and North Stars when starting to create their response. As many contemporary start-ups have team-members that are geographically distributed, we designed a self-facilitated digital experience that participants could follow as remote team members.

The "North Star" tool experience has the goal of a) supporting multiple teammates to understand the concepts behind ethical values in relation to product development and b) facilitate negotiations of differences across teammates when choosing and defining ethical values. We deliberately wanted to address the problem of determining values as

a group. Does one get more “votes” than another? How do you even start talking about such abstract concepts as “transparency”? Our tool was designed to guide teams through this process.

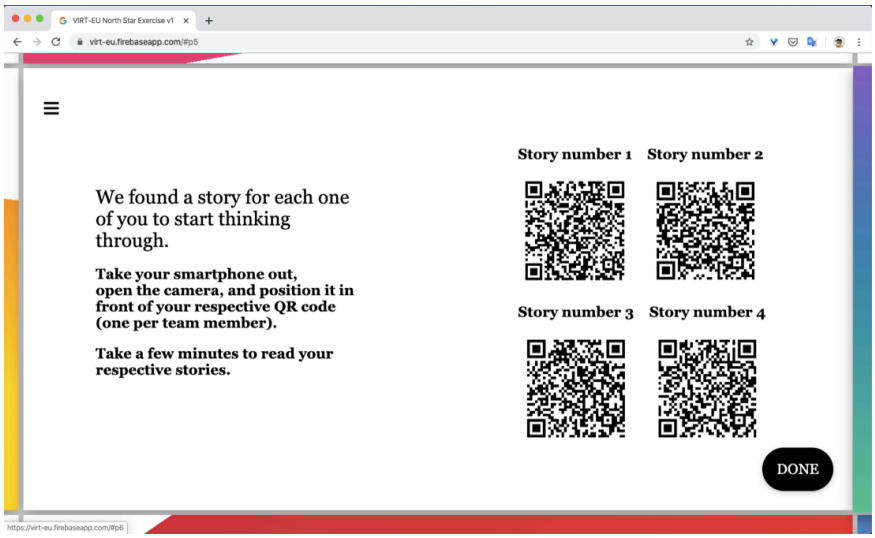
The experience follows this series of steps:

1. **Introduction to the tool**: its rationale, the VIRT-EU concepts of ethics in relation to technology, the ethical values identified by VIRT-EU



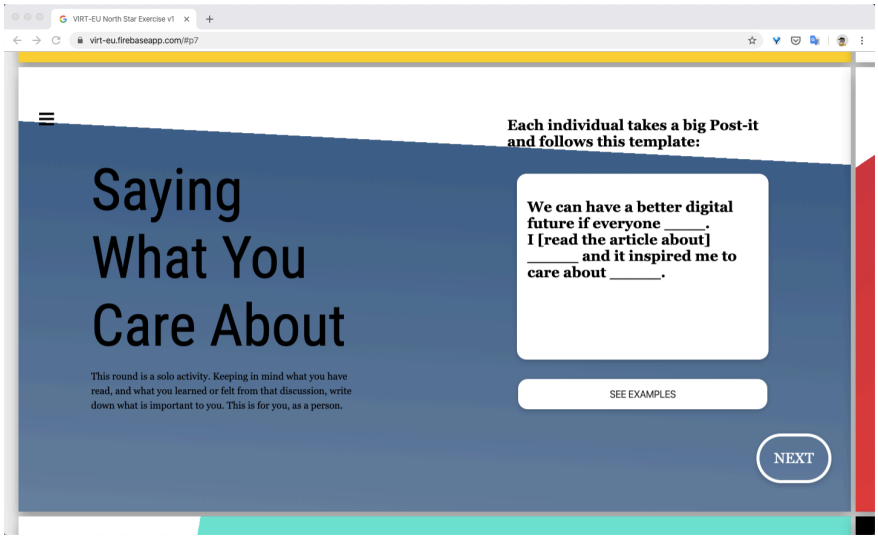
(image: overview of the tool)

2. **Warm-up:** Throughout the year we collected a database of “pathological cases” – media stories about IoT products or services that were problematic from an ethical point of view, where ethics are forgotten or overlooked, ethical values are misaligned, or products do not have ethical values articulated clearly at all in the first place. In the tool we used pathological cases as a point of discussion. Each team member was assigned their own pathological case and they were then asked to discuss and compare.

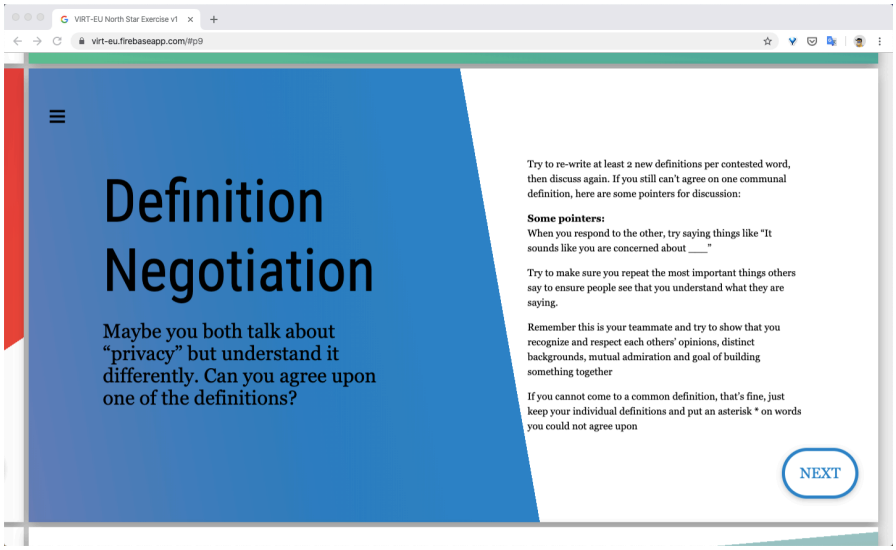


(image: interface for pathological cases delivery)

3. **Articulate, cluster, prioritise, define**: we structured steps of articulating ethical values as individuals, clustering as a team, and then prioritising these values together. Our tool included advice on negotiations and open discussion when disagreements occurred.

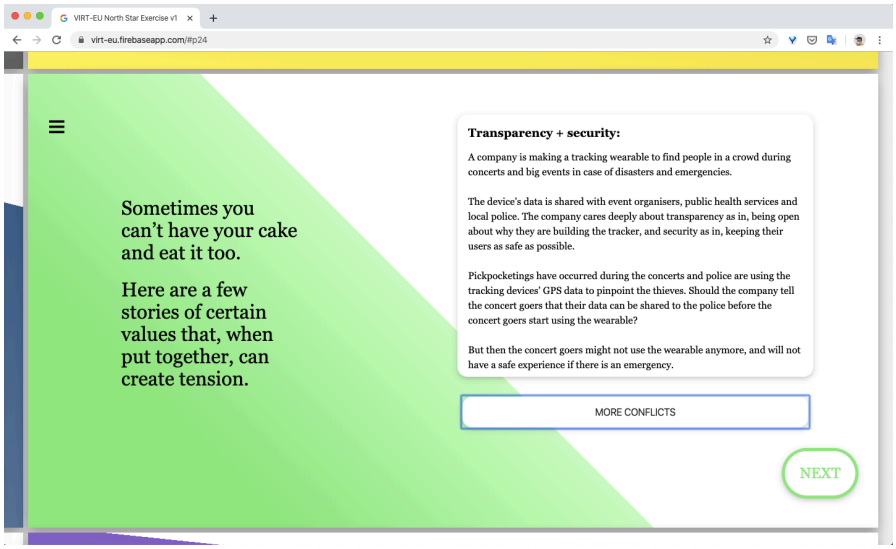


(image: interface for supporting articulation)



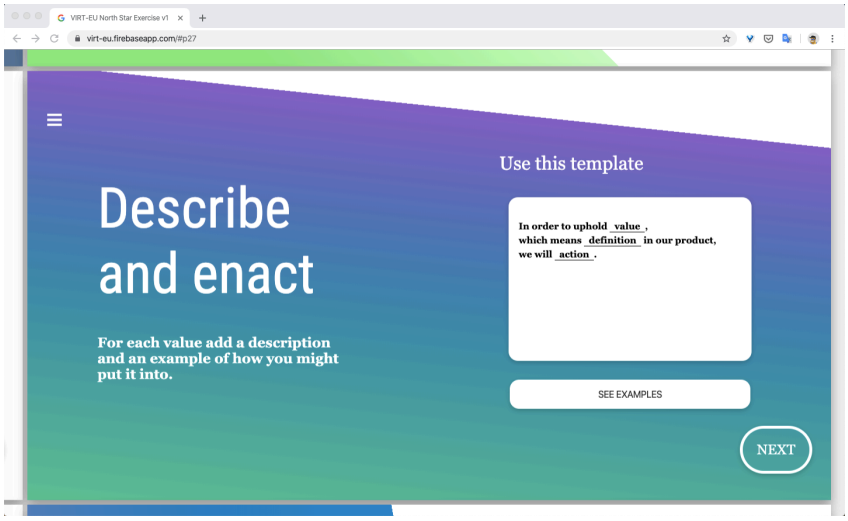
(image: interface for supporting negotiation)

4. **Dilemmas:** throughout our research, we found that some values can conflict with one another, creating possible dilemmas (depending on the product). In this area, we share these value conflicts as a way to prepare our participants for possible difficulties later in their product development process.



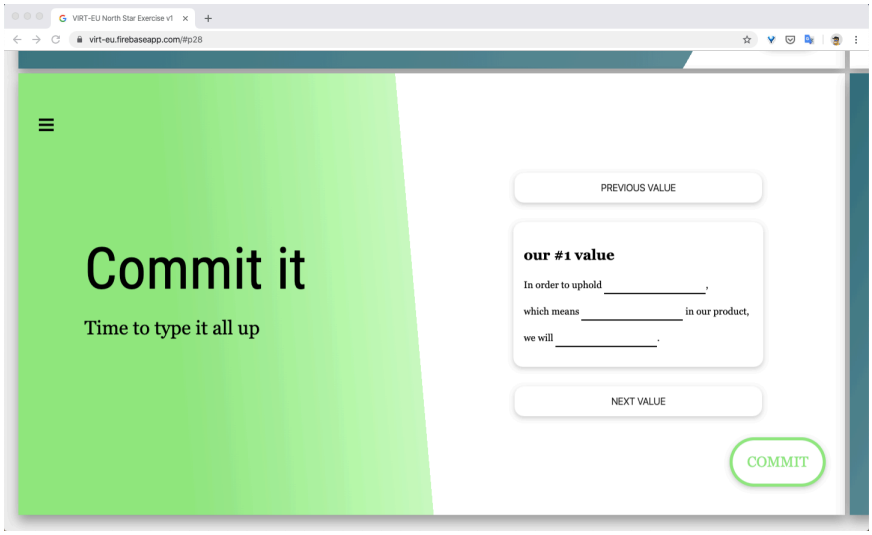
(image: interface for presenting value conflicts)

5. **Document & manifest:** we created a template to support our participants to describe not only the values and their definitions (according to that team) but also to work through how they might put these values into action in their product and team.



(image: interface for supporting the translation of values to action)

6. **Commit:** the final step of commitment is the outcome of the previous work of articulating, clustering, prioritising and negotiating, defining and enacting.



(image: interface for the final step)

We evaluated the North Star tool with six Design Challenge participants that made it into the final round. Overall, our participants found the tool interesting, but the whole process took a long time and being distributed made using it more difficult. While our participants felt that using such a tool perhaps once is feasible, they did not feel that this tool would be helpful throughout the process of tool development. They appreciated support for value articulation but found it difficult to apply in practice.

4.3.2 Paper tool iterations

Throughout the project CIID has conducted co-creation exercises and workshops, desk research and organized interactions with consortium partners intended to help translate conceptual, theoretical and empirical academic work into design processes and concepts. Through this, we found that ethics as a point of discussion comes up among IoT innovators at pivot points where difficult decisions must be made and of course, in public relations disasters where an outside party identifies a problematic aspect of the product. This has lead to prototypes of different tools to help developers and designers have those difficult conversations before the problems hit the media. For each tool, CIID went through a complex design process described in Figure 9 below.

Throughout the process, the team at CIID have tested a variety of tools at different stages of fidelity with five professional groups (five different IoT startups including a design consultancy, two early stage startups just developing their products, a mature startup with a developed product in market development and monetisation stage, as well as Design Challenge participants), two student groups (through modules and courses run through the teaching arm of CIID) and two stakeholder workshops co-organized together with the Open Rights Group.

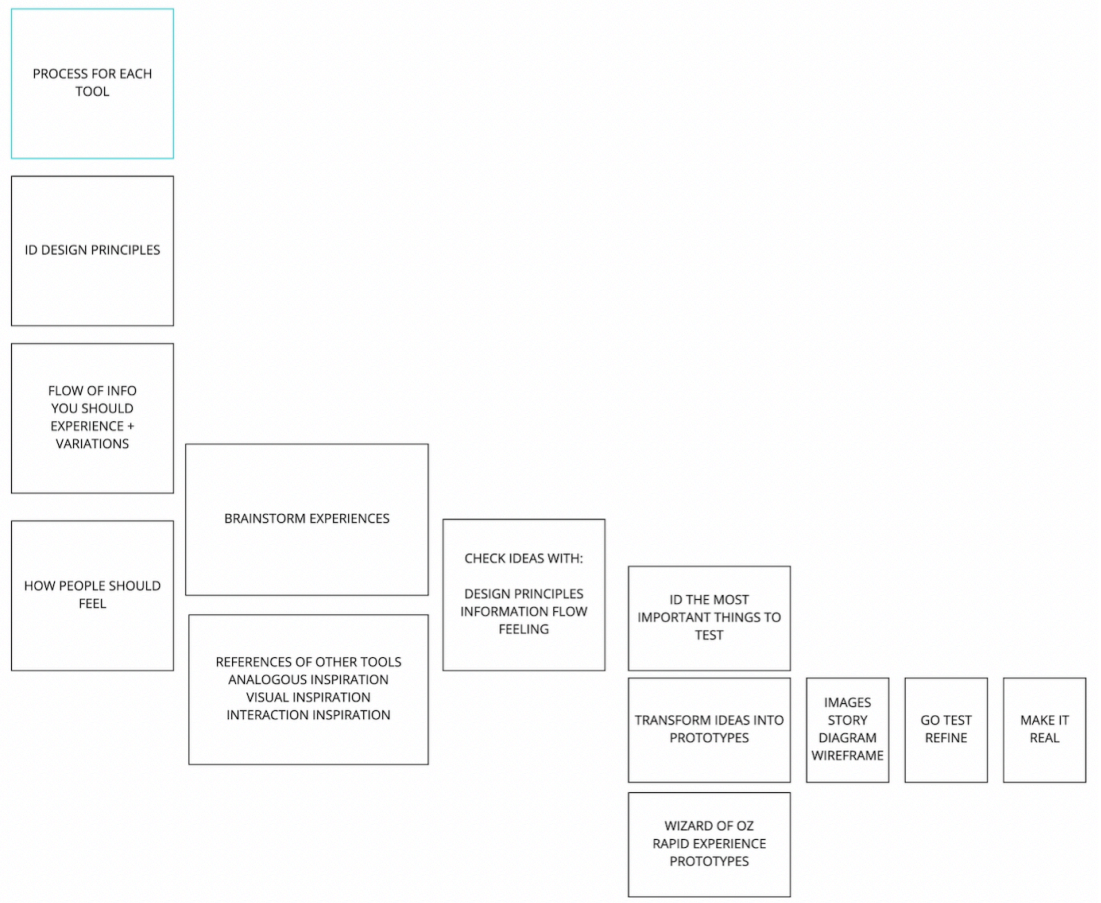


Figure 9: CIID design process for tool development

Where the initial ideation and output of co-creation workshops is presented in Deliverable 3.2, the full tool development process is detailed in Deliverable 5.3. As these deliverables demonstrate, there are a lot of ideas about how to support ethical ideation, but there are many aspects to technology development and each part of the process requires different approaches. However, ethics is a complex topic of discussion. Our workshops and interactive tests were effective when facilitated in person, but as our remote tests with Design Challenge participants demonstrated, building a stand-alone set of tools proved much more difficult. Part of the problem was that in order to do the kind of reflection necessary for thinking in ethical terms, it was important to push our participants outside of their comfort zones and ask difficult questions. These questions have to be tailored to be effects, how could we do this without us being present?

