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VIRT-EU

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D1.2

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(Annual Report)

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Project Consortium

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5	Copenhagen Institute of Interaction Design	CIID
6	Open Rights Group	ORG

Dissemination Level

PU	Public	X
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, pilot, prototype	
DEC	Websites, patent filling, videos, etc.	
O	Other	
ETHICS	Ethics requirement	

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First Year Progress Report

1 Executive summary

This report summarizes implementations of project plans, management structures and research practices oriented towards achieving project goals. In the first year of VIRT-EU activities we focused on mapping the empirical, theoretical and legal domains relevant to achieving our goals. The output from these research efforts is extensively detailed in **Deliverable 2.2** and **Deliverable 4.1.** This annual report describes the practical aspects of our research practice, management and dissemination activities. We discuss our efforts to ensure ethical treatment of research data, present an overview of risks that we have encountered and consider the process of risk mitigation. Based on the progress from the first year, we describe the roadmap of planned activities for Years 2 and 3 of the project.

1.1 Project objectives

The VIRT-EU consortium leverages a strong collaboration of SSH and ICT research approaches to provide new knowledge of and methods for how responsible innovation and technological development should be fostered to produce new connective devices and networked services supporting fairness and ethics in the future digital culture of Europe. VIRT-EU aims to address the complex interrelationship between human and technological networks and to achieve the following objectives:

1. Empirically identify how local culture and network society influence the understanding and movement of particular social values among technology developers and how local difference and networked commonalities can influence the development of ethical subjects from a virtue ethics perspective, using data mining, social network analysis (SNA), qualitative inquiry and design methods. (**WP 2 and 3**) - *partially completed in the first year*
2. Develop a Privacy, Ethical and Social Impact Assessment (PESIA) framework shaped by state of the art legal research and empirical data, to enable developers and other societal stakeholders to reflect upon, evaluate and take into account not only the data protection, security and privacy aspects of new technologies but also the ethical and social concerns embedded within that challenge autonomy and freedom. (**WP 2, 3 and 4**) - *significant progress made in the first year*
3. Systematically consider and implement the PESIA framework by co-designing self-assessment tools with technology developers, who may not be able to anticipate the future use of their projects and their clients and partners, grounded in existing developer practices and based on quantitative, case study and design research that identifies how ethics operate as process. (**WP 3, 4 and 5**)
4. Leverage expert civil society partners to engage SMEs, makers, advocates and other stakeholders in implementation of co-designed tools and processes working towards alignment with the changing European data protection landscape in order to build collective and social resilience in an age of individual subjectivity (**WP 5 and 6**)

Developers embed their own values into the technologies and services they design - these are often values that they imagine their users also share. This imaginary is important for understanding how technologies come to be the way they are. Understanding what kinds of values often end up articulated in new designs and services and what kinds of discussions prefigure design decisions is crucial for developing effective interventions that might affect future technology development. Current research suggests that there is a significant misalignment of values between those embedded within technologies and those of the users engaging these technologies, especially when it comes to personal data management and privacy. Even when users engage with applications or technologies that ostensibly follow all the rules, they can come away from the experience with a feeling of discomfort and a sense of wrongness. Understanding how the gap develops in the first place is key to addressing it.

The main goal of the first year of the project was to produce cutting edge mapping of the online networks of the developer communities as a new way to understand the dynamics of innovation in the network economy, paying attention to how people within this developer community become ethical subjects.

Such an understanding will enable us to develop a foundational framework of assessment and actionable tools based on our knowledge of the ethical practices of the developer community. To this end VIRT-EU has developed data collection systems for automatic collection of data on online interactions in the self-described IoT community via Twitter and MeetUp online platforms; engaged ethnographically with a range of actors across the spectrum of the IoT developer communities in Europe, identifying productive locations and relevant actors for upcoming in-depth fieldwork; created a broad overview of existing regulations and standards that affect the development of IoT products and services; and produced an analysis of the European regulatory framework for data protection with a particular focus on the Data Protection Impact Assessment. These activities lay the groundwork for the development of the Privacy, Ethical and Social Impact Assessment (PESIA) framework and for its implementation into practical and usable tools designed to support responsible innovation practices of the designers and developers of IoT products and services.

1.2   Summary of activities and results

VIRT-EU data collection systems and tools: In order to support development of interdisciplinary methodologies and to facilitate collaboration among project partners, a suite of data collection and data analysis tools was developed to support automated data collection from online sources, exploratory analysis of collected data. Resources were developed to enable partners to also conduct offline data analysis by providing access to prepared datasets in a securely managed data repository. Throughout the project the datasets in the data repository will be evaluated for their potential inclusion into the Open Research Data Pilot in accordance with the Open Research Data Management Plan **(D1.6)**. A detailed description of the tools and the development process is provided in **D2.2**. A practical overview of data collection and analysis resources is provided in **section 2.1.2**.

Qualitative domain exploration: Co-design of practical tools to support ethical analysis and moral reasoning as part of responsible innovation efforts requires in-situ engagement with potential users of such tools. To lay the groundwork for co-design efforts, we first needed to map and understand the dynamic space of IoT innovation in Europe. We mapped key ethical issues through in-person engagement with nearly a dozen field sites across Europe, developing relationships with developers and designers, getting to know key players in the field and mapping mainstream and alternative narratives. The substantive output of this work is reported in detail in **D2.2**. Further, we conducted a discourse analysis of manifestos, statements and calls to action produced by European designers and developers. This work has been published in proceedings of the 2018 ACM Conference on Human Factors in Computing Systems (CHI 2018). **Section 2.1.3** details the practical process of field engagement and ethical data handling considerations. **Section 2.2.4** details selected field sites and work plans for Year 2 in-depth fieldwork.

Overview of existing regulations and standards: The Internet of Things is a complex space given that it typically involves software development, hardware construction and sensor deployment as part of the innovation process. Thus the range of regulations and standards that are relevant to this area extends far beyond the projects' primary concerns with privacy and data protection. Initial ethnographic fieldwork (**WP2 Task 2.2**) made it clear that many developers and designers, especially those that work for startups, small design consultancies and small-medium enterprises, struggle to familiarize themselves with all necessary rules and policies. An initial detailed overview of the panoply of standards and frameworks that affect IoT products and services was produced, forming a significant section of **D2.2.** This effort will form a basis for a planned technical report publicly available for download from the VIRT-EU website. **Section 2.1.4** explains the genesis of this overview and plans for future such output.

PESIA groundwork: Current privacy and data protection impact assessment mechanisms are limited in their ability to truly address the new challenges of intensive data collection practices that form the backbone of most IoT innovation efforts. In particular, current risk assessment procedures do not adequately consider ethical and social impacts of both individual and collective dimensions of data collection and use. The Privacy, Ethical and Social Impact Assessment (PESIA) model is intended to address this issue. The output which forms the basis of deliverables **D2.2** and **D4.1** layed the groundwork for the development of the model. **Sections 2.1.5, 2.3.2 and 2.3.3** detail completed and ongoing efforts in this direction.