As a result, we opted for a combination of a digital tool implementation, which provided us with the ability to tailor the experience to the users to some extent, and paper-based downloadable tools, which allowed our participants to use just the part of the experience they needed and to modulate their time commitment and context of experience. We selected the most effective tools that worked in a variety of contexts and forced people to reflect, think deeply and step out of their comfort zones to shake things up as it were. The tools also were amenable to use throughout the design cycle rather than at any one particular point. The final tools are described in detail in Section 5.

5. Building resilience against hyper-individualist notions of ethics

This section details activities in WP5 (Tasks 5.3 and 5.4) and WP6 (Tasks 6.1, 6.2 and 6.3) in service of fulfilling Deliverables 6.2 and 6.3.

The VIRT-EU project ambitions were to go beyond offering critiques of individualist notions of ethics and instead to develop tools and approaches to allow different ways for technology startups and small organizations to explore ethical questions and apply different ethical practices in their IoT design work. Our empirical, theoretical, legal and design research was organized to achieve this goal in combination with diverse approaches to continuous dissemination. In the course of the project we have developed a range of ethical interventions. Some of these have resulted in stand-alone self-assessment tools, others offer scripts and scenarios for convening difficult conversations about ethics with diverse stakeholders and still others provide resources to learn more about ethical frameworks and to use the VIRT-EU content in teaching.

At the mid-point of the project we faced a choice of direction, given the limited resources available. On the one hand, we could pour our energy into conducting the kind of deep intellectual and empirical work that would enable us to produce a solid grounding for tool prototypes that would offer novel, functional and productive ways for convening discussions about ethics and for integrating different ethical standpoints into the design process. However, this would result in prototypes still needing further development to really achieve significant and lasting impact on a broad scale. On the other hand, we could limit the research and conceptual development and focus on lighter weight and more familiar approaches, enhanced by some of our initial research. However, in this case we would have the time and the resources to publicize and gain significant attention for our work. Yet this second route would have resulted in much shallower impact down the road, with our prototypes likely joining the veritable graveyard of ethics tools and ethics canvases amidst increasing corporate tech hand-wringing about ethical conduct or, in the best case, perhaps contributing to current strategies of corporate ethics washing.

We chose the first option with full knowledge that at the end of the project we would have prototypes with much potential, but still needing further development. We also had to be creative with our dissemination, targeting the European IoT developer community specifically rather than going after a more diffuse audience. In this section we present an overview of our ethical interventions and offer some examples of the community engagement efforts we have made.

5.1 VIRT-EU workshops as ethical interventions

How to talk about ethics and how to intervene in the creation of technology are important questions. Throughout the project we sought to identify what we called "pivot points" as opportunities for intervention. We found that discussions about IoT online and in MeetUps and other events, there are two future scenarios that are often presented. One of a dark future of hyper-surveillance society à la Black Mirror and the other of the ultimate connected future in which your fridge, kettle, toaster and [self-driving] car can all speak to one another to make your life fully integrated and seamless in the perfect smart city. In order to convene conversations and to provide structure for reflection with and about ethics we first had to move away from both of these extreme endpoints. Thus we designed a series of workshops, supporting materials and tools for the purpose.

In our research we realized that although our audience was technology designers and developers, our focus on startups and small size organizations required that we consider the broader ecosystem of stakeholders involved, from venture capitalists and accelerators to regulators and policy makers. As such, we designed workshops for ethics conversations oriented towards three different groups of stakeholders. The workshop materials can be found in Deliverable 6.2 and on our website under the heading *Interventions*.

5.1.1 Bear & Co simulation and The Moral Algorithm workshop

Our first audience was IoT designers and developers. CIID, ORG and LSE engaged this audience in a series of co-design workshops mentioned in the previous section in order to develop our approach and to form a foundation for prototyping the VIRT-EU tools. Throughout these workshops we realized that although our participants wanted to have a discussion about ethics, many lacked the vocabulary to really engage with these concepts deeply. Ethics seemed like something far removed, abstract and philosophical, not at all connected to the daily grind of trying to keep a startup company afloat. Our participants had to make difficult decisions about the design of their devices, the economic underpinnings of their business models, their relationships with their funders, but often these decisions did not seem to relate to a discussion about ethics. We saw that allowing this audience to experience a simulated situation where such decisions are interrogated as ethical conundrums as they are made, would be an important step towards connecting the abstractions of ethics with the daily practice of IoT innovation.

The first iteration of this workshop was the Bear & Co simulation described in Section 4 above. Although this simulation was effective in challenging the audience, it required a lot of set up and did not offer good opportunities for group discussion. We evolved this original simulation into an interactive workshop we termed "The Moral Algorithm" that is designed to allow groups of people to work together, debating their decisions as they

addressed various difficulties a fictional IoT company might encounter. This workshop was particularly effective when the teams were composed of participants with diverse backgrounds who nevertheless had some direct experience in the field of IoT innovation. The workshop works well for up to a maximum of 20 participants.

5.1.2 Policy & Ethics workshop

Creating opportunities for designers and developers to talk and debate about ethics with each other is important. However, the field of IoT involves a great many actors, all of whom have different ideas about notions of ethics and about the purpose of IoT innovation in general. We believe it is important to bring these actors to the table, but getting people form different parts of life to talk with each other productively can be a challenge. This is especially so if the topic of conversation is as potentially incendiary as ethics. Thus we developed a workshop focused around familiar policy issues of data protection and privacy, which brought in broader concerns in a structured way that promoted productive debate and discussion.

This workshop is composed of three parts. Part 1 introduces the idea of ethics and asks participants to discuss what they think the term means and how it relates to technologies in question, where they see the need for ethical discussions and why they think this might be important. This allows everyone around the table to get to know each other and to establish their positions on the topic.

Part 2 offers the PESIA questionnaire as a tool around which discussion moves forward, now focusing primarily on issues of privacy and data protection – concepts that most often associated with ethics. While our workshops used PESIA, any impact assessment tool can be used in this section to identify points of agreement and disagreement, exploring the structure and methods that might be necessary for systematic considerations of privacy and data protection in IoT innovation.

Part 3 challenges the discussions and agreements reached in Parts 1 and 2, by moving considerations of ethics outside the familiar trope of data protection and considering broader implications of IoT innovation. This part of the workshop becomes highly interactive and we have developed special paper-based printable tools for this purpose. This exercise uses an approach based on speculative fiction to challenge participants by taking on each other's roles and addressing tricky dilemmas in IoT innovation.

Thus the workshop is designed for participants to first establish relationships and to negotiate each other's positions through more familiar discussions before being challenged to step out of their individual comfort zones. Our testing of this format in London, Amsterdam and Edinburgh have allowed us to iterate the specifics of structure and materials, but overall, the feedback was very positive and we were able to achieve productive conversations on difficult topics. The workshop works best for 10-15 participants.

5.1.3 How to talk about ethics: Unforeseeable Futures

Our final workshop was designed to involve a broader audience at events that bring together technologists and people from outside the technical world. Throughout the project we engaged in a lot of industry oriented events and conferences. The audiences at such events were often diverse and wanting to engage in vigorous debates about the possibilities IoT offers as well as about the threats it represents. Over the course of three years discussions of ethics have gone from excitement to a sense of fatigue, where ethics has slowly become a term few bother to define but many hold up as "something important". Many developers and designers in our co-design workshops and subsequent user-testing of our initial tools, wanted more substance in discussions about ethics and more foundation in the kinds of philosophical and theoretical frameworks that underlie ethics as a term. Many complained that discussions about ethics felt naïve but that they themselves lacked much familiarity with what it was all about. Thus our final workshop we designed to engage diverse audiences in thinking about ethics, challenging their comfort zones and preconceptions, and to offer a basic introduction to ethical theory.

The workshop first invites participants to imagine that they are part of a design team at a small company and have been charged to make a design decision that will decide much for the product the company is developing. The audience is then repeatedly challenged to take different issues into account as they debate the decision. While the decision itself is never actually finalized, the discussions that arise from the positions participants take are about the relationship between the high ideals of ethical conduct and the realities of what it takes to develop IoT technologies and to survive as a small company. As participants wind down their debates, the workshop shifts towards discussing what ethical theories underlie each issue they have been forced to take into account. This is an opportunity to demonstrate ethics as a process and ethical frameworks as lenses that focus on some things but intentionally ignore others. We offer our participants our own take on ethics and present the VIRT-EU ethical framework as a potential answer to the limitations of each ethical theory on its own.

We originally developed this workshop for the Techfestival in Copenhagen and tested it there in 2019. We made changes to the original design and brought the new version to MozFest 2019 in London. The final iteration was presented at ThingsCon 2019 in Rotterdam where our participants included designers, developers, students and even EU commissioners who attended the conference. We documented workshop iterations by creating publicly available video narratives. This workshop works well with small groups of 10-15 people but can scale easily up to 40-50 people, making it a good fit for a variety of contexts.

5.1.4 Preparing workshop materials as artefacts

Since September 2019, we conducted more testing and feedback mechanisms to co-create our workshop formats with diverse audiences at the intersection of industry, research and policy. We then created workshop formats that could allow others to use research outputs in an autodidactic way. Interim formats have been delivered as part of Deliverable 6.2. Having produced printable materials, we then worked to create content that could be easily communicated online. This has been possible by creating clear and simple guidelines to use our workshop materials and navigate our interactive tools that are now available on our website and comprise part of the VIRT-EU service package (D6.3).

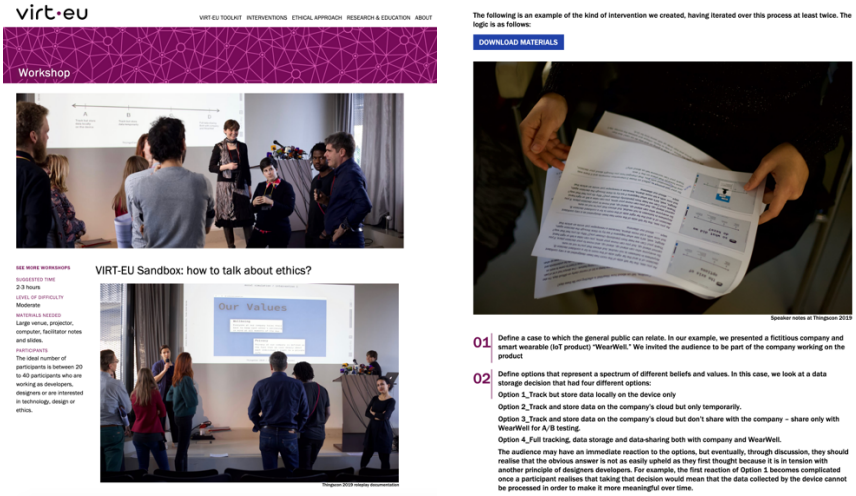


Figure 10: Presentation of research guidelines on VIRT-EU service package website

5.2 VIRT-EU Tools

While the workshops are useful instruments for convening conversations about ethics, they require time, space and people to come together. We also wanted to offer possibilities for people to stay in their companies and use our tools for discussion and reflection. For this we designed a series of stand-alone tools. Two of these, PESIA interactive questionnaire and Ethical Stack are digital interactive implementations that people can use even if the company in question is distributed in remote parts of the world. These require significant time and commitment. For smaller decisions, lighter discussions and co-located groups, we also developed one-off paper tools that can help developers gain an overview of their products, consider potential implications of their decisions and even play around with how a particular decision might affect the company reputation by coming with potential news articles using our templates. All of our tools make up the VIRT-EU service package (Deliverable 6.3) and are freely available on our website.

5.2.1 Ethical stack

The Ethical Stack is a series of tools to support creators of new connected technology to reflect on their product's ethical and social impacts. The tools present a facilitated, structured process that reveals possible present and future ethical challenges that creators (designers, developers, CEOs) might either not yet considered, or not yet prioritized.

The series of tools works in the following way for our users:

1. The first part of the tool is about laying out the product, considering the ethical values each member of the team is trying to embed in it, and receiving feedback about areas of possible ethical issues.
2. The second part of the tool is about moving from "issue" to "challenge" to action. We help our users to identify the key challenge(s), give them further tools understanding the roots of the challenge and how they can address it accordingly.
3. When they are done, they will be able to demonstrate how their product works, its values and aspirations, as well as some thought-provoking ethical issues that they need to consider as you continue your product development.

When building new products, often constrained and under pressure from investors, teammates, family, time, money, ethics comes last in the to-do list (if it makes it to the list at all). When there is a moment to "deal with ethics", there's little support for those who want to understand how their product might have ethical issues. So our series of tools are designed to serve as a partner in the process of taking ethics into account.

Based on our research, co-creation and testing, we present this path (steps 1-4), which is an overview of the Ethical Stack. While steps 1-3 are online, step 4 is taken offline and onto paper. Each step is supported by specific guidance and custom-designed tools. The overview of the process below is to bring creators to acknowledge and understand that they have an ethical challenge and how they can address it.

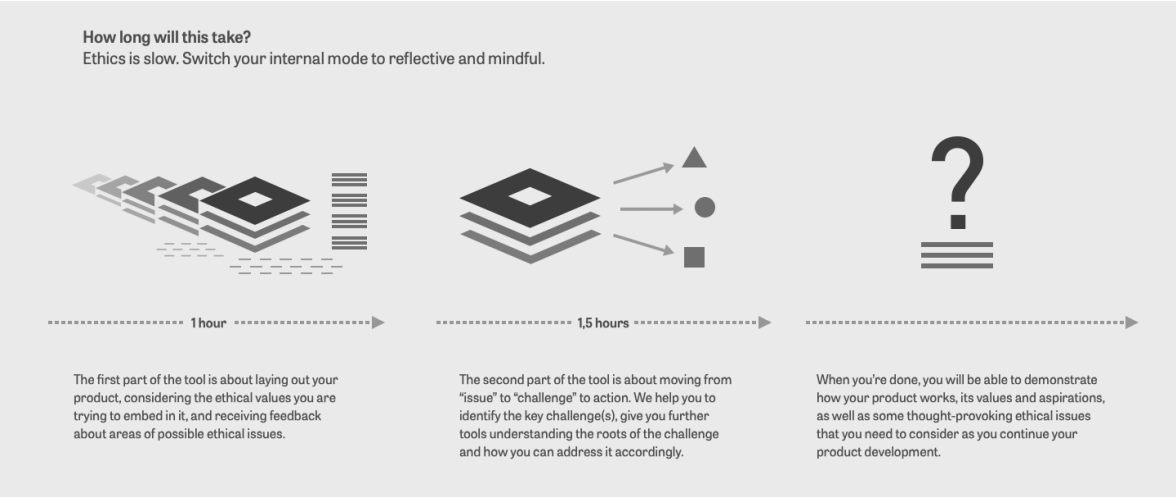


Figure 11: Ethical stack tool process

We begin by asking creators to populate their stack, to "explode" the many silos of the product they are working on. What are the materials in the device, what is the context, who constitutes the team, are there 3rd parties engaged, etc.? We ask pointed questions for each layer with which the participant interacts.

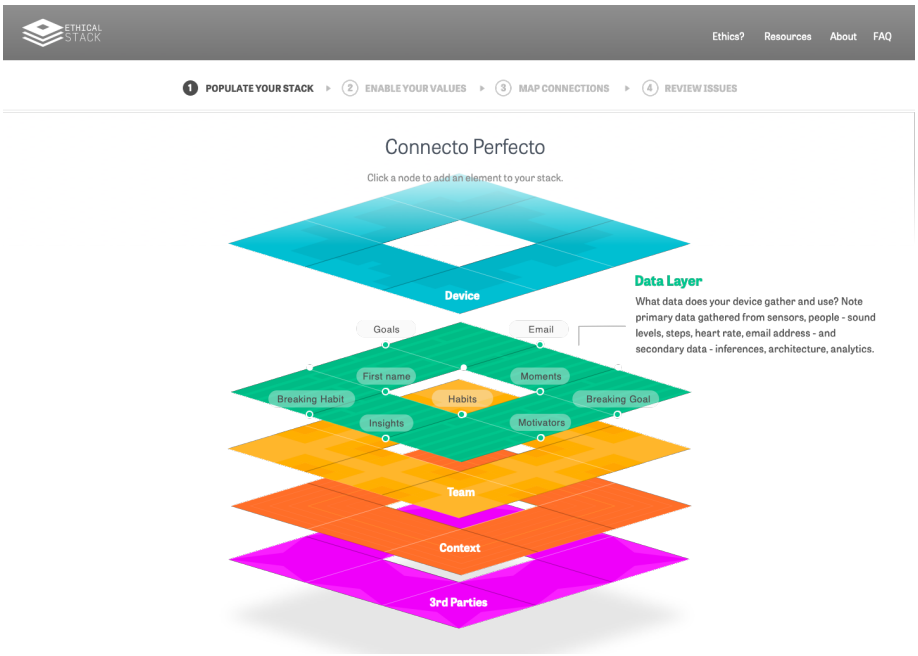


Figure 12: Populating the ethical stack

Once the stack is populated we ask creators to articulate their values as ethical grounding of the product. We also ask that the participants demonstrate exactly how their values reverberate through their product as the connection of a value to a material may be the direct concept the creator wants to show, but actually if that material is connected to many more materials, the ethical value at the root of these many connections is meant to be represented throughout. As soon as the connections through materials and values are in place, our system can begin to ask questions of the participant. What are the ethical implications of the "vision" or ethical values you set forth as linked to your product? What kind of social impacts might you create and are these aligned with your vision? The answers to the questions demonstrate gaps between the "vision" and the reality of the product. Based on answers, we can identify ethical challenges they have not addressed, and we explain why these challenges merit attention.

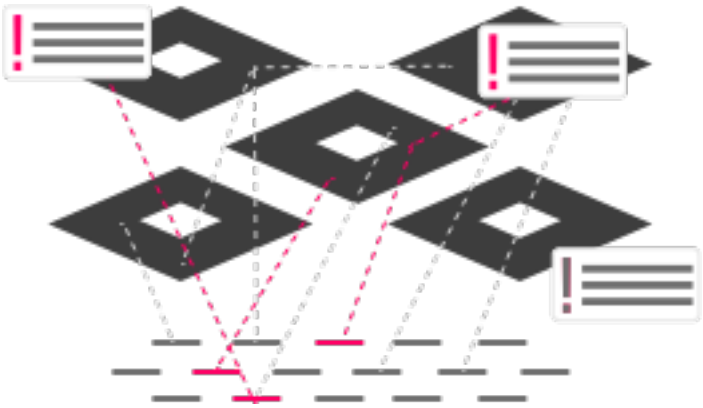


Figure 13: Connecting values to map layers

The online portion of the ethical stack helps creators identify the root of the gap between their vision, or values, and the material reality of their product. Through our paper tools, we share processes for finding the roots of the ethical issues we have identified together in the previous steps. Creators are prompted to ideate and redesign in alignment with their values. According to the root of the challenge that only they can identify, depending on the specific product and team, we structure an ideation and evaluation process that finishes with a realistic reflection on their values.

Once the online portion is complete we invite creators to use the paper tools we offer to complete the process. This series of tools supports creators to address the ethical challenges that the interactive system of the Ethical Stack has surfaced. If the creator identifies an ethical challenge for their product, it is because we noted an inconsistency between the product they are developing and the values to which they aspire (for example: they answered "yes" to the question "will the users be monitored in private spaces such as bathrooms?" but they also stated that they care about dignity).

We assume that if they knew about the inconsistency already, they either a) are not prioritizing it and/or b) do not understand why it is important or problematic. If a) or b) is the case, we consistently found that working through scenarios at scale helped to shed light. Our first exercise we call “What If Everyone In The World (WIEITW)” where creators are asked to imagine a world where their product has achieved massive success and everyone has it and uses it all the time. Such an exercise demands that creators embrace the fact that there will be unforeseeable impacts of their own answers. It requires them to take into account the different people and the lengthy life cycle of the product they are building. Perhaps the embedded IoT device is ok for an immediate target group, but if everyone in the world has it, it is important to imagine scenarios of unlikely users. For example, perhaps the embedded device works just fine for the current temperature outside an office in Berlin, but what if it is in India, or in Norway in the winter? Just a simple consideration of time and place can change everything.

Of course, it is easy to leave things there, in the theoretical fiction of a massive product success. Therefore, we follow the WIEITW with a bowtie (risk assessment) kind of activity. First, we ask developers to select a scenario that they most want to achieve, or the scenario they most want to avoid. Then, they brainstorm with our guiding questions and follow their own process to identify a few good options. Once they have identified good options, they come back to the online system. At this point our system helps them assess which option is the best according to the discussions in their team, supporting arguments and the values that underlie those arguments. We provide basic definitions for particular values that they identify and offer challenging questions to help steer the discussion. After this process, the system offers the team a chance to integrate a

decision back into the Ethical Stack, showing how they will handle the challenge in practice.

The intended audience for the Ethical Stack is a team working on a product - including at least three people with different roles and sets of knowledge: a product manager, a designer, a developer, the CEO. Other important roles at the table could be: UX designer, user researcher, marketing, public relations. The Ethical Stack development is based on empirical findings, co-creation and testing sessions. In our initial testing with start-ups and small companies we have identified three main reasons developers might want to use Ethical Stack tools:

1. The creators want to check if they are on the right track
2. The creators are unsure about a few areas within their system
3. The creators are at a decision-making moment and want to get help understanding the impact of taking one decision or the other.

We ran 6 major workshops in Amsterdam, London and Copenhagen, testing progressive versions of a) how to talk about ethics b) simulations and d) worksheets to navigate ethical decisions. We created the Ethical Stack based on the many rounds of testing, where we observed that the cross-silo map of a given product was consistently the crux of our discussions of ethics. As a way to bring ethics into action, the Ethical Stack seeks to map out that action in order to identify where the ethical challenges might be.

The Ethical Stack is designed as a stand-alone prototype in this series of tools for ethical reflection and self-assessment when building new connected technologies. The tool reflects the abilities of our partners and our team to collaborate and translate across disciplines. CIID Research alone a could never solve such difficult questions of what ethics is, or how technology developers understand and relate to ethics. It has only been because of our interdisciplinary collaboration with teams within VIRT-EU such as the LSE, the ITU and ORG that we could deliver meaningful tools that support ethical reflection when building new technology. The Ethical Stack is especially unique and innovative in its ability to encompass a powerful range of knowledge in a simple yet meaningful series of tools. The tool is part of the VIRT-EU service package (D6.3) and is available on ethicalstack.net as well as on our website. The paper tools that are offered as part of the Ethical Stack but also as stand-alone downloads are described in the next section in detail.

5.2.2 Short-engagement paper tools

Conversations about ethics are difficult especially when these are about evaluating your own actions. Our tools are designed to ask difficult questions, push at assumptions or forgotten uncertainties. While the Ethical Stack described above is a digital tool, we also made sure that our tools can be used offline. The four major tools that we have developed create structures and offer a language to guide the discussions. We have also developed tools that can be used in lieu of the Ethical Stack to achieve a similar mapping

on paper. All of these tools are available as part of the VIRT-EU service package, on our website and on our GitHub repository. We recommend printing each as an A3. All of the tools are made available as part of the VIRT-EU service package D 6.3 and on our public GitHub repository D 7.6.

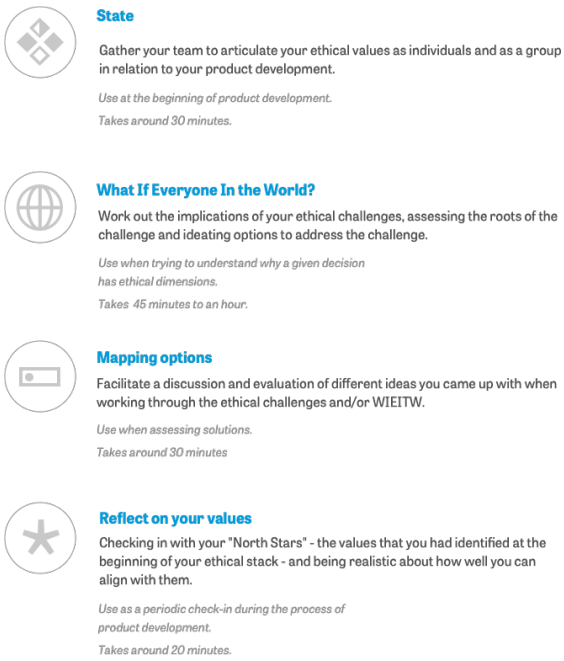


Figure 14: Tool presentation screenshot

The "State" tool is designed to support small groups across teams or within teams to identify their mutual set of ethical values for the product they are building together. This work of identification, articulation and negotiation of a shared set of ethical values can be especially meaningful at the beginning of the process of working on a product, in order to set an intention and a "guiding star" for subsequent decisions.

Good for: Gathering your team to articulate your ethical values as individuals and as a group in relation to your product development
When to use: At the beginning of product development
How long it takes: 30 minutes

The "What If Everyone In The World" (WIEITW) tool is an exercise that requires participants to imagine what might be the best possible outcome of their product or service according to many – wild success and popular use. This exercise reflects on the good, bad, and weird impacts that such success might have, creating a space for the fears or worries that are often brushed aside in the race for profit. After noting a few scenarios across these different branches, the exercise prompts participants to brainstorm ways to support / prevent / mitigate the most or least desirable impacts, respectively. This process is, in the end, a way to explore the uncertainties of future challenges and a chance to brainstorm high-impact solutions in the present.

Good for: Working out the implications of your ethical challenges, assessing the roots of the challenge and ideating options to address the challenge
When to use: When trying to understand why a given decision has ethical dimensions
How long it takes: 45 minutes - 1 hour

The "Options" template is designed for creators to address the multiple facets that most decisions represent. Instead of treating decisions as linear and straightforward, we encourage participants to map out the arguments that various individuals or stakeholders may bring to the table and connect these arguments back to how they do

or do not align with the ethical values identified in the “State” tool. This template does not generate an answer as to which option should be taken; it is meant to structure the discussion necessary for a group to assess and decide amongst themselves.

Good for: Facilitating a discussion and evaluation of different ideas you came up with when working through the ethical challenges and/or WIEITW.
When to use: When assessing solutions
How long it takes: 30 minutes

The “Reflection” wheel can be used successively throughout the product development process. After a group has identified what they believe to be their ethical values, they may set periodic internal check-ins on these values by using the “Reflection” wheel. The “Reflection” wheel can be used to mark how well they think they are actually doing to stand up for their values thus far in the product development choices, ideally leading them to notice which values they either cannot truly support because of value conflicts or because of unrealistic expectations within their group. This wheel is also recommended for the final step of the Ethical Stack – which will already have opened various ethical challenges and conflicts for the participants.

Good for: Checking in with your "North Stars" – the values that you had identified at the beginning of your ethical stack – and being realistic about how well you can align with them.
When to use: As a periodic check-in during the process of product development
How long it takes: 20 minutes

The “Map” tool is a paper-based version of the Ethical Stack’s digital steps of collecting the many elements of your product in one “stack” and mapping the connections between each element as well as the ethical values your group seeks to embed in the product. This tool is most useful once you are through the prototyping phase and have a clear idea of how you will develop your product technically. It is designed to support your overall team to get on the same page in terms of what you are building, for whom, where, and why.

Good for: Lay out your stack
When to use: Throughout product development
How long it takes: 30 minutes

5.2.3 PESIA interactive questionnaire

While the paper PESIA questionnaire is useful, our stakeholder testing suggested that an online tool would add significant value. Firstly, by allowing users to provide digital input directly, with saving of their work in independent projects that can be retrieved at will. Secondly, the tool provides error and warning feedback where the input of the

users indicates a potential risk of breaching data protection or a strong departure from best practice. This mainly applies to the user not providing any explanation or justification after signalling they carry out a higher risk activity, and not on an analysis of their textual answers. Thirdly, users will obtain a printable copy if the questionnaire that they can use as part of their compliance work.

The interactive questionnaire has been implemented by ORG based on Deliverable 4.4, using the open source project Alidade.tech[61] (this tool was created by the NGO Engine Room in der to help social change organisation make informed decisions about their choices of technology). This required a substantial amount of work. ORG had previously tested several survey tools such as LimeSurvey and Google Forms, but found that these tools were mainly geared towards the survey owner obtaining information about the users and did not fit our needs. We wanted to help users provide information to be fed back to them and not to gather the details of IoT projects. ORG also looked at adapting the PIA tool made available under an open source license by the French data protection authority CNIL[62]. We found that tool to be excessively complex to adapt and thus chose to develop our own.

Figure 15: PESIA interactive questionnaire

ORG took the results of deliverable D 4.4 and did further consultations and analysis detailed in Section 3.X. The feedback was that the questionnaire was too long and we made a decision to make it more manageable by only making the relevant sections available to users in the online version.

The tool is currently online but protected by a password as the consortium develops a framework and an agreement for collective exploitation of project output after project end. We expect this agreement to be in place prior to the project review.

5.3 Community engagement

From the start, VIRT-EU has been committed to co-create its toolkit through iteration and developer engagement. In doing so, VIRT-EU's consortium has lead workshops and other meetups at the intersection of industry, research and policymaking where we have tested our project outcomes. Below we present some highlights from our major activities in the last year of the project focused on in particular on project output dissemination. The list below is by no means exhaustive (see Section 7 – Dissemination for a full listing of all events we organized and participated in) but these events demonstrate our approach.

[61] https://alidade.tech/
[62] https://www.cnil.fr/en/open-source-pia-software-helps-carry-out-data-protection-impact-assesment

5.3.1 Design challenge event at ORGCon 2019 in London

The final year of the project has been focused around designing tools based on the research conducted in prior years. As part of tool design, the project plan included Task 6.2 – a design challenge to test initial tool prototypes with real designers. Thus in January of 2019 we began preparing for running a Design Challenge event, scheduled in July 2019. The design challenge provided an opportunity to test tools for the earliest stages of ideation on creating connect devices and get feedback on them, to engage with our developer/designer community and to begin the process of outreach as we transitioned from co-creation to testing. It also provided the capacity to integrate design decisions within broader discussions of law, technology and policy.

The Design Challenge event was co-located with ORGCon 2019 hosted by our partner the Open Rights Group. As described in Task 6.2, the challenge was organised as a physical event and structured around a critical views on technology conference. VIRT-EU presented a separate speaker/panel track with the Design Challenge event. The event, open to all European developers to participate, was advertised to the communities under study and via social media channels such as Twitter and Facebook, leveraging substantial followings of several consortium partners, members of the multi-stakeholder board, and the consortium as a whole.

Living with Difference in the Connected Home
A VIRT-EU Design Challenge

For years we have heard that the 'smart home' is coming, using connected devices to transform everyday life. Personal assistants, remotely-triggered thermostats, responsive lighting and cooking, cleaning and food preparation apps and services promise to make our individual lives better by personalising aspects of the environments and information around us.

While this personalisation happens, another important trend changes what home is and who is there. Younger people live longer with their parents, or return to their homes after study. People of all ages experiment with collaborative living and share spaces and experiences. Families change shape, and some people at home need extra care to accommodate age, illness or different abilities.

These issues of difference and care challenge the idea that connected systems are just for personal use. We share our space, our information and our devices in complex ways, even as we simply try to get through 'ordinary life at home'. How might connected Internet of Things (IoT) systems and products enter into and change communal spaces of home?

Figure 16: Design challenge brief concept

We began preparations for the Design Challenge by first creating a design brief needed to allow professionals to engage relatively easily, as we could not expect professionals to take many hours out of their work even if they might win a monetary prize by doing so. Therefore we created a design brief that contained as much information as they might need with an accessible yet probing topic. We requested that participants submit a low fidelity but clear concept.

Technological innovation, while at times concerned with imaginaries of making sweeping changes in the world, tends to focus on the individual and their actions when it comes down to the particularities of design. Whether through personas, end-user research or merely imagination, when technologies are designed, few imagine collectivity as a primary design goal. Thus our design brief focused on collectivity in particular and asked designers to think about more complicated constellations of end-users all of whom inhabit fundamentally social spaces even when they might live alone (Figure 16).

Our design challenge included two phases: a first “napkin sketch” of a concept, and then If participants submitted a relatively clear sketch, we gave them a link to the first tool of articulating values and asked them to complete that exercise along with continuing their concept development. In this way, we were exploring both how we might intervene in their design processes when coming up with new ideas as well as understanding what the design process is, for them.