The rest of the report is organized as follows. **Section 2** details the practical implementation of the planned substantive empirical, theoretical and design work, and provides a short discussion of encountered barriers

and implemented solutions. We describe our activities within each work package, report on completed tasks and explain the groundwork in place for upcoming tasks. **Section 3** details how project management activities have been implemented, successes and failures of technical and collaborative tools we employed and what solutions we have put in place to support the rest of the project activities effectively. **Section 4** details our dissemination activities and our expectations for future dissemination activities. **Section 5** provides an overview of anticipated changes to the Open Research Data Management plan in view of the realities of the empirical work processes and the unanticipated issues that we have encountered. Finally, **Section 6** provides our roadmap for Years 2 and 3 of the project.

2   Detailed description of substantive work progress

2.1   WP 2 Domain Analysis

The goal of **WP2** was to establish frameworks for ethical and social impact assessments taking into account relational ethical frameworks and the collective dimension of data protection. Thus the tasks in this work package addressed the initial development of the multiple impact assessment framework alongside the general mapping of the research domain through initial data acquisition and the production of initial descriptive analysis of communities, networks, contexts, and policies. The work in **WP2** ensured that VIRT-EU partners planned early in the project for mechanisms to support successful integration of theoretical development with the results of the qualitative and quantitative research activities that will happen later in the project. A part of **WP2** entailed the general mapping of the current EU policy landscape around the EU General Data Protection Regulation (EU GDPR), and the public rhetoric of the various IoT stakeholder communities (entrepreneurial, civil society, and academic) with regard to personal data management, privacy, identity and well-being. **WP2** also set the stage for later deep empirical engagement with developer communities through ethnographic encounters and co-design. Thus empirical activities in **WP2** were primarily focused on exploring the domain of IoT developer communities, engaging in person and online with the relevant actors central to these communities and identifying previously unknown to researchers online resources where these communities congregate. As originally planned, all tasks except for **Task 2.1** in **WP2** have been successfully completed. **Task 2.1** is on schedule to be completed on time.

2.1.1   Original work package objectives

1. Define and implement methods and procedures for initial network data collection. Define a flexible model of multiplex network able to be integrated with additional data sources. Produce initial descriptive quantitative models of networked practices of the communities under study including networks of relationships and collaborative practices, actions and discussions in order to identify key actors in these networks. - ***achieved***
2. Extend existing maps of IoT developers and communities to be used to identify sites of inquiry for further analysis of communities of practice - ***achieved***
3. Identify initial social configurations through observation and analysis of discussion, work practices and social norms that can indicate ways of applying insights about distributed communities of practice and their real-world counterparts. These configurations include quantitative and qualitative modelling of social dynamics as well as collaboration practices and norms. - ***on-target to be completed as planned***
4. Produce an initial data corpus as a baseline to follow over time throughout the project - ***achieved***
5. Formulate domain requirements through exploratory analysis of quantitative and qualitative data, combined with analysis of relevant EU policy and law. - ***achieved***

2.1.2   Task 2.1 Collection of online data from online platforms and data design - *in progress*

The initial phase of the project included a general analysis of the online data and online platforms that were considered relevant for the project. We developed this analysis on two complementary levels, on the one side we had to understand, through the initial results of our ethnographic exploration of the research field, if 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 had to evaluate the technical feasibility of the data collection and to design the technical infrastructure to host and support the analysis of the data.

At the beginning of the project we performed an analysis of potential data sources, deciding to collect data from Twitter, LinkedIn, and MeetUp. After a deeper analysis of the technical feasibility of LinkedIn data collection, and in consideration of the use of this platform by the community of IoT developers, we made the decision to remove LinkedIn from the list of data sources. This is due to both the mostly static nature of LinkedIn– largely used as a repository for potential collaborations and hiring opportunities rather than for actual discussions – as well as due to the difficulties in accessing the data through an API-based approach.

Once we had selected the relevant online sources we wanted to collect we developed, as part of the activity of **Task 2.1**, a suite of online tools to allow the automated collection of data from online sources and the exploratory analysis of the collected data. The tools that are part of the first three tasks have been developed specifically for the project, with the exception of the tool to collect tweets that was produced by extending existing software. These tools are intended to be used by project members from different units, and thus to facilitate interactions between the qualitative and quantitative methods of data analysis. We provide details about the data collection for the two platforms:

- **Twitter**: here events or online themes of discussion are often associated to specific hashtags, that can be seen as keywords that Twitter users include in their posts to indicate the context of the message. As an example, people writing tweets about the London Tech Week festival would often use the hashtag #LTW. Therefore, we have modified and deployed on our server the open source tool YourTwapperKeeper (https://github.com/540co/yourTwapperKeeper) that allows registered users to collect tweets containing a list of given hashtags. Project members can login to a web page where they can include more hashtags and inspect the current results of the other active data collection processes.

- **MeetUp**: here the process is different. We have implemented a monitoring system where group members can register their MeetUp accounts (or special accounts they created for Virt-EU). Once the accounts are registered, it is sufficient for project members to join the groups and events they are interested in directly on the MeetUp website. A monitoring process is automatically started at regular intervals on our server and collects the information about all the new groups and events project members have joined.

Alongside the data gathering, the system that was developed allowed also for the exploratory analysis system of Twitter data. This tool allows an interactive analysis of the collected datasets so that all project members can (1) explore the online discussion and compare it with onsite observations, (2) identify central actors in the online discussion, including actors who had not been identified through the physical participation in the corresponding event, (3) explore related hashtags and the corresponding topics of discussion, and (4) get a visual intuition regarding the structure of the conversation, in particular the presence of well-separated communities and other central actors. All of the Twitter datasets collected through the data collection tools described above are securely available on our analysis web site, made accessible only to project members. Each Twitter dataset can be explore in a number of ways. Tweets can be read and filtered according to various parameters (e.g. the presence of a specific keyword, or the author of the message) allowing for a qualitative exploration. All datasets, both the original and those obtained applying filters, can be downloaded for further analysis with external tools.

Task 2.1 is currently in progress and will continue to be active until **M28** as planned. Most of the system development work associated to this task has been concluded during the first year. Over the next 14 months we will continue software maintenance activities, perform targeted extension of functionality identified during the project and not present in the original plan (if needed), and maintain continuous data collection.

All collected data are treated in accordance with **D1.6** - Open Research Data Management Plan. All project data has been securely stored inside our single handling site at Uppsala University. Access to the server has only been granted to researchers officially involved in the project. Anonymisation has not been applied yet because no consolidated dataset has been prepared and made available for validation and re-use through the Open Access to Research Data Pilot. Random checks of the data have not identified any problematic data,

such as the presence of members of vulnerable groups. Such random checks will continue on a regular basis throughout the project.