The Design Challenge was also an opportunity for us to test an early prototype of our tools. Thus, in the Design Challenge, we structured the way in which our respondents would integrate ethics into their work. If they had a clear enough early idea, they would pass to the "short-listed" phase, where they get a link to a tool that will support them in their ethical reflection at that stage of the design process into clear concept. They were asked to both use our tool as well as complete a new stage of work: full materials of technical diagram and user storyboard. For more information please see the website https://designchallenge.virteuproject.eu/ for the announcement and this page for more details such as specific design constraints, structured submission expectations as well as personae and references.

Advisory Board members, Alexandra Deschamps-Sonsino (Designswarm, UK), Rob van Kranenburg (IoT Council, NL), Dawn Nafus (Intel Corp, USA) and Simone Rebaudengo (automato.farm, China) served as judges. The selected concepts were those that best answered the Design Challenge question and had the most potential for impact in the world, selected by our team based on the judge’s recommendations according to the evaluation criteria listed on the website.

We selected three participants to present their concepts – the winner, runner-up and honorable mention: Thomas Amberg (winner), Emeline Brule and Charlotte Robinson

(runner up), and Fahmida Azad (honourable mention). They were asked to present their concept in a 10-minute "lightning talk" at our Design Challenge event at ORGCON, and discuss their work with the judges. This session was also meaningful for the audience, who learned about why a given early concept might be deemed as meeting both the design brief as well as an overall goal of contributing positively to society according to our judges.

Figure 17: Design challenge winners. From left to right: Thomas Amberg (winner), Emeline Brule and Charlotte Robinson (runner up), Fahmida Azad (honorable mention)

The event also included a panel discussion *Can Tech Truly be Ethical* as a separate session in the VIRT-EU track. The panel included Professor Paul Dourish (UC Irvine), Professor Lillian Edwards (Newcastle University), Professor Gina Neff (Oxford University) and Professor Ann Light (Sussex and Malmö Universities) and was moderated by project coordinator Irina Shklovski. Extremely well attended (standing room only), the panel tackled difficult questions about ethics and technology in a discussion with attendees. As one attendee later wrote in a review of the conference, this was "a fantastic session, it really began to open my eyes to how complex ethics in technology can get."[63] We created extensive video documentation of the Design Challenge through video interviews of our Advisory Board members made available on our blog and YouTube channel.

The ORGCon, keynoted by Edward Snowden, attracted over 700 delegates including 150 delegates who attended events in the VIRT-EU specific track.

[63] https://matt.si/2019-10/orgcon/

Figure 18: Still image with video documentation on VIRT-EU's Design Challenge with Alexandra Deschamps-Sonsino.

5.3.2 Mozfest 2019 – The VIRT-EU sandbox: Discussing ethics and IoT

During the 10th anniversary Mozilla Festival held in Ravensbourne University in London at the end of October, Irina Shklovski and Alison Powell held an emergent session to challenge the attendees to consider the ethical ramifications of technology design and development. The setting was a company concerned with employee well-being that had designed a wearable tracking device to support work-life balance. We asked participants to imagine themselves being part of a developer team in a small company charged with making important decisions about their product.

This role-play workshop gathered a group of diverse participants to discuss a range of options developers have to choose from when they face design dilemmas. These dilemmas are connected to how their technologies will intervene in people's lives. In this case, we focused the discussion on data storage, access and use options, which then defined what services we could be offered. During this event participants asked how they might be able to learn more about ethical frameworks or use other VIRT-EU tools. In total 15 participants were part of the workshop with many more looking on as the session was conducted in an open emergent sessions space. We documented the workshop activities and created a video about it. Watch full video here

Figure 19: Mozfest workshop documentation video with Alison Powell

5.3.3 Thingscon 2019 – Unforeseeable Futures workshop

In December after sharpening our workshop formats and tools, we attended Europe's leading conference on responsible IoT on December 12 & 13 in Rotterdam. At ThingsCon we presented our "How to talk about ethics" workshop in the "How do we shape responsible IoT" track. Irina Shklovski gave a short keynote to introduce the track, which ran the full first day of the conference. The VIRT-EU team then ran our workshop in the first half of the day. Once again, Alexandra Deschamps-Sonsino supported VIRT-EU with her participation. Amongst our audience of approximately 20 people we also had the pleasure to interact with two members from the European Commission.

Irina Shklovski and Funda Ustek-Spilda then participated in the NGI digital trust infrastructure workshop in the afternoon, making significant contributions to the conversation, which have become part of the official NGI discussions report.[64] On day two Annelie Berner and Irina Shklovski presented and demonstrated the Ethical Stack to conference attendees as part of the case presentations event.

Figure 20: Unforeseeable Futures Workshop at Thingscon 2019

5.4 The Service Package: A meeting point with community developers

Throughout our research, it became clear that it is important to communicate our research outputs online in a way that is accessible and engaging to non-academic audiences. As such, we designed the service package site to showcase our outputs online with language commonly used within developer communities and specifically targeting creators of connected technologies.

While the current VIRT-EU project website served as a communication channel in the form of a blog. The Service Package version focuses on formally building a common space in which developers and designers of connected devices have access to our materials and tools, which are presented in a clear and simple visual language. In

[64] https://www.ngi.eu/news/2019/12/17/ngi-workshop-on-trust-frameworks-at-thingscon-2019/

addition, we use storytelling as a way to convey complex theories belonging to academic conversations by translating them into short visual documentaries or stories.

As per the Grant Agreement, VIRT-EU has committed to developing a Service Package that ORG will deploy and publicize to the IoT developer community, interested stakeholders and activists online. “The knowledge VIRT-EU will generate from this project will be produced with the developer community and disseminated through the consortium’s extensive policy, activist, academic and developer networks. VIRT-EU is committed to the open access to data and information to the greatest extent feasible.” (p. 72 of the Grant Agreement Amendment).

We committed to “develop transferable results and contribute to better practice and support ethical design for IoT developers by identifying the social, economic and political design challenges facing European innovators and developing a series of recommendations and usable tools to enable ethical design; The deep knowledge gained in WP2, WP3 and WP4 will be transformed into usable instruments, tools and recommendations in WP5 and WP6, and made available via open access channels and through partner networks. “ (p. 74 of the Grant Agreement Amendment). As such, the service package fulfills this commitment.

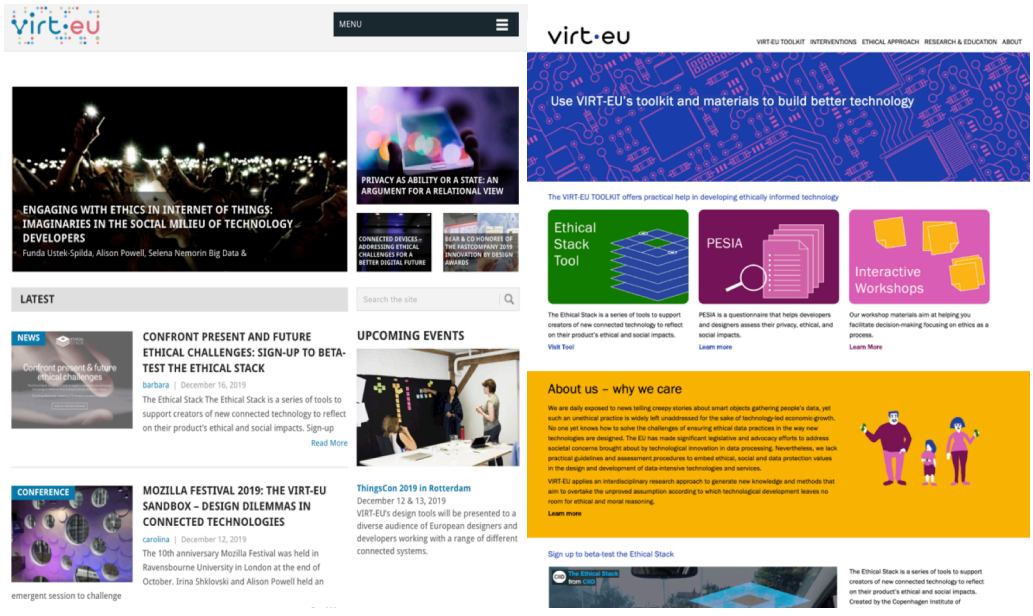


Figure 21: VIRT-EU website (left) and Service Package (right) comparison

The service package is a web-based enduring toolkit that will continue to be made available at the end of the VIRT-EU research project. Its main purpose is to increase the impact of the project by providing easier access to the outputs of the consortium’s work. This will enable people involved in the development of digital technologies to apply an innovative ethical approach to their work where end products and systems incorporate positive ethical values in their material and functional embodiments.

The target audience is broader than the IoT start-up community and independent developers that were the target of the VIRT-EU project itself. This change is the result of feedback on how to maximize the impact of the project and includes what we call technology development multipliers: design agencies, consultants, key people at larger companies. These multipliers can increase the overall reach of the tools quicker than trying to only promote it directly to many startups and independent developers. We also expect that policy makers and academics focusing on ethics and tech, such as the UK Centre for Data Ethics will use the tool and amplify its impact. Another target group are specialist media in IoT and technology.

The service package offers three main value propositions:
1. A compelling narrative about ethics and technology including an ethics primer targeting non-academic readers
2. A toolkit with the Ethical Stack and several practical tools to incorporate ethics in the production of digital technologies
3. An interactive impact assessment tool based on PESIA

The service package will also include other practical outputs from the project, such as the index of other ethical tools available from third parties and a review of regulations and standards relevant to IoT.

5.4.1 Structure

In order to unify all research outputs of the project in a coherent and appealing visual style and language we collected and organised our research outputs under specific categories. These comprise the components of the VIRT-EU service package deliverable D6.3

The Service Package website includes

VIRT-EU toolkit
- Ethical Stack (developed by CIID) as a microsite available on virteuproject.eu
- PESIA as a downloadable PDF and as an interactive questionnaire implementation
- Paper tools for shorter exercises and explorations

Interventions
- Curated stories translating academic content to real-world problems
- Workshop facilitation scripts and guidelines for industry, policy makers, activists, NGO's, etc.
- Ethical Reviews: Including three unboxing videos

Ethical approach
- VIRT-EU index of ethical tools

- Ethics Primer brochure
- Ethics Primer animation
- Ethical tools report

Research and Education

- Publications
- Syllabi, modules and educational exercises
- Deliverables

Target Group

Our main target group is developers or designers making technology (Internet of Things creators) as per the original orientation of the project and the claims we made in the proposal. We are also interested in media attention as secondary target group given the reviewer feedback at the first periodic review. As a project with a considerable academic component, we also address others interested in education or research related to privacy, ethics and technology across the disparate fields covered by the project.

Redesign specifications

The website was designed by Denise Burt (elevator-design.dk) and her colleague Bugge Lützhøft (ekranoplan.dk) based in Copenhagen. We chose them given their professional portfolio and quote which fits our needs, time frame, and budget. These efforts are a response to the reviewers' request to make our work visually appealing and attract more users to our channels (our web, Facebook, LinkedIn and Twitter platforms).

Implementation specifications

As per initial agreement during proposal writing, reiterated during the first periodic review, ORG will provide VIRT-EU with a hosting server for the service package and all of its components at the end of the project period in order to ensure that project output remains useful and operational after project end. This decision is currently pending partner negotiations of the joint ownership agreement. This means that ORG commits to managing hosting costs each year from 2020 onwards and, at the very least, taking care of the minimum maintenance necessary, such as Wordpress updates, privacy policy updates, GDPR updates and similar.

6. Project dissemination activities

Dissemination and communication of the project results has been pursued towards the technological and scientific communities, citizens, policy makers, entrepreneurs and other scholars. Such a mixed audience has required a significant diversity of outputs and dissemination efforts. To maximize the VIRT-EU impact, at the outset of the project we have defined a road map for a proper integration and widespread use of project

deliverables, targeted management, complemented by adequate dissemination and exploitation of project results and development of intellectual property.

As a matter of knowledge engagement and wide dissemination, project partners have participated broadly in sessions and conferences that involved practitioners as well as academic researchers and oftentimes a mix of both. Training of young scholars has been a particular area of focus for the project, and we have aimed to not only engage with young scholars through event organizing but also through active development of teaching curricula.

The VIRT-EU dissemination strategy retains its central commitment to ensuring that project results are broadly disseminated to IoT developer communities, interested stakeholders and policy professionals as well as to the academic community. Our efforts on all these accounts are described below.

6.1 Overall communication, dissemination and exploitation objectives

- Disseminate the progress and the results of the project to the developer communities as well as to a diverse audience of interested stakeholders including civil society (citizens and advocates), policy makers, entrepreneurs, and other scholars
- Have a considerable impact on European discussion about ethical values designed into future technologies by disseminating key concepts, challenges, scenarios and tools through an innovative mix of channels and formats that the different stakeholders recognize and value
- Bridge emerging policy, advocacy, scholarly, entrepreneurial and community innovation conversations around data use, collection, storage, and re-use in the developer and maker communities.
- Support responsible research and innovation across Europe through scholarly reports and broadly accessible social media discussions on distinctly European innovation cultures and opportunities in this emerging industry.
- Contribute to the knowledge exchange and mutual learning between SSH and ICT communities

Given the diversity of the actors involved in the VIRT-EU project, dissemination is conducted through **(1) Events and Networks (2) Internet-based communication and (3) Publications.**

6.2 Dissemination strategy and tactics revised

Taking into consideration the reviewer's feedback on the project, the VIRT-EU consortium has developed a stronger dissemination strategy to reach a wider audience including: technological and scientific communities, citizens, policy makers,

entrepreneurs, developers and designers and advocates for responsible technology development.

Since our last review, we have strengthened our dissemination strategy and consequently gained more media attention and obtain awards or mentions for our public-facing interventions and project outcomes. In the last year of the project, we have dedicated our attention towards testing our project outcomes, publishing articles advancing debates on ethical technology in academia and participating in local events where industry, research and policy-makers meet. We have also improved our communication tactics re-designing our website for a better user experience that could engage developers in our project outputs and also closely developed our final toolkit using workshops as test beds to try our tools and workshop formats.

In addition to our communication tactics, we have also closely worked with ITU's communication department to figure out the best ways to share our content online. As a part of this effort, we have been more active on social media with Twitter, LinkedIn and Facebook accounts using our network during events and for commenting on relevant content throughout the project. All of the partners used their personal social media accounts to reach a broader audience. For example, the Open Rights Group shared VIRT-EU's tweets at least once a week or anytime it was relevant and tagged the VIRT-EU profile when tweeting about IoT and ethics. ORG's Twitter profile has 39.800 followers as of 20 December 2019 and enjoys 243,000 average tweet impressions per month. In addition, our advisory board and network of industry leaders and researchers have helped us reach out to broader groups.

6.3 Public dissemination efforts

As part of our effort to ensure breadth of project output dissemination we have collaborated with two different organizations.

Insight Publishers is a professional academic dissemination company that helped us disseminate information about Bear & Co demonstrations and the Design Challenge event. They created three press releases and two different profile articles in April, May and June of 2019. Social media posts based on the press releases reached 1,448 followers on Twitter and 157,881 followers on LinkedIn. VIRT-EU News Stories were written and uploaded to the Insight Publishers website, and were also featured in the IPL monthly Newsletter which reaches over 1,000 Industry-relevant stakeholders per month.

A VIRT-EU Article was written and printed in the latest edition of the Projects magazine and uploaded to the Projects magazine website. The magazine was distributed at the Sustainable Places 2019 conference where approximately 250 delegates were in attendance.

The press releases were "picked up" by the following outlets:

- Business Telegraph
- CORDIS: https://cordis.europa.eu/news/rcn/131290/en?WT.mc_id=RSS-Feed&WT.rss_f=news&WT.rss_a=131290&WT.rss_ev=a
- Computerworld.dk: https://www.computerworld.dk/art/247764/morgen-briefing-jysk-it-selskab-runder-en-omsaetning-paa-en-halv-milliard-microsoft-aabner-kunstudstilling-om-cybersikkerhed-iot-projekt-skal-saettes-fokus-paa-faellesskab
- ECN mag: https://www.ecnmag.com/news/2019/05/immersive-ethics-tool-helps-developers-avoid-internet-things-dystopia
- PROSA (Danish IT Union): https://www.prosa.dk/artikel/internet-of-things-skal-goeres-etisk-forsvarligt/
- Inside Scandinavian Business: https://www.insidescandinavianbusiness.com/article.php?id=431
- Industrial Internet of Things
- Innovation Toronto
- Intel Insights
- IoT council: https://www.theinternetofthings.eu/irina-shklovski-virt-eu-project-and-it-university-copenhagen-are-running-and-iot-day-event
- IoT times: https://iot.eetimes.com/new-project-helps-iot-developers-think-more-deeply-about-ethics/
- IoT Now: https://www.iot-now.com/2019/05/02/95374-immersive-experience-sets-participants-tricky-task-running-iot-start-without-ditching-values/
- Insight publishers: https://ipl.eu.com/bear-co-immersive-ethics-tool-helps-developers-avoid-internet-of-things-dystopia/
- Parallel State
- PHYS.org: https://phys.org/news/2019-05-immersive-ethics-tool-internet-dystopia.html
- Smart303
- Softroots
- Trendolizer: http://virtualreality.trendolizer.com/2019/05/immersive-ethics-tool-helps-developers-avoid-internet-of-things-dystopia.html
- Vinaj

We also collaborated with the Open Access Government publication, which gets distributed quarterly to over 200,000 key individuals, such as MEPs, EU commissioners, Government, Academic and Business leaders in Europe, North America and Japan. Also the website receives an average of 23,000 visits weekly. VIRT-EU has placed information about the project and the tool release in the October 2019 and January 2020 editions of the publication.

6.4 Multi-media content

In order to create long-lasting documentation of the activities carried when testing out project outputs, ITU allocated resources to document how we tested the tools and research outputs in different event formats. Alongside textual documentation, we have also used visual documentation to interview members of our consortium and advisory board as a way to translate academic outputs into accessible and audio-visual communication that can prevail online after each event.

6.4.1 Ethics Primer

Throughout our interactions with the IoT developer community we found a strong desire to learn about ethics as a subject but little in the way of accessible content. As we developed our theoretical framework we realized that the literatures we drew upon were different and less accessible than the more familiar concepts of consequentialism and even virtue ethics on its own. Thus in 2019 we began the project of developing an ethics primer – a relatively short and simply written document that introduces five major ethical frameworks and then demonstrates how these work in practice through examples. We had the primer professionally designed in order to ensure coherent visual language for all of our output. The primer is part of the VIRT-EU service package Deliverable 6.3.

6.4.2 VIRT-EU “Let’s Talk About Ethics” Animation

The ethics primer is a textual document, but in the age of digital communication we also needed a visual expression of our research. Thu, we collaborated with an animator-mathiasbotfeldt.com who created a 4-minute video “Let’s Talk About Ethics.” We based the animation script on the ethics primer. The video talks about ethics through a practical example and is being used to promote our service package on diverse platforms.

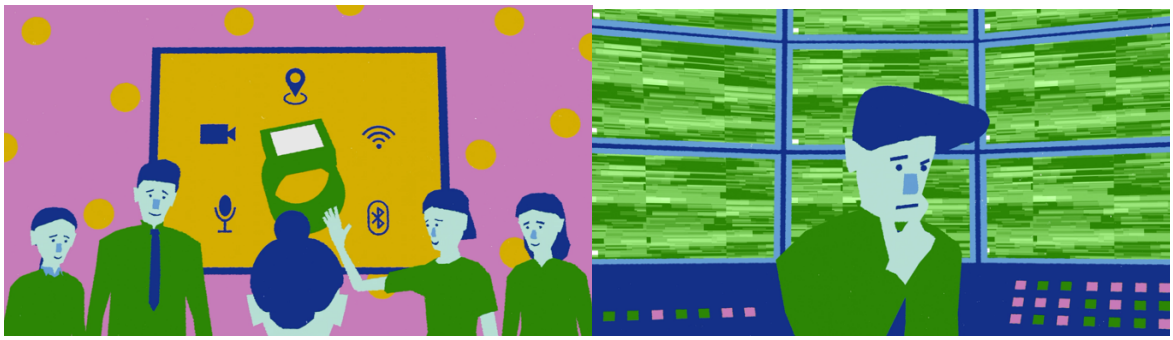


Figure 22: Stills from "Let's Talk About Ethics" animation

The main purpose of the animation was to inspire creators of connected technology (developers and designers of IoT) to think about the role ethics actually plays in creating connected products. We sought to create an inspiring story that could live on the internet for people to view and share when discussing responsible technology

development. Rather than providing a lecture on ethics, we decided to tell the story of Leo, a product designer building a smartwatch for children who has to navigate the difficulties of being virtuous, while paying attention to the pressures and limits of being a startup and thinking deeply about the role his envisioned technology might play in the world.

6.4.3 Ethical Unboxing Videos

As part of our public outreach we have also created three *ethical unboxing* videos, playing on a popular genre of YouTube videos. Here researchers from LSE and ITU studied the way in which specific products are sold on the market, connecting concerns with ethical considerations. These unboxing videos helped us communicate the type of research we were conducting to a wider audience shedding light on how some companies selling IoT do not communicate clearly to consumers what the product does and how data is stored. The videos have been viewed over 1000 times On the VIRT-EU YouTube channel and continue to gain attention.

Ethical Unboxing I: Sammy Screamer by BleepBleeps

For the first video in our Ethical Unboxing Series, Ed Johnson-Williams and Funda Ustek-Spilda reviewed Sammy Screamer by BleepBleeps. Sammy Screamer was launched in February 2014 and started being shipped in April 2016. So we can say it has been around in the market for nearly 3 years. It had a really successful Kickstarter round, raising over $90k with more than 1000 backers.

Sammy is a movement sensor that connects to the BleepBleeps smartphone app. BleepBleeps advertises that you can stick Sammy on the stuff you want to keep an eye on – like a door, a bag or a kid's buggy or the cookie jar. When they are moved, Sammy starts screaming and you get a notification on your smartphone. The level of sensitivity to movement can be adjusted, so can its volume.

We have reviewed Sammy on five values we have identified throughout our ethnographical fieldwork in the internet of things (IoT) space: Privacy, Security, Interoperability, Usability and Sustainability for our unboxing video. We concluded with pointing out potential issues with sustainability and communication of data practices.

Sammy has a full plastic casing. These cases are made in China and assembled in the UK. In general, it would be great to have more information about the kind of plastic used in production, and whether it is recyclable. It would also be desirable if BleepBleeps had a recycling scheme for its products and their batteries.

We loved the design of Sammy and were impressed by the design thinking behind it. Many IoT devices include cameras, recorders, trackers and so on without putting much thought into their implications for the privacy and security of the individuals. Despite the fact that some users noted that without WiFi, Sammy's usability left room for

improvement, we appreciated that this was a design decision to make the product more secure, and protect it against attacks.

We would have liked to have more information about the data collected by Sammy and have more detailed information on how BleepBleeps uses that data. We found that the consent sought from users was implied consent only, and would prefer users to be actively encouraged to inform themselves about the privacy policies that govern their device and data.

Ethical Unboxing II: Smartwatches for Children

The second video in the VIRT-EU Ethical Unboxing Series considers four different fitness tracker smartwatches for kids. Here we ask: is it ethical to track your kids and quantify their everyday life? If yes, are there any potential risks that need to be accounted for? Although connected devices, such as smartwatches, are attractive and we do not discourage anyone from buying them, we believe that customers should be informed about the responsibilities they take on when buying these products. This video is intended to help people consider what to think about when deciding to purchase these.

In this video, the VIRT-EU team from LSE, Alison Powell and Funda Ustek-Spilda, guide us through the kinds of questions we need to ask when purchasing and using IoT devices for children. Before filming, Funda Ustek-Spilda collaborated with Ed Johnson-Williams from ORG to study trackers for children available in the market and decided to focus on the following four fitness tracker smartwatches in particular that have been specifically designed for children. In this video we reviewed the Hangang GPS tracker for children, 2) Bhdlovely kids smartwatch mobile cell phone (Pink-S9), 3) Garmin Vivofit Jr. daily activity tracker for kids and 4) Fitbit Ace kids activity tracker.

The discussions raise questions that may encourage parents to think about what devices they buy for their children and what the implications of buying those devices are. While some of these devices may track the location of children, take photos or audio record them, there is no information in terms of how parents are able to know how the data are gathered or stored, apart from only one of the four smartwatches reviewed in the video. Germany went so far as to ban the sale of "smartwatches" for their infringement of national surveillance laws by, for example, listening in on classroom lessons[65]. With all the cool features and bright colours that come with these smart devices, parents may not always be aware of the privacy issues, but how should they know? Privacy policies do not make for exciting reading – between the length, the jargon and the dryness of the text, it is not surprising that people tend not to read them.

[65] https://www.bbc.com/news/technology-42030109

In addition to transparency issues, risks such as the possibility of being hacked are of great concern when studying these devices. As Funda puts it: “If you can spy on someone, there is a possibility someone else could spy on you”. If a company that manufactures these gadgets does not take into account privacy and surveillance in their manuals and gives detailed information about their product, how can parents make sure that these companies protect their users against being hacked?

Ethical Unboxing III: Sleep devices
The third video in the VIRT-EU Ethical Unboxing Series is about the smart technologies we bring into our bedrooms and our beds. We decided to focus on two devices from the same company – Beurer – and were surprised to find that the data was managed differently in each device. How is the consumer supposed to know this?

We looked at the Beurer SE80 Sleep Sensor and the Beurer SL70 Snore Stopper – two devices that are available in stores in Copenhagen, Denmark. Although many of us buy our devices online, we often have to look for information ourselves. We expected the shop attendants would help us find out about these devices, but got little information. Since these devices collect data while we are in bed, we were interested in finding out what data is being stored. Who gets to access this data? Can the company use these data and how? What happens to these data after we stop using the device?

Since sleep-tracking devices depend on collecting data to fulfil their purpose, they are often connected to smartphone apps to help users adjust settings and keep track of their data. Although these devices are from the same company, they connect to different apps that can be found on Google Play. The sleep sensor connects to the SleepExpert app, and the snore stopper can be connected to the SleepQuiet app. So we did research online, read those privacy policies and terms of service, and unboxed products, to find out what happens to the data these sleeping devices collect. It turned out that the SleepQuiet app is developed and run by a different company from outside the EU. We concluded that although IoT devices might provide useful features for sleep tracking, the confusing mélange of notifications, data explanations, terms of service and privacy policies make it difficult to trust these devices with respect to data practices in such intimate settings.

6.4.4 Blog Posts
The VIRT-EU project has been committed to communicative academic content to the public. As part of this effort we have made sure that our research is well represented on our blog by creating at least one substantive blog-post per month. In the final six months of the project we created video documentation of our activities in running public events and workshops, editing these into engaging videos and posting these as part of our public communication alongside blogposts. In total we created 40 blogposts across six different categories of content detailed in Table 1 below.

Post type		Number of posts
Methods	Introduction to VIRT-EU methodologies from qualitative and quantitative teams	2
Law and policy	Posts about GDPR, PESIA as well as legal and policy issues that VIRT-EU research addresses	6
Publications	Summaries and public reporting on VIRT-EU academic publications and presentations	6
Thinking about ethics	Considerations of ethics from different points of view from discussions of IoT Manifestos to theories of ethics to insights from ethnographic and quantitative research	14
Interventions	Attempts to consider current relevant issues in IoT innovation and development and to propose changes, new directions and different approaches	5
Public events & design engagements	Documentation and discussions of VIRT-EU public events, co-creation workshops and design engagements	14
Video reporting & interviews	Posts discussing VIRT-EU video communication including ethical unboxing videos, as well as video interviews with VIRT-EU team members and our advisory board members.	6

Table 1: Blogpost numbers by category

6.5 Public engagement

A substantial part of VIRT-EU activities has had to do with community engagement in various ways. In fact, much of our research and co-design process has centred on concerted engagement with developers and designers through co-design and co-creation workshops. As our tools and ideas developed, we included stakeholder workshops to engage with a broader cross-section of actors in the field of IoT. These efforts are detailed in Deliverables 3.3, 5.3, 5.4 and 6.1.

Throughout the project members of the consortium have made a considerable efforts to go beyond co-design and stakeholder engagement workshops in order to engage with industry leaders, researchers and policy makers in the field of IoT innovation. We detailed much of our public engagement through workshops and industry appearances in Deliverable 7.3 Local Briefing Sessions submitted in June 2019. Below we list all of our public engagements since June 2019. In particular we want to highlight that over the course of 2019, the consortium has invited participants of workshops and talks to explore and contribute to the development of our final project outcomes. In order to test prototypes and research outputs of the project, we have organized events in tech-related conferences such as Techfestival in Copenhagen, Mozfest in London and ThingsCon in Rotterdam. During the last round of events before the completion of the

project, consortium members provided workshops and talks dedicated to industry audiences.

In January 2019 POLITO on behalf of the VIRT-EU project organized a panel at CPDP 2019 to bring the project, its insights and results to a diverse audience of policy makers, civil society representatives, researchers and technologists.

> Mantelero, Alessandro, Annelie Berner, Javier Ruiz, Alison Powell, Irina Shklovski. *Values and Ethics in Innovation for Responsible Technology in Europe* Joint VIRT-EU panel at *CPDP 2019*, Brussels, Belgium. January 2019. https://blogit.itu.dk/virteuproject/2019/02/08/virt-eu-panel-at-cpdp-2019/

In July 2019 the VIRT-EU project organized an ethics and IoT track at the ORGCon 2019 event in London. As part of this track we presented a hands-on workshop on IoT and data practices, a panel on ethics and IoT and a Design Challenge event where participants presented their concepts and got feedback from the judge panel. The three events were well attended, ranging from 30 to over 100 attendees throughout the day.

> *ORGCON 2019*, London, UK, July 2019
> Panel + Workshop: Power to the user? - Moving your data between Internet of Things devices, facilitated by Leonie Maria Tanczer, July Galindo Quintero, Jessica Lis, Sarah Turner, Simon Turner. Approximately 30 attendees.

> *ORGCON 2019*, London, UK, July 2019
> Panel – Can Tech Truly Be Ethical? moderated by Irina Shklovski (ITU). Panel participants Paul Dourish (UC Irvine, USA), Ann Light (Sussex University, UK & Malmö University, Sweden), Gina Neff (Oxford University, UK), and Lillian Edwards (Newcastle University, UK). Over 100 attendees, standing room only.

> *ORGCON 2019*, London, UK, July 2019
> Event: VIRT-EU design challenge facilitated by Annelie Berner (CIID), judged by Dawn Nafus (Intel, USA), Alex Deschamps-Sonsino (Designswarm, UK) and Rob van Kranenburg (IoT Council, NL). Approximately 40 attendees.

Over the last three years VIRT-EU has established a strong relationship with several tech conference venues. TechFestival Copenhagen is one of these and we were proud to present two very well attended workshops at the event this year.

> *TechFestival 2019*, Copenhagen, Denmark, September 2019
> Unforeseeable Futures, Ethics and New Technologies - a workshop facilitated by Irina Shklovski ITU), Annelie Berner (CIID) and Raffaella Rovida (CIID). Approximately 40 attendees

> *TechFestival 2019,* Copenhagen, Denmark, September 2019

Make Your Own GDPR Erasure Poetry, - a workshop facilitated by ETHOSLab, Rachel Douglas-Jones (ITU) Marisa Cohn (ITU) and Katja de Vries (Lund) https://techfestival.co/event/gdpr-erasure-poetry/ Approximately 30 attendees.

Through the VIRT-EU project LSE began a collaboration with the Women of Wearables (WOW) – a global organization headquartered in London. WOWs goal is to inspire, support and connect women who work with wearable and digital technologies worldwide. These goals coincide with VIRT-EU's aims of convening and enriching developer conversations about ethics.

Women of Wearables/Human Data Interaction, London, UK, October 2019
The Pivot Strategy for ethical decision making in business - a workshop facilitated by Funda Ustek-Spilda, Alison Powell (LSE) and Javier Ruiz (ORG)

The goal of the VIRT-EU project has always been to engage with developers and designers across Europe and it has been important to us to speak to diverse groups Europe-wide. As a result we developed strong relationships with organizations behind MozFest in London and DesCon in Serbia. Both events are focused on bringing together regional audiences to engage in capacity building. Where MozFest is a broader event looking at Internet-based technologies in general, DesCon specializes in security and IoT. We have closely engaged with both organizations and their events over the past two years of the project and this is year is no exception.