2.1.3 Task 2.2 Initial domain exploration and identification of informants in European centers of IoT innovation – *completed*

During the first year of the project a focus on ethnographic domain mapping and identifications of informants in European centers of IoT innovation has been central. The initial proposal marked two field sites - London and Barcelona - as starting points for our inquiry. Our project team has attended events across Europe in London, Geneva, Lyon, Torino, Copenhagen, Bled, Malmö, Berlin, and Barcelona engaging with large IoT conferences and smaller meetups in order to begin mapping of the European IoT scape (**Task 2.1 and 2.2**). From a qualitative point of view, the field of European IoT development represented a vast and diverse space. Thus we worked exploratively, using a broad fieldwork scope that in the next phase of the project will be narrowed down to geographic locations and selected development sites for more in depth ethnographic inquiries (**Task 3.3**). Insights from participating in events taking place in different parts of Europe (see **D2.2** for an event overview) have played a crucial role for our choices of field sites for more in depth ethnographic inquiry (**Tasks 2.6 and 3.3**) - see **section 2.2.4** for details. Through this fieldwork it became clear that, while London remains a central and important space for IoT innovation efforts, Barcelona is far less active than originally expected and does not fit our in-depth site selection criteria. As a result, we used a process constructed from a combination of qualitative and quantitative methods to select better suited field site locations.

As we detail in **Deliverable 2.2**, it is clear that ethics in IoT is not easy for developers to define or localise. Through ethnographic methods such as observations, extended field notes, interviews, document and policy analyses, nevertheless, our project team has gained an initial understanding of some of the most commonly expressed ethical values among European IoT developers and how these values are discussed and instantiated (**D2.2**). During the mapping of the domain throughout the first year of the project it has come to our attention that the European IoT development scape is characterized by a range of 'mainstream' perspectives related to ethics and IoT and focused on commercial development of IoT-related technologies and services. We have also identified a selection of 'alternative' perspectives that take critical or oppositional views to these mainstream positions. This insight has enabled us to identify appropriate field sites for **Task 3.3** together with quantitative analysis of IoT-related activity on MeetUp.org, interviews and observations as well as discussions with our Advisory Board. The field site selection process is detailed in **Deliverable 2.2**.

2.1.4 Task 2.3 Initial analysis of the network data – *completed*

As part of the activities planned in **Task 2.3** we have performed an initial analysis of the network data. While this analysis will be continuously updated and extended in **Tasks 3.1 and 3.2** until the end of the project, the initial output provides significant insights and shows how quantitative and qualitative analysis can be productively integrated. The initial data collection has been focused on Twitter data and included three types of hashtags. Event-specific, capturing tweets about events that team members attended or those we identified as important through qualitative engagements in the field. Topic-specific, monitoring the discussions about specific concepts or activities that were identified as important through qualitative fieldwork (e.g. the development of proposals for IoT manifestos). A general #iot hashtag that is intended to capture a large number of tweets without any specific focus apart from being related to the Internet of Things as identified by those posting the tweet. The output from this effort is detailed in **D2.2**.

A goal of the initial analysis was to investigate similarities and differences between IoT related events and to use these events for an initial test of community detection methods. In order to do cross-event analysis over the IoT-related events, the Twitter communication networks of these events have been analyzed, so far using existing quantitative metrics from the literature.

While the analysis of the quantitative data is still an ongoing activity, that will span a large portion of the project, we have already been able to observe extremely low similarities between groups participating in different events, denoting the presence of localised groups of interests. Nevertheless, the existence of a small group of actors who is travelling from one event to another has been detected, some central actors have been identified (both in terms of content producers as well as in terms of content sharers) and the kernel of a

potentially larger community structure has been observed. These insights were integrated with the ethnographic part of the domain exploration described in the following section. For additional details regarding the result of our exploratory analysis please refer to **D2.2**.

2.1.5 Task 2.4 Research on policies and institutional contexts for data identification, collection and analysis in Europe – *completed*

This task focuses on identifying the different concepts of ethics and data protection across Europe. POLITO and ORG carried out this task from different but complementary perspectives. On the one hand, POLITO focused on data protection regulation, case law and legal theory and adopted a methodological approach that is not merely theoretical but also considers empirical evidence directly collected by POLITO, provided by partners and available in literature. On the other hand, ORG surveyed the wider regulatory framework around IoT and collected data about the practices adopted by IoT developers. This completed work will form the basis for a report on myriad standards and regulations relevant to IoT, intended for designers and developers in Europe.

The research carried out by POLITO focused on data ethics in general and its relationship with the data protection regulatory framework, in order to identify the ethical and social values underpinning data protection issues, which are to be implemented through the PESIA model. The evolution of data protection regulation reveals the different values and interests which led to the current framework, based on different kinds of legal sources, such as data protection legislation, judicial decisions, guidelines, charters of values, best practices and standards.

The research underlines that social and moral values are embedded in regulatory tools and therefore stresses the need to extract moral and social values from empirical evidence deriving both from on-field surveys and legal instruments. POLITO therefore examined the available empirical evidence collected by various means across Europe and analysed the Data Protection Directive, which constitutes the cornerstone of current data protection regulation. The outcomes of this task have been reported in **D2.2**.

2.1.6 Task 2.5 Definition of the multiplex network data model for the ecosystem to be studied – *completed*

Once the different digital platforms to be used as data sources have been identified we have defined a model to integrate and select relevant data, to be manually curated. We call this "multiplex network data", and the definition of what should be included in this data "multiplex network data model". A centralized database with a data input interface corresponding to the model has also been developed during the first year. This tool is essential to allow the multi-platform analysis planned by the project but also to allow cooperation across research units and to guarantee high data quality. The main concepts behind this tool are that (1) data from different sources should be integrated and stored in a common format, to allow their joint analysis, and (2) only relevant and high-quality data should be part of the analysis. The current model of the multiplex network works with the two relational layers that we have already discussed (Twitter and MeetUp), and also allows the storage of data collected from additional less structured sources, such as web pages. For example, an actor who is influential in the IoT area can be identified because she is mentioned during the interviews or because of her role in the discussion on Twitter, or because of the events she organizes on MeetUp. In addition to the database we have also defined a process so that every project member participating in an event or responsible for the collection of a dataset will be able to insert selected actors and associate a structured description of them. These actors can then be monitored over time and across multiple platforms. This monitoring activity will provide us with the multiplatform data necessary to apply network analysis methods.

2.1.7 Task 2.6 Synthesis of findings and formulation of domain requirements – *completed*

Given the breadth of the empirical and theoretical work conducted by all of the partners in the first year, a synthesis of findings was crucial. CIID conducted an overview of completed research, preparing a strategy for broader social media based dissemination to the broader community of stakeholders, reported in **D2.1**.

In order to ensure interdisciplinary research process and empirical synthesis, CIID and LSE partners organized a 2-day internal consortium event in London. The event was divided into the consortium meeting with the VIRT-EU advisory board and an empirical synthesis process among consortium partners. The outcomes of the meeting were reported in detail in the synthesis section of **D2.2**. The advisory board evaluation and comments will be integrated into Year 2 and Year 3 project plans. CIID, ITU, LSE and ORG have planned the goals and pragmatics of the upcoming design research and co-creation workshops with developers, as informed by the anthropological and network analysis findings thus far. CIID will blog documentation of these workshops and will include materials used, inputs from participants and key learnings that we will gather through the co-creation. This process will lead us to understand central as well as outlying themes identified by the qualitative research so far. Furthermore, it will lead us towards initial concepts for tools for developers to support reflection on ethics of data practices in their design processes, and will allow our team to give feedback to the legal analysis partners on the elements of the Privacy, Ethical and Social Impact Assessment framework.