MozFest 2019, London, UK, October 2019
The VIRT-EU Sandbox on Ethics and IoT - a workshop facilitated by Irina Shklovski (ITU) and Alison Powell (LSE) – Approximately 15 attendees

DesCon 2019, Belgrade, Serbia, October 2019
The Pivot Moment in ethical decision making & Negotiating ethics - two workshops facilitated by Funda Ustek-Spilda (LSE)

The Open Rights Group has organized two large-scale ORGCon events in 2019 in London and Edinburgh. VIRT-EU was showcased at both events with different kinds of engagement. In October we presented our tools and workshops to diverse audiences.

ORGCon Scotland, Edinburgh, UK, October 2019
Pivot Strategy: Making Ethics Intelligible and Negotiable, facilitated by Funda Ustek-Spilda (LSE) and Javier Ruiz (ORG)

ORGCon Scotland, Edinburgh, UK, October 2019
The Pivot Moment in Ethical Decision Making, facilitated by Funda Ustek-Spilda (LSE)

ORGCon Scotland, Edinburgh, UK, October 2019
Negotiating Ethics, facilitated by Funda Ustek-Spilda (LSE)

One of the main goals of the VIRT-EU project has been to try to reflect on ethical concerns emerging from data use, extraction and inference that go beyond what is currently covered by the GDPR. As part of this effort LSE organized a workshop where we invited stakeholders to think about the General Data Protection Regulation (GDPR) and to reflect on their use of data. We used materials from previous CIID & LSE workshops in London and adapted them with questions from the IoT Mark (Better Mark) Assessment. The workshop was attended by 15 people, including people who founded IoT startups, security and privacy consultants and people whose job roles included data management and control.

VIRT-EU Workshop on Privacy beyond the GDPR, November 2019, London, LSE
Facilitated by Funda Ustek-Spilda and Sebastian Lehuede (LSE)

The VIRT-EU project has worked closely with the Internet of Things community of designers and developers in Rotterdam and Amsterdam. We have also established strong connections to the ThingsCon network. This year we presented VIRT-EU tools and workshops at ThingsCon 2019.

ThingsCon 2019, Rotterdam, NL, December 2019
VIRT-EU Workshop Unforeseeable Futures, facilitated by Annelie Berner (CIID), Irina Shklovski (ITU) and Funda Ustek-Spilda (LSE). Approximately 20 attendees

The VIRT-EU team was invited by the London IoT Meetup to organize an end of project event where we presented developer-oriented project outcomes to the London IoT innovator community. Alison Powell kicked off the event by describing our ethical framework and how we came to build this framework based on our quantitative and qualitative research. Javier Ruiz described PESIA: Privacy and Security Impact Assessment developed by the VIRT-EU team at Politecnico di Torino and transformed into an online tool by the Open Rights Group. Funda Ustek-Spilda introduced the Ethical Stack, developed by Copenhagen Institute of Interaction Design based on the three years of VIRT-EU research. We had a lot of interest in our project and several members of the audience asked us if we would be interested in giving further workshops and demonstrations about how to use the Ethical Stack and PESIA.

London IoT Meetup #94, 17 December 2019, @Designit London
Facilitator: Alex Deschamps-Sonsino. Presenters: Alison Powell, Funda Ustek-Spilda and Javier Ruiz
https://attending.io/events/london-internet-of-things-meetup-94

6.6 Public talks and keynotes

Engagement with a broad range of stakeholders around the questions of IoT has been extremely important for VIRT-EU partners. Throughout the project we have established ourselves as authorities on the topics of ethics and IoT. As such, the partners have made special efforts to participate in non-academic events through many keynotes and

speaking engagements beyond the more hands-on workshops described above. Our dissemination efforts for the first half of the project are documented in Deliverable 1.3. Below we present a list of public speaking engagements for the second half of the project from July 2018.

Berner, Annelie. Panel presentation in "Teaching a digital native generation for a sustainable future technology" at Ars Electronica conference, Linz, Austria, September 7, 2018. https://ars.electronica.art/error/en/campus-digitalnative/

Berner, Annelie and Peter Kuhberg. "Computational Media and Tools for Ethics" at Processing Community Day, Copenhagen, DK. February 1 2019. https://ida.dk/arrangement/ida-it-processing-community-day-copenhagen-328098#beskrivelse

Berner, Annelie. "IoT Day: Bear & Co" for IoT Day at Ethos Lab at IT University, Copenhagen, Denmark, April 9, 2019. https://ethos.itu.dk/2019/03/26/iot-day-2019/

Berner, Annelie. "Backing Ethics with Research" at the Mind the Gaps conference, Malmo, Sweden, May 21, 2019. https://mindthegaps.io/

Berner, Annelie. "Ethics & Technology: Designing a Desirable Future" invited talk at Get Transformation Done event, Bürserberg, Austria, October 11, 2019. https://www.poesis.at/transformation-x-society/

Berner, Annelie (CIID) & Shklovski, Irina (ITU) *Presenting VIRT-EU tools for designing with ethics*. Presentation at ThingsCon 2019, Rotterdam, December 2019

Lehuede, Sebastian (LSE). "IoT and Ethics" at London IoT Meetup #81, October 30, 2018.

Powell, Alison "Ethics and the Internet of Things" at the Association of Internet Researchers conference, Montreal, Canada October 15, 2018.

Powell, Alison (LSE). "A New Ethics of Sense" at St John's College Oxford, Digital Visual Culture Symposium, January 7, 2019.

Powell, Alison (LSE). "Living With The Others at Home's Door" at the Future Home Symposium, London Design Museum, March 16, 2019.

Powell, Alison (LSE). "Doing, Postponing and Evading Ethics: the politics and economics of ethics in IoT Startups". Alan Turing Institute workshop on uses and Misuses of Connected Devices, April 3-4, 2019.

Powell, Alison (LSE) "Beyond Surveillance: Data, Ethics and Connected Devices" at Goodenough College, London, May, 2019.

Powell, Alison (LSE), "Understanding Automated Decisions" at the Alan Turing Institute "Driving Digital Futures" public seminar, September 18, 2019.

Shklovski, Irina (ITU) *A Practical Ethics for IoT?* Invited talk at the Algorithmic Sovereignty Summit. TechFestival 2018. Copenhagen, September 2018

Shklovski, Irina (ITU) *AI – Making Sense of Complexity and Opportunities*. Keynote at the TechFestival 2018. Copenhagen, September 2018

Shklovski, Irina (ITU) *Beyond Compliance: Legal is not the same as ethical*. Keynote at the IDC Privacy and Data Security 2019 Conference. Copenhagen, February 2019

Shklovski, Irina (ITU) *Data, Smart Things and Ethics in the Public Sector?* Guest talk in the Public Sector Management with Data course for public sector employees in the Copenhagen area. February 2019

Shklovski, Irina (ITU) *Ethics & the Internet of Things.* Invited lecture in the Taming the Machines – Securing Knowledge public lecture series. Hamburg University. April 2019

Shklovski, Irina (ITU) *Thinking about ethics and IoT* invited talk at ThingsCon System Reboot Unconference. Berlin, May 2019

Shklovski, Irina (ITU) *A Better Digital Future: Meeting the ethical challenges of connected technologies.* Keynote at Kulturnatten ITU, Copenhagen, October 2019

Shklovski, Irina (ITU) *Practical Ethics: Presenting VIRT-EU tools for technology developers.* Design and ethics shaping the cutting-edge solutions in safe AI panel at DTU High Tech Summit. Kgs. Lyngby, Denmark October 2019

Ustek-Spilda, Funda (LSE). "Doing Ethics at the Outset" at Multi-stakeholder panel discussion on IoT, networks, identifiers and privacy of data, DesCon 2018 Opening Panel, October 12, 2018.

6.7 Non-academic publications

Douglas-Jones, R., Fritsch, E., Shklovski, I. & Hauberg, T. (2018) IoT as an Ethical Challenge. *Article written for LinkedIn and the VIRT-EU blog:* https://www.linkedin.com/pulse/iot-ethical-challenge-thor-hauberg/

Fritsch, E., Douglas-Jones, R. & Shklovski, I. (2018) The manifesto moment in IoT. *The State of Responsible IoT.* V2 ThingsCon https://medium.com/the-state-of-responsible-iot-2018/the-manifesto-moment-in-iot-1d20732ce97e

Mantelero, A. (2018) Can a black box be trusted? *Digital Society Blog* Humboldt Institute for Internet Studies. 10.5281/zenodo.1148245

Shklovski, I. (2018) Responsibility in IoT: What does it mean to "do good"? *The State of Responsible IoT*. V2 ThingsCon https://medium.com/the-state-of-responsible-iot-2018/responsibility-in-iot-what-does-it-mean-to-do-good-dd31bff2691a

Shklovski, I. (2019) A better digital future: Meeting the ethical challenges of connected technologies. *Open Access Government* October issue

Shklovski, I. (2019) Design me a pause button. Graceful and dignified. *The State of Responsible IoT.* V3 ThingsCon https://thingscon.org/small-escapes-riot-report-2019-out-now/

Shklovski, I. (2020) A better digital future: Developing tools to meet the ethical challenges of connected technologies. *Open Access Government* January issue

6.8 Awards and recognition

VIRT-EU has been recognized for academic, design and public outreach achievements with awards and grants.

VIRT-EU's immersive ethical installation Bear & Co, created by CIID in collaboration with ORG, LSE and ITU, joined 483 projects, products, and services from Nike, Microsoft, Mastercard, Gensler, and others in the FastCompany 2019 Innovation by Design Awards. The Bear & Co installation won an honorary mention in the Experimental category

Ann Light (Advisory Board), Irina Shklovski (ITU) and Alison Powell (LSE) won a Best of alt-CHI 2017 Award for their paper "Design for Existential Crisis" at the ACM Human Factors in Computing (CHI) Conference in Denver, CO

Alison Powell (LSE) has been awarded a position at the Ada Lovelace Institute, with responsibility for directing a research network on data, AI and ethics.

Funda Ustek-Spilda and Alison Powell (LSE) have been awarded an HDI Network Fund small grant for "Pivot Strategy: Making ethics intelligible and negotiable" in 2019 as partial support for the VIRT-EU Design Challenge.

6.9 Academic talks and presentations

The VIRT-EU project is a Research and Innovation Action (RIA) and our academic activities are cutting and innovative. Thus alongside our public engagement we have paid significant attention to engagement with our respective academic communities.

In particular, we want to highlight an important appearance by POLITO PI Alessandro Mantelero at the UN in Geneva, Switzerland to discuss the Privacy, Ethical and Social Impact Assessment:
Mantelero, Alessandro (Polito) *New and emerging issues: The collective dimension of data protection and the tools to safeguard it (Privacy, Ethical and Social Impact Assessment)*. Presented at the *Expert workshop on the right to privacy in the digital age*; OHCHR, International expert workshop, Geneva, United Nations, February 19-20, 2018

Our academic dissemination efforts for the first half of the project are documented in Deliverable 1.3. Below we present a list of academic dissemination appearances for the second half of the project from July 2018.

Esposito, Samantha *L'impatto del trattamento su diritti e libertà alla luce della giurisprudenza delle autorità garanti italiana e spagnola.* Presentation at *L'entrata in*

vigore del Regolamento (UE) 2016/679: la riforma alla prova della prassi in Italia e in Spagna, International conference, University of Pisa, Pisa, June 8-9, 2018.

Lehuede, Sebastian, Alison Powell and Funda Ustek-Spilda. *Pragmatist Ethics in Technology Building: Internet of Things Components as Occasions for Ethical Innovation*. Paper presentation at *International Association of Media and Communication Researchers* conference (IAMCR), Madrid, July 7, 2019.

Magnani, Matteo. *Multilayer networks meet databases*. Talk at *Complex networks conference*, Lisbon, Portugal, 2019.

Magnani, Matteo. *Temporal text networks*. Talk at *International Conference on Computational Social Science*, Amsterdam, NL, 2019.

Magnani, Matteo. *Multilayer networks meet databases.* Invited speaker at International workshop on *Social Network Analysis (ARS): Multilayer, Multilevel and Multimode Networks*, Salerno, Italy, 2019.

Magnani, Matteo. *Large scale social and multilayer networks*. Invited speaker at Bi-annual meeting of the *CLAssification and Data Analysis Group* (CLADAG) of the Italian Statistical Society (SIS), Cassino, Italy, 2019.

Magnani, Matteo. *An Analysis of the Consequences of the General Data Protection Regulation on Social Network Research*. Talk at *SUNBELT Conference*, Montreal, CA, 2019.

Magnani, Matteo. *Multilayer social networks*. Talk at the Dagstuhl seminar on V*isual Analytics of Multilayer Networks Across Disciplines* (19061), Dagstuhl, 2019.

Mantelero, Alessandro. *Risk assessment in personal data processing: from DPIA to a broader perspective*. Presentation at the *13th International IFIP Summer School on Privacy and Identity Management – Fairness, accountability and transparency in the age of big data,* 20-24 August 2018, AIT Austrian Institute of Technology, Vienna, Austria

Powell, Alison (LSE). *Future Internets* Plenary keynote lecture at the *Association of Internet Researchers conference*, Montreal, Canada October 13, 2018.

Powell, Alison *Ethics and the Internet of Things* at *CIGR: Conference on Internet Governance Research*. Institute for Advanced Legal Studies, University College London. May, 2019.

Powell, Alison and Funda Ustek-Spilda *Will technology [really] save us? Moral orders in social ventures.* Paper presentation at *Data Power conference*, September 12, 2019.

Rossi, Luca, Obaida Hanteer, Matteo Magnani, Davide Vega D'Aurelio,(October 2019) *Observing the tech, using meetUp data to study the evolution of IoT*, Paper presentation at the *Association of Internet Research Conference (IR'18)*, Queensland University of Technology

Shklovski, Irina (ITU) *Tackling digital resignation*. Presentation at Dagstuhl seminar on *Values in Computing*. Dagstuhl, Germany, 2019

Shklovski, Irina (ITU) *Life is not about data.* Presentation at the *Data Narratives* Seminar. IT University of Copenhagen. Copenhagen, Denmark, March 2019

Shklovski, Irina (ITU) *The VIRT-EU project: Ethics in IoT.* Invited panel participant at *Computers, Privacy & Data Protection 2018*. Brussels, Belgium, January 2019

Shklovski, Irina (ITU) *Translations: Academia, Research and Ethics*. Invited panel participant at *Beyond data ethics: datafication and the good life* seminar. University of Copenhagen. September 2018

Ustek-Spilda, Funda "Thinking beyond software in IoT Ethics" at Uppsala University, Department of Information Technology, Division of Computing Science, April 16, 2019.

Ustek-Spilda, Funda, Alison Powell, Sebastian Lehuede & Irina Shklovski (2019) Peril vs. Promise: IoT and the Ethical Imaginaries, Proceedings of the CHI 2019 Workshop on New Directions for the IoT: Automate, Share, Build, and Care, May 4-9, Glasgow, the UK.

6.10 Academic publications

Although the project has been very active in producing important research, much of our academic output is still in progress. Below we present our research publication efforts, those that are already published and those that are in various stages of preparation.

6.10.1 Journal publications

Brodka, P., Chmiel, A., **Magnani, M.** and Ragozini, G. (2017). Quantifying layer similarity in multiplex networks: a systematic study. *Royal Society Open Science,* 5(8).

Esposito, M. S. (2018). L'impatto del trattamento sui diritti e le libertà delle persone fisiche: una valutazione alla luce della giurisprudenza delle autorità garanti italiana e spagnola. In Mantelero, A., Poletti, D. (eds). *Regolare la tecnologia: il Reg. UE 2016/679 e la protezione dei dati personali. Un dialogo fra Italia e Spagna* (Pisa: Pisa University)

Hanteer, O., & Rossi, L. (2019). An Innovative Way to Model Twitter Topic-driven Interactions Using Multiplex Networks. *Frontiers in Big Data*, 2, 9.

Kotsios, A., **Magnani, M., Rossi, L., Shklovski, I. & Vega, D**. (2019) An analysis of the consequences of the GDPR on online social network research. *ACM Transactions on Social Computing*

Mantelero, A. (2017). Regulating big data. The guidelines of the Council of Europe in the context of the European data protection framework. *Computer law & security review*, *33*(5), 584-602.

Mantelero, A, & Giuseppe, V. (2017). "Legal aspects of information science, data science, and Big Data." In: *Frontiers in Data Science* / Matthias Dehmer, Frank Emmert-Streib. CRC Press, Boca Raton, pp. 1-46 - ISBN 9781498799324

Mantelero, A. (2017). Towards a big data regulation based on social and ethical values. The guidelines of the Council of Europe. 41 *Revista de Bioética y Derecho* 67-84.

Mantelero, A. (2018). AI and Big Data: A blueprint for a human rights, social and ethical impact assessment. *Computer Law & Security Review*, *34*(4), 754-772.

Powell, A. (2018) Moral Orders in Contribution Cultures. *Communication*, C*ulture and Critique*, V11(4), p. 513–529, https://doi.org/10.1093/ccc/tcy023

Ustek-Spilda, Funda, Alison Powell and Selena Nemorin (2019) Engaging with Ethics in Internet of Things Design: Diverging Imaginaries in the Social Milieu of Technology Developers *Big Data and Society*.

Vega, D. and Magnani, M. (2018). Foundations of Temporal Text Networks. *Applied Network Science,* 3(1), 25:1-25:26.

6.10.2 Articles in proceedings

Afsarmanesh, N., **Magnani, M**. (2018). Partial and overlapping community detection in multiplex social networks", in I*nternational conference on Social Informatics (*SocInfo).

Fatemi, Z., Salehi, M., **Magnani, M**. (2018) A generalized force-directed layout for multiplex sociograms, in *International conference on Social Informatics* (SocInfo).

Fritsch, E., Shklovski, I. & Douglas-Jones, R. (2018) Calling for a revolution: An analysis of IoT manifestos. *Proceedings of the 2018 ACM Conference on Human Factors in Computing* (Montreal, Canada). ACM

Hanteer, O., Rossi, L., Vega, D., Magnani, M. (2018). From interaction to participation: the role of the imagined audience in social media community detection and an application to political communication on Twitter. In *2018 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM)* (pp. 531-534). IEEE.

Hargitai, V., **Shklovski, I**., & Wasowski, A. (2018). Going Beyond Obscurity: Organizational Approaches to Data Anonymization. *Proceedings of the ACM on Human-Computer Interaction*, *2*(CSCW), 66.

Light, A., **Powell, A., & Shklovski, I.** (2017) Design for existential crisis in the Anthropocene age. *Proceedings of the 2017 Conference on Communities & Technologies* (Troyes, France, 2017). ACM

Light, A., **Shklovski, I. & Powell, A.** (2017) Design for existential crisis. In *alt.chi Extended abstracts of the Proceedings of the 2017 ACM Conference on Human Factors in Computing.* (Denver, CO, 2017). ACM.

Powell, Alison, Funda Ustek-Spilda & Irina Shklovski (2019) Virtue, Capability and Care: Beyond the consequentialist imaginary. *Ethicomp 2020 - Paradigm Shifts in ICT Ethics: Societal Challenges in the Smart Society*. La Rioja, Spain, 17-19 June.

Ustek-Spilda, Funda, Alison Powell, Sebastian Lehuede & Irina Shklovski (2019) Peril vs. Promise: IoT and the Ethical Imaginaries, *Proceedings of the CHI 2019 Workshop on New Directions for the IoT: Automate, Share, Build, and Care*, May 4-9, Glasgow, the UK.

6.10.3 Submitted journal and conference papers under review

Hanteer, Obaida, Roberto Interdonato, Andrea Tagarelli, **Luca Rossi, Matteo Magnani.** Community detection for multiplex networks. Under submission, *ACM Computing Surveys*

Interdonato, Roberto, Diego Perna, Andrea Tagarelli, **Davide Vega, Matteo Magnani.** Multilayer network simplification. Under submission, *Computer Science review*.

Magnani, Matteo, Luca Rossi, Davide Vega. The multinet library for the analysis of multiplex networks. Under submission, *Journal of Statistical Software.*

Vega, Davide, Matteo Magnani, Luca Rossi, Funda Ustek-Spilda, Sebastian Lehuede, Alison Powell and Irina Shklovski "A Twitter-based Study of the European Internet of Things". Under submission, *Information Systems Frontiers*.

6.10.4 Papers in preparation

Powell, Alison, Funda Ustek-Spilda and Irina Shklovski "Thinking Otherwise: A practical framework for ethics in technology design" Prepared for submission to *Big Data and Society.*

Shklovski, Irina, Berner, Annelie, Ustek-Spilda, Funda and Seyfried, Monica. "Bear & Co. Immersive simulations and ethical dilemmas" Prepared for submission to *ACM Interactions Magazine*

Shklovski, Irina, Luca Rossi, Davide Vega, Matteo Magnani. Can You Walk the Talk? The Limits of Ethical Conduct in Twitter Research. Prepared for submission to *Big Data & Society*

Shklovski, Irina, Ustek-Spilda, Funda, Lehuede, Sebastian and Powell, Alison. "Where is ethics in practice? Values as things in IoT startups" Prepared for submission to *ACM Conference on Human Factors in Computing 2020*

Shklovski, Irina, Ustek-Spilda, Funda, Powell, Alison and Bener, Annelie. "How to talk about ethics: Convening difficult conversations" Prepared for submission to *Proceedings of the ACM on Human-Computer Interaction* (CSCW)

Ustek-Spilda, Funda and Alison Powell "Moral Orders in Social Ventures" Prepared for submission to *Communication, Culture and Critique.*

Ustek-Spilda, Funda, Alison Powell and Irina Shklovski "The political economy of IoT" Prepared for submission to *Science, Technology and Human Values*

Ustek-Spilda, Funda, Irina Shklovski and Alison Powell "What's Your Ethics? A review of ethical tools for technology development. Prepared for submission to *First Monday.*

Ustek-Spilda, Funda, Sebastian Lehuede, Alison Powell, Irina Shklovski, Davide Vega, Luca Rossi and Matteo Magnani "Hierarchies of Care: ethics in technology development" prepared for submission to *Social Studies of Science*.

6.11 Educational materials

Discussions about ethics and technology have included much soul-searching in computer science and engineering education about how to educate future technology professionals[66]. Over the last three years VIRT-EU partners have worked to integrate VIRT-EU content in education. Many of our efforts have been documented in Deliverable 7.4 – Curriculum development, submitted in December 2018. We have continued course development further throughout 2019. Below we present two examples of the course curriculum development we have completed in 2019. All of our curriculum development content will be made freely available for download on the VIRT-EU open GitHub repository (Deliverable 7.6) and as part of the VIRT-EU service package (Deliverable 6.3)

6.11.1 Designing Ethical Futures

CIID PI Annelie Berner together with her colleague Monica Seyfried designed a five-day workshop for aspiring designers and interaction design students to think about ethics in the design process. This is a collaborative, open workshop about challenging and to some extent, messy topics. The workshop is designed to help students learn how to use ethical theories to reflect upon what they design and why. Berner and Seyfried used futurescaping methods to envision the unexpected consequences of new technology. The main outcome of the workshop was to help students gain skills in designing experiences that bring to life ethical theories.

The workshop was offered as part of the CIID summer school in July 2019 at UNCity Copenhagen with UN City employees and international students. All tools and materials for the workshop are available for download as part VIRT-EU output.

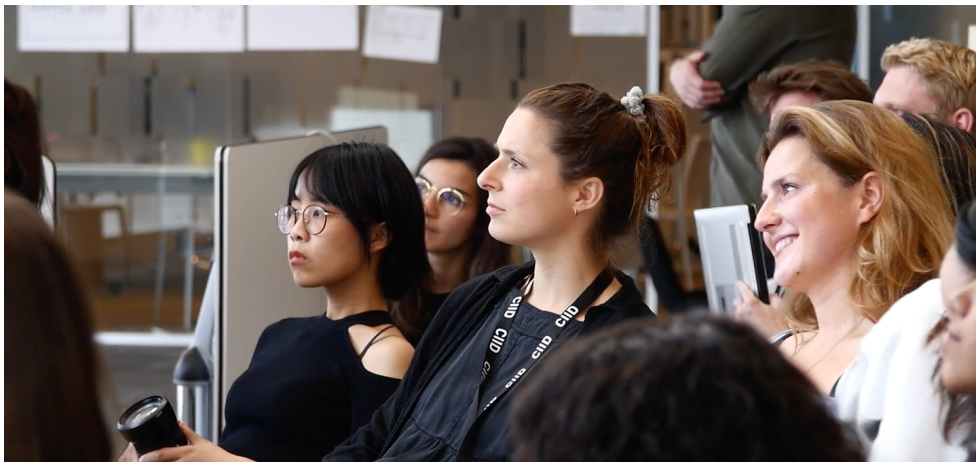


Figure 23: CIID researchers Annelie Berner and Monica Seyfried running the workshop at UN City Copenhagen

[66] https://news.harvard.edu/gazette/story/2019/01/harvard-works-to-embed-ethics-in-computer-science-curriculum/; Grosz, B. J., Grant, D. G., Vredenburgh, K. A., Behrends, J., Hu, L., Simmons, A., & Waldo, J. (2019). Embedded EthiCS: Integrating ethics broadly across computer science education. *Communications of the ACM*; Frauenberger, C., & Purgathofer, P. (2019). Ways of thinking in informatics. *Communications of the ACM*, *62*(7), 58-64.

Workshop description:
As more and more products become connected - to each other, to us, to their environments - more and more data are being shared, stored and processed algorithmically. How might we evaluate and reflect upon how these products are designed and what their implications are? We will create experiences that playfully immerse people into core ethical theories, using those theories to question and re-think how we design with new technology.

Intended learning outcomes

- Understand foundational ethical theories and how they relate to design and technology
- "Provocatyping": prototyping to provoke ethical reflection
- Design for difficult decision-making and speculative world-building
- Learn about the potential of new technology
- Learn how to apply futurescaping design methods to the challenge of unpredictable outcomes of new technology
- Learn about the role of data in connected products and how to map that data ecosystem

Workshop process
We use three core elements in this workshop - ethics, futurescaping and new technology - to spark our inspiration and ground our creative prototyping.

We explore how we can bring ethical thinking into the design of new technology and get hands-on in this exploration, using collages, sensorial explanations and basic mapping to improve how we can talk about the challenging topic of "ethics." When we consider ethics and technology, we have to consider both the design of a device or product as it is now, as well as how it could be in the future. Therefore, we will use futurescaping methodologies to uncover unexpected outcomes, address possible, probable and preferable futures. Once we have explored the future impacts from an ethical point of view, we will make these futures tangible, creating different experiences - for example, prototyping a machine that constantly questions why you are making X decision, or creating a simulation experience in order to practice for difficult moral dilemmas.

We get hands-on with our foundational ethical theories and connect these theories to the design of new technology. We will then move into futurescaping around those new technologies and prototype to demonstrate the futures that we have revealed throughout this process.

6.11.2 Reflections on Ethics in Data Science

ITU PI and VIRT-EU coordinator Irina Shklovski developed a first semester course taught as part of the ITU Data Science Bachelor program to help students think about ethics in their work with data. The goal of this course is to relate the technical content

of the Data Science program to critical concerns about data and data science approaches. Students learn different ways people might think about data in business, research and society at large. Most importantly, students learn to think in terms of ethical considerations through practical examples and hands-on experience with data.

The topics and approaches covered in this course include:
- Domain-specific approaches to asking questions along with the reasons for why questions might need to be asked differently
- Translating technical concepts to real-world concerns through research-based language
- Knowledge claims in different research traditions
- Empirical methodologies in different research traditions
- Ethical implications of data-driven practices

Intended Learning Outcomes:
- Account for different definitions of data, different data types and different research approaches that generate it
- Identify the knowledge claims underlying different interpretations of data
- Explain the difference between quantitative and qualitative approaches to data generation
- Examine the implications of data collection for research, business and society
- Discuss different debates about the implications of data for people in organizations and society
- Reflect on the ethical implications of data collection and processing in different contexts

Learning activities
The course is built around four modules exploring approaches to data science from different perspectives. Students will engage in weekly group activities producing content for a data journal. A selection of entries to the data journal will become the basis for their exam. The course includes primary theoretical readings, current empirical and conceptual academic literature as well as weekly discussions of media articles about current data and technology issues. Students are introduced to a range of pathological cases and learn to engage with these through the VIRT-EU ethical framework. The course was taught in the Fall 2019 semester at ITU. All curriculum components, materials and handouts are available for download as part of VIRT-EU output.

6.11.3 Multiplex Networks Analysis Methods workshop

Matteo Magnani, Luca Rossi, Davide Vega and Obaida Hanteer developed the material for a workshop teaching how to use some of the data analysis software developed for the project. This material has been used and tested at five international conferences.

The material is available in the open-access data repository (Deliverable 7.6) together with the datasets collected for the project.

Intended Learning Outcomes:

- Visualizing multiplex networks.
- Computing actor measures (degree, neighborhood, ...).
- Computing actor/layer measures (layer relevance, ...).
- Using layer comparison methods.
- Performing community detection (generalized Louvain, clique percolation, ...).
- Using generative models.

Learning activities
The workshop introduces the R multinet library for the analysis of multiplex social networks. It consists of very brief theoretical presentations of major concepts (multiplex centrality measures, clustering algorithms, etc.) followed by practical tasks where the participants use the library to apply the concepts to a pedagogical dataset

6.12 Research tools and libraries

As part of the project we have developed two software tools made available to the community, in addition to software produced to support the research team in the data collection and analysis process. The first tool is a network analysis library (https://cran.r-project.org/web/packages/multinet/index.html) available on the official software repository for the R system (CRAN), which is one of the most used frameworks for statistical data analysis. The library is the result of the re-engineering of previous code that has been rewritten to support the needs of the project and extended with the new methods developed for the project and used to analyze Twitter data, as described in Deliverable 3.1. During the last year the library has been downloaded more than 600 times per month.

The second tool is an extension of an existing popular Twitter data collection tool, where we have added functionality to simplify compliance with the GDPR for researchers that engage in large-scale social media data collection and analysis (https://bitbucket.org/uuinfolab/dmi-tcat-plugin/src/master/). The tool is described in Deliverable 6.4.

7. Project management

7.1 VIRT-EU management objectives

The overall management objectives of the VIRT-EU project were originally laid out in work package 1 and then reiterated in the Consortium Agreement signed by all partners

before the start of the project. Throughout the three years, ITU as coordinator organized project management activities to achieve the following objectives:

1. To ensure an efficient management structure where all technical, financial and legal knowledge is created and disseminated in a coordinated and coherent manner;
2. To ensure properly coordinated and monitored project plans and activities to meet high quality levels, and manage possible risks;
3. To realise the EC requirements for communication and reporting and evaluate the quality of the work through deliverables.

The following sections detail VIRT-EU management activities including communication, scientific and administrative activities, risk mitigation and quality assurance.

7.2 Overall management practices and risk contingency planning

The project management structure was established in the first month of VIRT-EU and agreed upon during the kick-off consortium meeting. The structure has proven efficient and adequate for aligning with the need to plan, manage and control project activities of WP-leaders, Task-leaders and the Project Coordinator.

VIRT-EU is characterized by highly interdependent WPs and involvement of most or all partners in scientific or technical tasks. The only exception to this is WP4, which involved concerted activities of two of the six partners (Polito and ORG) with limited involvement of LSE as the third partner. The cross-disciplinary nature and collaboration of all partners has been experienced as an advantage served to strengthen the extent and relevance of the completed work described in Sections 2-5. Furthermore, the interdependence of the research activities ensured that cutting edge scientific research was integrated with applied activities of the non-academic partners, resulting in close engagement with non-academic audiences and concerted efforts at translation between highly conceptual work and its practical applications.

To assure strong project management and day-to-day organization, consortium members assigned the following tasks and responsibilities to the coordinator: *Control of progress during the project, ensuring that the project schedule is met – review of all reports before they are transmitted to the Commission* - Project progress has been satisfactory with most of the deliverables submitted on time and delivering work of consistently high quality. The VIRT-EU project has delivered on all of its objectives, producing high quality output in several distinct academic domains, achieving extremely high level of interdisciplinary research and thus generating significant methodological advancements as well as demonstrating exceptional ability to conduct high-level academic research that can have significant practical impact.

Monitoring compliance by the Partners with their obligations - conducted through frequent within-consortium communication and checking in with partners as they complete their tasks. There have been no breaches of compliance and all obligations have been fulfilled on time throughout the project. All partners have completed their assigned tasks, submitted content and deliverables as well as participated in a broad range of dissemination activities.