2.1.8 Deliverable and milestone list

Deliverables WP2

Num.	Name	Lead	Type	Level	Due date	Subm.
D2.1	Blog posts and multi-media material summarizing preliminary empirical and policy findings for developer communities under study and other interested stakeholders, disseminated through a variety of social media channels	CIID	DEC	PU	M9	Sept 30, 2017
D2.2	Revised and extended summary of integrated qualitative and quantitative findings, legal analysis and plans for further research activities in WP3 and WP4	LSE	R	PU	M11	Dec 1, 2017

Milestones WP2

Num.	Name	Achieved Date	Means of verification
M2.1	Initial multiplex network of collaboration and co-attendance	Sept, 2017	Internal report

Table 1: Deliverables and milestones for WP2

2.2 WP 3 Empirical Investigation of IoT Communities of Practice

WP3 empirically identifies, using social network analysis, sociological and design methods, how local culture and network society influence the understanding and movement of particular social values among *technology developers* and how local difference and network commonality can influence the development of ethical subjects. The tasks produce the major research activities on the multiplex network of the developer ecosystem under study composed of actors connected on different levels. The initial multiple networks are mapped on data collected in **WP2**, extending the network and adding additional layers of information based on the social media presence of relevant communities to produce the final version of the multiplex network used for the subsequent analysis. These additional layers will provide information to compare to the data already available. This will allow us to not only to map how technology developers connect in the digital and

physical world along with their communication patterns and activities, but also to develop a set of metrics that act as a proxy for measures of perception of ethical values across European developer communities of practice. These tasks rely on input from completed tasks concerned with focused analysis of the developer communities of practice identified in **WP2** and co-design and co-creation workshops with these communities conducted throughout **WP3** to identify relevant modes of design engagement for work conducted in **WP5** and **WP6**.

2.2.1   Work package objectives

1. Develop and evaluate centrality metrics and clustering detection techniques for the multiplex network.
2. Empirically identify, using SNA, sociological and design methods, how local culture and network society influence the understanding and movement of particular social values among technology developers and how local difference and network commonality can influence the development of ethical subjects.
3. Develop a set of metrics that act as a proxy for measures of perception of ethical values across European developer communities

2.2.2   Task 3.1 Definition of prestige / centrality analysis - in progress

Prestige and centrality are concepts that have been studied for a long time in traditional Social Network Analysis to characterize important actors in social networks. In this project we need extended versions of these concepts considering the existence of multiple social networks coming from different online platforms. During the execution of the task we have decided to focus on measures to characterize the overall relationship between multiple data sources, without necessarily characterizing each single actor (something for which existing measures seem to be sufficient). Therefore, we have performed an experimental analysis and comparison of around fifty alternative measures - this analysis formed the basis for a future publication in the field of network analysis. The main result of this comparison is a set of practical guidelines about which measures are appropriate for specific types of data. This result will be directly used in the future data analyses performed during the project.

2.2.3   Task 3.2 Pattern identification and cluster analysis - in progress

In **Task 2.3** (detailed in **section 2.1.4**) we collected Twitter data for different IoT events. To model the communications among the individuals who took part in these events, the **multiplex** structure from the Social Network Analysis field has been adopted. Such a network models different modes of interactions among the same set of individuals by seeing each mode of interaction as a separated layer such that within each layer, a single mode of interaction is modeled as a network of connections among representative units of the individuals, we call them **nodes**. We structured our multiplex network in such a way that each layer refers to a different IoT event and within each layer, a tie is added between two nodes if a reply/retweet action happened between the corresponding individuals (actors) on twitter in the specific event represented by that layer (as in the following figure). This work is described in detail in **D2.2**.

Various methods exist in the literature for detection of communities in a multiplex network. Each method has its own perspective on how a community can be defined. Given our dataset, detecting communities is a challenging task. Some methods that use network modularity to detect communities resulted in a large number of small communities. More restrictive methods such as "Cliques percolation" resulted in a smaller number of communities. We have chosen to use more restrictive methods for our analyses which gives us smaller but more densely connected communities. Developing community detection methods that focus on strongly connected groups allows us to reduce the noise present in social media data and to extract the underlying information about relevant members of the various IoT-related groups. This will be used in the following phases of the project to a) identify emerging communities within the IoT area, and b) monitor the evolution of the already identified communities.
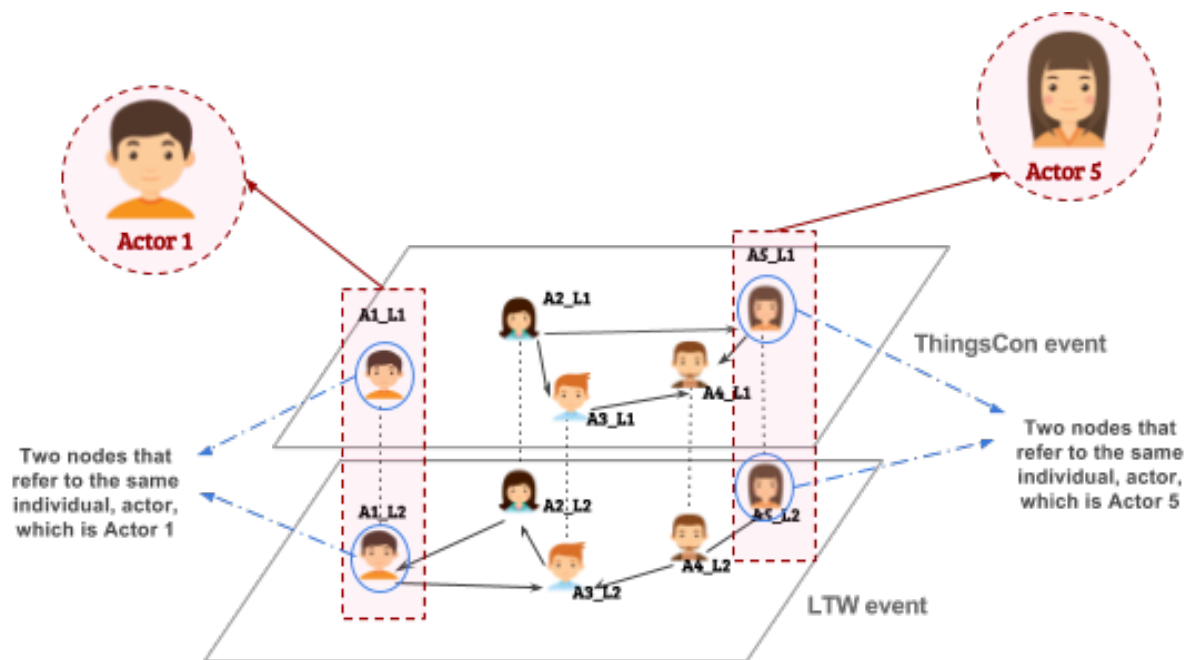
Figure 1. Multiplex network example

2.2.4 Task 3.3 Communities of practice studies – UK and other locations – in progress

Our initial domain mapping (**Task 2.2**) identified several potential field sites where we will conduct continued and sustained engagement within the networks of IoT developers. Based on qualitative data and quantitative analysis of MeetUp activity (detailed in **D2.2**) we have chosen London and Amsterdam as our main sites of engagement. Here we will explore in depth how ethics is enacted among European IoT developers.