Organisation of the Kick-Off Meeting - the kick-off meeting was organized by the ITU in January 2017. It included public project presentations by consortium members and closed all-consortium meetings used for planning purposes. Both aspects of the event were a substantial success. The project was extensively covered in Danish media and received a significant amount of attention on social media worldwide. Negotiations and agreements reached during the closed all-consortium meetings have ensured a well-run project that has managed to achieve all of its objectives so far.

Calling of GA meetings - the coordinator scheduled and delivered an agenda for the monthly GA meetings held via the Adobe Connect suite offered by the ITU. These meetings have been crucial to project success. Meeting schedules were agreed upon every six months. All GA members prepare short reports and discuss necessary project decisions.

Coordination of technical activities and workflow plan within work packages - Coordination of technical activities was conducted through GA meetings, deliverable management and other project activities. Furthermore, ITU ensured the availability several mediated communication media to ensure availability of project-specific real-time communication channels for all consortium members. Finally, the coordinator's research team at the ITU combined expertise across three of the four necessary areas of inquiry and engaged directly in ethnographic research, quantitative data analysis and design, while maintaining a close relationship with the law and policy partners to ensure that all scientific activities are coordinated and complimentary.

Review and management of project progress against objectives, success criteria and quality assurance - Progress review was conducted on a monthly basis during the GA monthly online meetings. Bi-annual all-consortium in-person meetings ensured that project progress was measured against success criteria. Annual reporting to our advisory board provided a means for quality assurance and external oversight. The final advisory board meeting organized in July 2019 alongside the major VIRT-EU conference and Design Challenge. The board reviewed and provided feedback on the project with extremely positive reviews. These can be viewed in video interviews conducted with the board as part of the project visual documentation available on the project website.

Adoption of change-control procedures for the work-plan as needed - adoption of change-control procedures and work-plan alterations was discussed at the GA meetings on a

monthly basis and was agreed upon by all GA members. Changes that have had to be implemented concerned selection of quantitative data sources and qualitative fieldwork sites, as well as the number and location of stakeholder meetings conducted in the second half of the project. Engagement directly with the field has forced us to reassess plans developed for the original proposal. Such alterations were expected and all project members were prepared to implement these quickly and efficiently.

7.3 Communication and project meetings

Given the interdependence and complexity of VIRT-EU, establishing frequent, reciprocal and constructive communication among project partners has been vital to success. The project partners relied on a combination of regular remote full consortium meetings, bi-annual in-person plenary meetings, working meetings among partners that were collaborating on particular tasks and constantly available online communication via the VIRT-EU mailing list maintained by ORG for questions, coordination, sharing of interesting content, event announcements and ad hoc discussions.

The following dedicated services have been setup to support VIRT-EU communication:

- Official mailing list for project partners to exchange ideas (maintained by ORG)
- Dropbox - commercial system used for sharing administrative content, publication drafts, deliverable drafts, publicity content and drafts of social media communication.
- Zotero - open source system used to share relevant literature and citations to ensure that all members have access to the primary literature.
- GoogleDrive - used for collaborative creation of deliverable documents and other types of co-written content.
- AdobeConnect - ITU-managed implementation to conduct remote WP and project meetings.
- Partner-specific secure data stores. Each partner implemented their own secure store for their ethnographic, design and quantitative data, accessible directly only to local team members. For example, ITU used their own secure implementation of OwnCloud to manage and store ITU's ethnographic material, accessible only to ITU team members. All access to data was controlled and data management is described below in section 7.7

Despite an extensive collection of mediated platforms and service in use by project members, the complexity and interdependence of project work and especially the interdisciplinarity of our research required frequent in-person meetings. We have originally planned 2-3 plenum all-consortium in person meetings annually. However, in the first year it became clear that sub-groups of partners needed to conduct more in-person meetings to ensure progress in interdisciplinary collaboration. Our policy was to support in-person meetings as often as was possible given our budgetary constraints.

Planned and completed physical project and plenary meetings are detailed in the table below. Partner sub-groups organized in-person meetings as needed.

7.4 Overview of project and plenary meetings

Meeting type	Date	Venue	Additional details
Project Kick-Off + 1st all-consortium plenary meeting	Jan11-12, 2017	Copenhagen, Denmark	Included a 2-hour public open lecture and project presentation
Qual/policy/law partner meeting	Jun 28-30, 2017	Barcelona, Spain	Organized as part of the International Conference on Internet, Law & Politics - Alessandro Mantelero, Javier Ruiz, Alison Powell and Irina Shklovski (PIs from POLITO, ORG, LSE and ITU)
Qual data analysis meeting	July 5-6, 2017	Copenhagen, Denmark	LSE and ITU qual teams meeting to discuss data collection and analysis. Selena Nemorin, Alison Powell (LSE); Irina Shklovski, Ester Fritsch, Rachel Douglas-Jones (ITU)
Qual/Quant calibration and data analysis meeting	Aug 21, 2017	Uppsala, Sweden	LSE, Uppsala & ITU (all project members from three partners)
2nd plenary meeting	Oct 27-28, 2017	LSE, London	Included an in-person meeting with members of the Advisory Group
VIRT-EU Data sprint	Nov 9, 2017	Copenhagen, Denmark	LSE, ITU, Uppsala (all project members either in-person or remote) organized by ITU ETHOS lab
Design research integration	Dec 6, 2017	Copenhagen, Denmark	CIID and ITU project members meeting in Copenhagen, Denmark (ITU) to finalize and align ethnographic fieldwork and co-design workshops plan
Qualitative-Legal team meeting	Jan 2018	Brussels	Project meeting – discussion about the intersections between the legal, policy and qualitative research outputs
Co-design workshop prep meeting	Feb 2018	Amsterdam	CIID and ITU project members met in Amsterdam to review opportunities for conducting upcoming co-design workshops
First round of co-design workshops and analysis	Mar 2018	Amsterdam	CIID, ORG and ITU project members met in Amsterdam to conduct co-design workshops and to discuss project progress

Second round of co-design workshops and analysis	May 2018	London	CIID, ORG and LSE project members met in London to conduct follow-up co-design workshops and to discuss project progress
3rd plenary meeting	May 14-15, 2018	ITU, Copenhagen	An all-consortium in-person meeting –Conducted as part of the planned task 3.5-4.5 this all-consortium meeting focused on interim empirical data synthesis with legal research development and resulted in the foundation for the VIRT-EU practical framework for ethics developed together by all partners
Design & prototyping meeting	Aug 13-17, 2018	ITU & CIID, Copenhagen	CIID, ORG and ITU project members met in Copenhagen to brainstorm prototyping ideas based on empirical work and informed by the practical framework for ethics.
4th plenary meeting	Sept 12-14 2018	Brussels	All partner meeting in conjunction with 18- month EU project review
Third round of co-design workshops and analysis	Dec 6-7 2018	Rotterdam	CIID, LSE and ITU project members met in Rotterdam to conduct co-design workshops and to discuss project progress
Project dissemination meeting	Jan 2019	Brussels	Polito, CIID, LSE, ITU and ORG met in Brussels to present VIRT-EU research at CPDP and to discuss further dissemination opportunities for the project
5th plenary meeting	Feb 21-22 2019	Torino, Italy	All partner meeting, discussing completion of the main phase of empirical data collection, consolidation of results, transition towards applied activities part of the project and dissemination plans
Qual-quant interdisciplinary methodology meeting	April 14-19 2019	Uppsala, Sweden	LSE, UU and ITU worked together to further develop interdisciplinary methods and approaches combining ethnography, network analysis and social media data mining
Tool development discussions	May 4-8 2019	Glasgow, UK	CIID, LSE and ITU met in Glasgow to present the Bear & Co demonstrator at CHI 2019, discuss tool development and publication activities
Final plenary meeting	July 12-13 2019	London, UK	All partner meeting in conjunction with Advisory board meeting and the Design Challenge event
Workshop development and testing meeting	August 2019	Copenhagen, DK	CIID and ITU met to develop the “how to talk about ethics” workshop and to discuss interim tool prototype testing

Workshop development and testing meeting	October 2019	London, UK	ITU, ORG and LSE met to finalize workshop development and to discuss publication and dissemination efforts
Final data insight exchange and data analysis meeting	November 23-25, 2019	Copenhagen, DK	LSE, ITU and CIID met for a three-day data exchange and analysis meeting, discussing publications and Ethical Stack development

Table 2: List of consortium meetings

7.5 Conflict resolution and partnership instability

There has been very little instability and conflict observed within partners throughout the project. LSE, ITU, ORG and Polito experienced minor personnel changes that were quickly addressed with no significant setbacks as a result.

In the development of final project outputs, Polito expressed concerns about the interactive implementation of PESIA, bringing to light potential liability of releasing a research product into such wide circulation. In order to accommodate partner concerns ITU asked ORG to ensure that liability issues brought up by POLITO are addressed and that prior to this point, the tool is not made available to the public at large. Thus ORG ensured that the current online version of PESIA is only available via a password to the commission alone at the point of submission of Deliverable 6.3. Deliverable 6.3 is thus marked as confidential in order to avoid any problems with accidental leakage of the login information. The partners are now investigating the liability issue.

7.6 Deliverable and milestone tables

The VIRT-EU project partners have successfully submitted all deliverables and achieved all milestones with the exception of MS10-Effect measurement. During the mid-term review we realized that our resources would be better used to focus on the kind of direct impact and dissemination that the project could make. In this case, we amended deliverable 6.4 from measurement of tool impact on developers to development and distribution of libraries and research tools to support ethical research practices. However, we overlooked amending the milestone table and this affected our ability to reach MS10. As part of D6.4 we created a library for the analysis of multi-layer networks and an extension to the most popular social media network data collection tool. In the last year the library has been downloaded more than 600 times per month, producing significant evidence of impact well placed (see Section 6.12 for details).

Work Package 1						
Num.	**Name**	**Lead**	**Type**	**Level**	**Due date**	**Submitted**

D1.1	Management and Quality Plan	ITU	R	PU	M02	Feb 28, 2017
D1.2	Annual Report	ITU	R	PU	M12	Jan 31, 2018
D1.3	Mid-term report	ITU	R	PU	M18	Jul 20, 2018
D1.4	Project final report	ITU	R	PU	M36	Dec 31, 2019
D1.5	Innovation and Open Access Management Plan	ITU	R	PU	M03	Mar 31, 2017
D1.6	Open Research Data Management Plan	ITU	R	PU	M06	Apr 28, 2017
Work Package 2						
D2.1	Social media reporting of progress in exploratory phase of the project	CIID	DEC	PU	M9	Sept 30, 2017
D2.2	Exploratory phase report and specifications for in-depth research activities	LSE	R	PU	M11	Dec 05, 2017
Work Package 3						
D3.1	Quantitative technical report	UU	R	PU	M28	May 1, 2019
D3.2	Public communication of in-depth research	LSE	DEC	PU	M21	Dec 21, 2018
D3.3	Prototype tool concepts	CIID	DEM	PU	M20	Sep 10, 2018
Work Package 4						
D4.1	First report-limits of GDPR and innovation opportunities	Polito	R	PU	M12	Dec 28, 2017

D4.2	Social media reporting of theoretical and legal insights	ORG	DEC	PU	M20	Sep 11, 2018
D4.3	Second report-PESIA methodology	Polito	R	PU	M24	Dec 31, 2018
D4.4	Final report on PESIA	Polito	R	PU	M27	Apr 30, 2019
Work Package 5						
D5.1	Academic dissemination	ITU	R	PU	M24	Dec 27, 2018
D5.2	Social media dissemination of findings	LSE	DEC	PU	M27	Apr 3, 2019
D5.3	PESIA prototypes	CIID	DEM	CO	M30	Sep 10, 2019
D5.4	Engagement and discussion scripts draft	CIID	Other	CO	M31	Sep 10, 2019
Work Package 6						
D6.1	PESIA scenarios	CIID	DEM	CO	M30	Sep 10, 2019
D6.2	Scripts and materials for workshops	CIID	DEC	PU	M35	Dec 3, 2019
D6.3	VIRT-EU service package	ORG	DEC	CO	M36	Dec 31, 2019
D6.4	Prototype for ethical data research practices	UU	DEM	PU	M35	Dec 2, 2019
Work Package 7						
D7.1	Dissemination Plan	Polito	R	PU	M02	Feb 28, 2017

D7.2	VIRT-EU gateway	Polito	DEC	PU	M03	Mar 31, 2017
D7.3	Briefing sessions and conferences	ITU	DEC	PU	M30	Jun 28, 2019
D7.4	Curriculum development	ITU	R	PU	M24	Dec 21, 2018
D7.5	Academic publications	ITU	R	PU	M18	Aug 14, 2018
D7.6	Open-access data repository	ITU	DEC	PU	M36	Dec 31, 2019

Table 3: List of Deliverables

Milestones			
Num.	**Name**	**Estimated Date**	**Means of verification**
MS1	Detailed implementation plan approved by the consortium and ready to implement	Achieved 02/2017	Document/Gantt chart
MS2	Dissemination plan	Achieved 03/2019	Document
MS3	Project website	Achieved 03/2017	Website is available for evaluation
MS4	Initial network mapping	Achieved 09/2017	Report
MS5	PESIA Definition	Achieved 12/2017	Report
MS6	Network analysis metrics	Achieved 02/2018	Report
MS7	Mid-term report & progress evaluation	Achieved 07/2018	Report

MS8	PESIA overview	Achieved 09/2018	Internal report
MS9	Initial prototypes produced	Achieved 06/2019	Use of prototypes by Design Challenge contestants
MS10	Effect measurement	M35	Report
MS11	Final deliverables and report	Achieved 12/2019	Report
MS12	VIRT-EU service package deployment	Achieved 12/2019	Public website available for the public to use

Table 4: List of Milestones

7.7 Research data management practices

The VIRT-EU Open Research Data Management Plan (DMP) – Deliverable 1.6 – outlines how research data has been handled during the project and will be handled after project end. It describes data collection, storage, management and analyses approaches as well as consent mechanisms used by the project. The DMP describes the data management life cycle for all data sets. The DMP was established by the Coordinator with contributions from all partners involved in data collection, processing and management and agreed on by the participants in order to detail explicitly and formally all data management aspects. VIRT-EU continues to be committed to ensuring compliance with the EU GDPR, the Data Protection Act and the National codes of conduct such as, for example, the Danish Code of Conduct for Research Integrity[67]. The DMP has been formally updated in April 2019 to include changes requested by the reviewers.

As part of Horizon2020 VIRT-EU is committed to open access to research data, all research output and scientific publications. Furthermore, as a project oriented towards a technology developer community, we are also committed to releasing all of our software and basic components of our tools as open source on publicly available data repositories such as GutHub. Quantitative and qualitative data sharing within consortium is managed by independent secure systems. The Uppsala University continues to house all collected quantitative data on their secure servers and will do so until required to destroy it (5 years after project end).

[67] Danish Code of Conduct for Research Integrity (2014): *http://ufm.dk/publikationer/2014/the-danish-code-of- conduct-for-research-integrity*

Data access has been carefully controlled throughout the project. Access to quantitative data is only available to the ITU quantitative team under the joint data controller agreement formally signed by UU and ITU. All other team members have access to results of analysis of the raw data upon request, but not the raw data itself.

All ethnography and design partners collecting qualitative data have committed to managing and storing the data each partner collects securely on their own servers. Partners have agreed that the partner who collected qualitative raw data will be solely responsible for its storage, maintenance and analysis. The results of the analyses of these data are available to all partners upon request throughout the project and after project end. As per agreement, partners using available data analysis as a basis for publications will inform the partners who have conducted the data collection and analysis originally and include them in the list of authors.

All formal workshop and interview participants have been asked to sign consent forms detailing their wishes for data handling and management. These consent forms are kept securely by each partner responsible for the particular data collection and will continue to be kept for 5 years after project end.

Selected data of scientific relevance that is appropriate for open data release has been openly shared on our GutHub repository as part of the VIRT-EU commitment to the open research data pilot. These data include Twitter and MeetUp networks collected for our analysis and discussed in Section 2 of this report. We will also share document repositories that we have collected, such as for example our list of ethical tools. These data do not constitute personal data and are not under the purview of the GDPR. Sensitive data collected through ethnographic research or during co-design workshops exploring the questions of ethics will never be shared publicly but will be kept for 5 years and then destroyed.