London

Initial fieldwork highlights that IoT innovation and investment emerge strongly in London due to clustered research, civic innovation, and SME industrial contexts (**Tasks 2.1 and 2.2**). As such, London remains a central hub for IoT development, but even more importantly for our project, it remains a central node in many important IoT networks, including research, policy and advocacy. In addition, regular London IoT MeetUps generated network data that allowed the project to identify participants in start-up culture across the city, while large-scale projects such as PETRAS have mapped the industrial landscape. Many members of the advisory board suggest a continued focus on London as a field site, although some uncertainty emerges related to the local community's response to the introduction of the GDPR given the prospect of the UK leaving the European Union.

Amsterdam

Amsterdam has been identified as one of the key locations where several alternative perspectives on IoT are actively developed. This is a geographical space we have not engaged with physically, but which has been strongly present in multiple ways across all of initial exploratory research. We have learned that central figures promoting ethical debate point to, or are strongly connected to, Amsterdam (such as ThingsCon Salons, the IoT Design Manifesto, the Things Network, IoT Council and Dyne.org). These communities of IoT developers offer a possibility to consider different kinds of values and how these may be positioned in opposition to mainstream concerns. This is expressed in manifestos authored by participants in the respective communities as well as through conversations with some of these during the outlined ethnographic engagements in the domain mapping. The IoT Meetup environment in Amsterdam is active, facilitating the use of network data to help surface field sites. The engagements seem to move beyond European borders which is valuable in terms of engaging with the networks and circulations of values amongst IoT developers

in Europe also from a network perspective (where some participants cut across sites in London and Amsterdam among others).

2.2.5 Task 3.4 European in-community co-design and stakeholder workshops – in progress

Given the quantitative and qualitative research conducted thus far - specifically, the IoT manifesto analysis, and together with the planned engagement with communities of practice in UK and Amsterdam, the in-community co-design workshops are taking shape both in terms of location and type of content to work through.

Based on the fieldwork with IoT developers and stakeholders at events such as ThingsCon salons, we will specifically consider the gaps and potentials of the highly-present **cards** as structuring tools for considering ethics in IoT development. We will then develop our own prototypes for tools and supporting artifacts together with IoT developers and stakeholders to ensure a better fit with existing design and development processes.

2.2.6 Task 3.5 Analytic seminar for interim exchange with WP 4 – anticipated in M16
As part of our commitment to interdisciplinary collaboration and research process, we take empirical and theoretical research synthesis very seriously. As such **Tasks 3.5** and **4.5** are intended to signal a cross-work-package effort to ensure that empirical and theoretical efforts inform each other. We have planned an all-consortium meetings for analytic data synthesis for April 2018.

2.2.7 Deliverable and milestone list

Deliverables WP3

Num.	Name	lead	type	Level	Date
D3.1	Technical report with the definition of the adopted network analysis metrics, code and quantitative analysis.	UU	R	PU	M28
D3.2	A series of blog posts and multi-media reports about interim empirical findings disseminated to the IoT community	LSE	DEC	PU	M21
D3.3	Prototype tool concepts produced from co-creation workshops	CIID	DEM	PU	M28

Milestones WP3

Num.	Name	Estimated Date	Means of verification
M3.1	Metrics for network data analysis defined and implemented	M14	Internal report

Table 2. Deliverables and milestones for WP3

2.3 WP 4 Law and Policy

WP4 represents the third pillar that, together with **WP3** will converge into the design and development phase. The primary goal of this work package is to systematically consider and implement data protection,

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security and ethical frameworks for technology developers based on outputs of **WP2** and in response to the concurrent work conducted in **WP3**. The tasks of **WP4** are concerned with two major challenges:

- Identifying the possible divergence between the values considered important in the communities of developers (analysed in the parallel **WP4**) and the existing legal requirements

- Developing a set of "best practices" and guidelines for privacy-oriented communities of innovators

To achieve these goals, the traditional legal methodology is combined with empirical findings on how ethics are enacted in the IoT developer communities.

The work package will focus on "data protection impact assessment" and "data protection by design", which represent the two main pillars of the future EU regulation on data protection. Against this regulatory background and on the basis of existing best practices, POLITO and ORG will define a set of guidelines to support the development of a broader innovative approach that combines the traditional privacy impact assessment (data protection impact assessment according to the EU GDPR) with ethical and social assessment of innovation.

The challenge of the research is in defining a prescriptive ethical framework and guidelines concerning the values that should govern the use of data, due the context-based nature of ethical values. In this sense, a baseline from which to identify these values may be the values recognised by international charters of fundamental rights, which can also serve to provide ethical guidance and define the existing relationships between the different values.

A different risk assessment model, which also takes into account the ethical and social effects of data use, directly affects data processing design. Literature on privacy by design has clearly stressed the relevance of embedding privacy values in the device and services. To achieve this goal, a preliminary analysis of the use of personal information in each specific application (good or service) is required to shape this use according to data protection purposes. Based on this assessment, suitable measures would be taken to reduce the potential negative outcomes of data use. This strict relationship between risk assessment and solutions by design implies that any change in the nature of the assessment would affect the architectural solutions adopted. Thus, the new PESIA framework necessarily leads to define a consequent new framework for the by-design approach.

2.3.1 Work package objectives
1. On the basis of the ongoing analysis in **WP2** and **WP3** this WP investigates the limits of the existing data protection regulatory framework, in terms of effective user's empowerment and prevention of potential negative individual and social effects of data processing.
2. Define a new and broader methodology of assessment (Privacy, Ethical and Social Impact Assessment- PESIA), which goes beyond the traditional privacy impact assessment and takes into account the ethical and social effects of data processing.
3. Provide guidelines for developers and consultants to conduct the PESIA.
4. Define a questionnaire based on developer practices identified in **WP3** that will assist in conducting the PESIA taking into account existing practices.

2.3.2 Task 4.1 Overview of the limits of the data protection regulatory framework – in progress

This task focuses on the approach adopted by the new General Data Protection Regulation (hereinafter GDPR) and its adequacy in addressing the new challenges of big data, which represent the core of many IoT applications and related business models.

The research carried out by the Polytechnic University of Turin (POLITO), reported in **D4.1** has primarily focused on how the notions of purpose limitation, data minimization, data subject's self-determination are elaborated by the EU legislator in the GDPR. In particular, in line with the main goal of the Virt-EU project, this report discusses the Data Protection Impact Assessment outlined by Article 35 of the GDPR and points out the limits of this model.

These limits concern two main aspects: the existing relationship between risk assessment and purposes of data processing, which proposes again the criticisms concerning the application of the purpose limitation principle in the big data context; the adoption of a risk-assessment procedure that does not adequately consider the ethical and social impacts of data use.

These limits confirm the need to go beyond the existing model of data protection impact assessment and to adopt a more complex process of multiple-impact assessment of the individual and collective risks related to the use of data.

2.3.3   Task 4.2 Defining a methodology for the Privacy, Ethical and Social Impact Assessment - PESIA – in progress

The limits of the GDPR emphasize the need to develop the PESIA (Privacy, Ethical and Social Impact Assessment) model, to take into account the ethical and social consequences of data use in IoT development.

The main challenges in drafting the PESIA model concern the definition of the ethical and social values necessary to carry out the assessment. To address these challenges, the PESIA adopts an "architecture of values" which is articulated on three different levels.

The first of them is represented by the common ethical values recognised by international charters of human rights and fundamental freedoms. The second layer takes into account the context-dependent nature of the social and ethical assessment and focuses on the values and social interests of the given community. Finally, the third layer consists in a more specific set of values provided by an ad hoc committee and it concerns the specific data processing application.

The ongoing research carried out by the POLITO is investigating all these three layers, extracting from a variety of documents the social and ethical values that are taken into account in data processing. To reach this goal, POLITO team is reviewing and analysing many different legal sources, while ORG is focusing on ethical and privacy practice. ORG will produce social media communication with IoT developers and other stakeholders to ensure a constant feedback loop. This social media output will be reported in **D4.2**. The results of this study will be presented in **D4.3** (**M24**), since these findings will be used to describe the PESIA methodology and to shape this new model of risk assessment.

2.3.4   Task 4.3 Providing general and sector-specific guidelines for PESIA – anticipated in M15
Considering the methodology defined in **Task 4.2** on the evaluation of ethical practices and ethical subjectivity in developer communities future work will address the guidelines for the adoption of PESIA. Since the ethical and social issues are addressed only in general terms by a non-specific PESIA, the task will include the sectors identified in **WP3**. The final decision on sectors will be made at an all-consortium meeting for interim exchange with **WP3 (Task 4.5)**.

2.3.5   Task 4.4 Providing general and sector-specific instruments – anticipated in M18

This task moves the PESIA guidelines into questionnaires that can be used by developers for self-assessment of the Privacy, Ethical and Social impacts of their products and services. The sectors concerned are listed in **WP3**. The questionnaires will provide the necessary components in developing software solutions for PESIA in **WP6**.

2.3.6   Task 4.5 Analytic seminar for interim exchange with WP 3 – anticipated in M16

Based on ongoing **Tasks 4.1**, **4.2**, **4.3** and **4.4** POLITO will prepare an interim report to facilitate work in **WP3** on the development objectives that are most fitting for the IoT context in **Task 3.2** and to generate greater focus in ethnographic and design investigations in **Task 3.3**. LSE will arrange an all-consortium interim progress-exchange conference with **WP3**.

2.3.7 Deliverable and milestone list

	Deliverables WP4					
Num.	**Name**	**lead**	**type**	**Level**	**Date**	**Subm.**
D4.1	First Report: This report to the internal members of the consortium is the synthesis and analysis of the findings of Task 4.1	POLITO	R	PU	M12	Dec 28, 2018
D4.2	Social media communication with an overview of the key elements of the PESIA.	ORG	DEC	PU	M16	Pending
D4.3	Second Report: This report to the internal members of the consortium describe the PESIA methodology and provides	POLITO	R	PU	M24	Pending
D4.4	Final report on PESIA and related guidelines and questionnaires	POLITO	R	PU	M30	Pending

	Milestones WP4		
Num.	**Name**	**Estimated Date**	**Means of verification**
M4.1	An initial definition of the PESIA methodology	Dec 2017	Internal report
M4.2	An initial overview of sector-specific issues concerning the application of PESIA	M20	Internal report

Table 3. Deliverables and milestones for WP4

2.4 Substantive work packages anticipated in years 2 and 3

2.4.1 WP 5 Data Synthesis and Tool Development – M18-M34

WP5 is composed of two parts. The first entails analytically and methodologically combining the network defined in **WP3** with the qualitative information from the field sites and co-design workshops in **WP3** and legal analysis development in **WP4**. In this work package, all VIRT-EU partners will perform comparative analysis of the four types of data. More specifically, enactments of ethics with respect to data and privacy will first be identified and categorized and then connected to legal concepts and privacy and data protection

by design guidelines. Then, these notions will be mapped to the corresponding network locations of IoT developers to enable a comparison of the network structure, innovation position, and the diffusion of the cultural notions. **WP5** activities will be to our knowledge, among the first systematic attempts to investigate the problem of propagation of ideas and concepts through extended ethnographic research with network members combined with a multiplex network analysis.

The second part of **WP5** turns research findings into actionable outputs directed towards the community under investigation and European policy makers and stakeholders. **WP5** develops recommendations and strategies for IoT developers handling issues of data and data use in a format that ease integration into the developer community through involving them directly in the design of the outputs. Three main types of outputs will be developed, namely:

- A set of scenarios that will enable developers to interrogate best practices in integrating ethical decisions about data processing into their own design practices.
- A set of guidelines to embed ethical and social impact assessment in the process of device design.
- A set of tools to enable ethical and social impact self-assessment in the course of development processes.
- A set of scripts/scenarios oriented toward developers as well as activists, civil society, non-profit organizations and others invested in developing a common ground through discussion of issues such as privacy and data protection with regards to the ethics of data-intensive and personal sensing technologies.

Work package objectives for **WP5** have been defined as follows:

1. Develop new methodologies for achieving analytic synthesis of qualitative and quantitative empirical data and legal analysis.
2. Identify connections between networked relationships among developers and community processes of idea exchange and enactment of ethics in practice.
3. Develop processes based on the ethical impact assessment framework and study of knowledge sharing and ethical practices to systematically consider and implement privacy, security and ethical frameworks for technology developers and their clients and partners.
4. Develop tools and materials to support developers in negotiating, articulating and acting on shared ethical values and to support interdisciplinary interaction among a range of stakeholders for addressing these issues.

2.4.2 WP 6 Took and Scenario Evaluation and Effect Measurement – M27-M36

WP6 will refine and finalize tools, scenarios, guidelines and scripts initially defined as outputs of **WP5**. These tools, scenarios, guidelines and scripts will then be offered as tools and materials to the developers delivered via the project website, ORG website and publicized through their networks and through the networks of the Advisory Group. At the same time **WP6** will also lead the evaluation of the impact of the project through the development of a set of quantitative measures of structural change in developer communities under study. **WP6** will include a public design challenge that will take the form of a competition to utilize PESIA tools and to produce a prototype or proof of concept that addresses one the scenarios developed in **WP5**. This is a significant and unique opportunity for integration between policy and practice, establishing an open process in an area where this kind of reflection has been lacking. Finally, **WP6** will use quantitative and qualitative measures developed in **WP3** to assess impact in developer communities.

Work package objectives for **WP6** have been defined as follows:

1. Develop a usable set of tools and materials based on the PESIA framework to be deployed to the broader community of developers and other stakeholders.
2. Evaluate the tools and materials produced by the project through co-design and co-creation with relevant communities.
3. Develop specifications for the use of project outcomes as a service to the developer communities and other stakeholders delivered via ORG website.

4. Demonstrate project effectiveness through quantitative measures of structural and qualitative changes resulting from project-lead interventions in developer communities under study over the course of the project.
5. Demonstrate effectiveness of tools and methods through a direct engagement with the IoT developers, makers and community innovators via a design challenge event.

3 Detailed description of management and dissemination activities

3.1 WP 1 Project management

The purpose of **WP1** is to exemplify the management and dissemination activities for all aspects of management, project control, communication, documentation and quality assurance as described in **D1.1** and **D1.6**.

3.1.1 Virt-EU management objectives

The objective of this work package is:

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.

3.1.2 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 only involves three of the six partners. 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 (see **Section 3.1.3**).

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 all deliverables submitted on time with the exception of this annual report, delayed due to the fact that a complete overview of project progress needed to be conducted after all deliverables have been submitted in Year 1. As such, the annual report had to be completed in January 2018 given that the final substantive deliverable of 2017 was submitted on December 27th. We do not anticipate any more delayed deliverables.

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 year 1.

Resolution of any potential partnership instability and conflict - There has been very little instability and conflict observed within partners. The one exception is personnel change at LSE, announced in December, which occurred due to a project member being offered a position at a different university which advanced

their career substantially. The LSE project members have worked hard to ensure that no significant problems are incurred by the project due to personnel changes. No significant setbacks are expected as a result.

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 schedules and delivers 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 are agreed upon every six months. All GA members prepare short reports and vote on necessary project decisions.

Coordination of technical activities and work flow plan within work packages - Coordination of technical activities is conducted through GA meetings, deliverable management and other project activities. Furthermore, ITU maintains 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 combines expertise across three of the four necessary areas of inquiry and engages 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 is conducted on a monthly basis during the GA monthly online meetings. Bi-annual all-consortium in-person meeting ensure that project progress can be measured against success criteria. Annual reporting to our advisory board provides a means for quality assurance and external oversight.

Adoption of change-control procedures for the work-plan as needed - adoption of change-control procedures and work-plan alterations is discussed at the GA meetings on a monthly basis and is agreed upon by all GA members. So far the changes that have had to be implemented concerned selection of quantitative data sources and qualitative field-work sites. 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.

3.1.3 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 rely on a combination of regular remote full consortium meetings, bi-annual in-person plenary meetings, working meetings among partners that are collaborating on particular tasks and constantly available online chat via Rocket.Chat 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:

- An official mailing list for project partners to exchange ideas
- Podio - functional project management and progress tracking
- Rocket.Chat - open source secure real-time communication system run by the ITU
- Dropbox - commercial system used for sharing administrative content, publication drafts, deliverable drafts, publicity content and drafts of social media communication.

- OwnCloud - secure ITU implementation currently used to share ethnographic material, accessible only to consortium members
- 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.

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 requires frequent in-person meetings. We have 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 is to support in-person meetings as often as is possible given our budgetary constraints. Planned and completed physical project and plenary meetings are detailed in the table below. Partner sub-groups will organize in-person meetings as needed.

Table 4: Overview of project and plenary meetings

Meeting type	Date	Venue	Additional details
Project Kick-Off, all-consortium	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	August 21, 2017	Uppsala, Sweden	LSE, Uppsala & ITU (all project members from three partners)
1st plenary meeting	Oct 27-28, 2017	London, UK (LSE)	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

2nd plenary meeting	April 2018	TBD	*Planned meeting*
3rd plenary meeting	June/July 2018	TBD	*Planned meeting* - in conjunction with 18-month project review
4th plenary meeting	December 2018	TBD	*Planned meeting*
5th plenary meeting	June 2019	TBD	*Planned meeting*- in conjunction with Advisory board meeting and Public Design Challenge
Final plenary meeting	November 2019	TBD	*Planned meeting*- prior to project end (in conjunction with closing conference)

3.1.4 Open access and open research data management

As part of Horizon2020 Virt-EU is committed to open access to research data and scientific publications. Quantitative and qualitative data sharing within consortium is managed by independent secure systems. Currently Uppsala University is housing all collected quantitative data on their secure servers. Access to data is only available to consortium members through a secure authentication system. Qualitative data has been housed on a secure OwnCloud implementation at the ITU with external to ITU consortium members granted web-access. As we move into intensive ethnographic data collection, such an arrangement is insufficient. As such, the consortium is currently exploring other options for secure cloud sharing services that offer end-to-end encryption. We expect to implement the new data sharing arrangement by March 2018 when initial ethnographic data will require extensive sharing within consortium.

Selected data of scientific relevance is openly shared, except for identifying information and sensitive data that will never be shared publicly as detailed in **D1.6**.

VIRT-EU is committed to open-access policy. All publications, reports and deliverables produced by the project are made available on the project website.

3.1.5 Deliverable and milestone list

Deliverables WP1						
Num.	**Name**	**Lead**	**Type**	**Level**	**Due date**	**Subm.**
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	Pending

D1.4	Project final report	ITU	R	PU	M36	Pending
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

Milestones WP1

Num.	Name	Estimated Date	Means of verification
M1.1	Detailed implementation Plan approved by the consortium and ready to implement	Achieved 02/2017	Document/ Gantt chart
M1.2	Mid-term report and progress evaluation	M18	Public report
M1.3	Final deliverables and reports	M36	Document

Table 4. Deliverables and milestones for WP1

3.2 WP 7 Communication, Dissemination and Exploitation

Dissemination and Communication of the project results is pursued both towards the scientific and technological communities, citizens, policy makers, entrepreneurs and other scholars. To maximize the VIRT-EU impact 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 proper development of intellectual property.

As part of the dissemination activities, project partners ensure that sessions and conferences the project supports and organizes will involve researchers as well as practitioners. Training of young scholars is a particular area of focus for the project as we plan to not only engage with young scholars through event organizing but also through active development of teaching curricula.

The VIRT-EU dissemination strategy is committed to ensuring that project results are broadly disseminated to IoT developer communities, interested stakeholders and policy professionals as well as to the academic community.

3.2.1 Overall communication, dissemination and exploitation objectives

1. 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

2. 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
3. Bridge emerging policy, advocacy, scholarly, entrepreneurial and community innovation conversations around data use, collection, storage, and re-use in the developer and maker communities.
4. 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.
5. Contribute to the knowledge exchange and mutual learning between SSH and ICT communities

3.2.2 Development and maintenance of the VIRT-EU online presence

The Virt-EU website was designed internally and launched as part of the project Horizon 2020. It can be reached through the following link: https://virteuproject.eu/.

The website contains dissemination sections with project, advisory board and partner descriptions, deliverables, and news and events. Its interactive components consist of an active blog, embedded Twitter and Facebook widgets, and a Timeline inserted in the results section. From May till November, the website counts for a notable mean of 7.68 daily unique visitors from 91 different countries (further access and impact statistics are detailed in Appendix 1).

For the second year of the project, a series of blogs and social media presence is planned to make sure that the results are made available as they are produced.

3.2.3 Social media presence and public communication through blogging

The social media communication channels for the Virt-EU project, Twitter and Facebook, are set up as @VIRT_EU and @VIRTEU. On the Twitter account blog posts, reports and news are tweeted and updated. The Twitter account has 314 followers, 548 mentions and thousands of views (See Appendix). Similarly, the Facebook site is active in announcing events, sharing publications and reflections. The site has 54 posts, 36 likes and 37 followers (See Appendix).

The Virt-EU project has taken advantage of the significant social media following of advisory group members, researchers and partners to channel discussions around Virt-EU and increase the extent of the project's social media presence where both the participants and the audience are active users.

The Virt-EU blog documents the researchers' public talks, panels and discussions. In year 1 we produced 12 blog posts listed in **section 3.2.4**. These blog posts introduced the project goals, reported on ongoing empirical work and theoretical development and considered current relevant issues discussed in the media. In Year 2 we plan to add a MEDIUM account in order to enhance dissemination of our informal essays and blog posts oriented towards non-academic audiences.

3.2.4 Academic publications and dissemination

Throughout the year, Virt-EU partners produced a significant amount of published work and participated in various conferences representing the primary locations for the dissemination of research and results detailed in the Dissemination Plan **(D7.1)**.

Accepted journal publications

Mantelero, Alessandro; Vaciago, Giuseppe (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, Alessandro (2017), Regulating Big Data. The guidelines of the Council of Europe in the context of the European data protection framework. In: *Computer Law & Security Report*, vol. 33 n. 5, pp. 584-602. - ISSN 0267-3649

Mantelero, Alessandro (2017), Towards a Big Data regulation based on social and ethical values. The Guidelines of the Council of Europe (Hacia una regulación de los datos masivos basada en valores sociales y éticos. Las directrices del Consejo de Europa). In: *Revista De Bioética Y Derecho*, vol. 41, pp. 67-84. - ISSN 1886-5887

Piotr Brodka, Anna Chmiel, Matteo Magnani, Giancarlo Ragozini (2017), Quantifying layer similarity in multiplex networks: a systematic study, In: *Royal Society open science*.

Conference papers published in proceedings

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

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. Best of Alt.CHI Award

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

Presented conference & workshop papers (without proceedings)

Gandy, Jr. O. H., Nemorin, S., (2017), Neuroeconomics, behavioral economics, and the political economy of 'nudge'. *Paper presented at the IAMCR 2017 Conference* in Cartagena, Colombia, July, 16-20, 2017.

Fritsch, E. & Shklovski, I. (2017) Exploring and expanding ethics in IoT development. *Position paper for the Designing the Social Internet of Things workshop. Conference on Human Factors in Computing (CHI 2017*

Submitted journal & conference papers under review

Gandy, Jr. O. H. & Nemorin, S. The political economy of 'nudge': Smart city variations. Submitted to *Information, Communication & Society*.

Nemorin, S. Sensor sensibility: IoT's Imperial inheritance and the techno-colonisation of the Global South. Submitted to the *8th Biennial Surveillance Studies Network / Surveillance & Society Conference*, Aarhus, Denmark.

Salehi, M., Magnani, M., Fatemi, Z., A simple multiforce layout for multiplex networks – Submitted to *Social network analysis and mining*, Springer.

Demetzou, K., Böck, L., Hanteer, O. Smart Bears don't talk to strangers: analysing privacy concerns and technical solutions in smart toys for children. Submitted to the *PETRAS Living in the Internet of Things Conference*, London, UK

Journal papers in process

Nemorin, S., Powell, A., A virtues-based approach to making sense of ethics in IoT.

Powell, A., Shklovski, I., Rossi, L., Magnanin, M., Mantelero, A., Douglas-Jones, R. Why ethics in IoT needs an interdisciplinary inquiry - the VIRT-EU approach.

List of academic keynotes, conference talks and presentation

Alessandro Mantelero. Bruxelles, March 13-14, 2017-ECPC Conference: Regulating Privacy through Accountability Principles and Ethical Standards in the era of Big Data, Maastricht University, Brussels Campus. Conference presentation: The ethical dimension of consent in a Big Data world.

Alessandro Mantelero. Berlin, October 12-13, 2017-European workshop on "Algorithmic decision making and human rights implications", Alexander von Humboldt Institute for Internet and Society. Conference presentation: Ethics and accountability questions of artificial intelligence

Alessandro Mantelero. Madrid, November 17-18, 2017-IV Congreso de Bioética, Nuevos retos: Reglamento europeo de protección de datos, Big Data y evaluación de tecnologías sanitarias, Instituto de Salud Carlos III. Conference presentation: El Reglamento Europeo y los datos masivos. Un nuevo paradigma en la protección de datos.

Alison Powell. Tartu, October 19 (2017)-Association of Internet Research Conference 2017, Dorpat Convention Center, University of Tartu, Estonia. Conference presentation: Information Politics of the IoT.

Alison Powell. Washington, April 26 2017-DUB-Speak Seminar, University of Washington. Conference presentation: A Manifesto for Virtue Ethics in Technology Design.

Alison Powell. Washington, April 26 2017-E-Science Centre Seminar, University of Washington. Conference presentation: Introducing the Virt-EU Project.

Alison Powell. Ottawa, June 23 2017-Data Power Conference, Carleton University, Ontario. Conference presentation: Dilemmas of Sense: Ethics and Action for Data Citizenships.

Davide Vega. Lyon, 29 November-01 December 2017-VI International Conference on Complex Networks and Their Applications, Université de Lyon 2. Conference presentation: Text networks: foundations and structural analysis.

Irina Shklovski. Aarhus, Denmark June (2017) Why should we talk about ethics in IoT? Invited talk at the Digital Living Research Commons, Aarhus University, Denmark.

Irina Shklovski. Barcelona, Spain June (2017) Ethics and the Internet of Things. Where, who, how? Part of the VIRT-EU panel on Privacy, ethical and social impact assessment of risks in data processing at 13th International Conference on Internet, Law & Politics,

Selena Nemorin. London, February 22, 2017. IoT Advisory Panel for the Loughborough University research project: The impact of the internet of things on managing work.

Selena Nemorin. London, October 9-10, 2017. Presentation: A virtues-based approach to making sense of ethics in IoT. European workshop: NetGain Partnership event on algorithmic accountability. Royal Society for the encouragement of Arts, Manufactures and Commerce in London.

Matteo Magnani. Mainz, September 26-29, 2017-III European Conference on Social Networks, Johannes Gutenberg-University. Conference presentation: Optimization-based local simplification of multiplex networks.

Ester Fritsch. February 1 2017-Workshop Community-based Sustainable Smart Cities and IoT, Connected Seeds and Sensors, Rich Mix London. Presentation: Exploring and Expanding Ethics in IoT Development.

List of industry/public conference talks/presentations

Alessandro Mantelero. Bruxelles, May 11-12, 2017-Annual Conference on European Data Protection Law 2017 ERA- Academy of European Law. Conference presentation: The GDPR & Convention 108's new guidelines: Meeting the challenges of Big Data.

Alessandro Mantelero. Bruxelles, July 6, 2017-EDPS Trainees' Conference – "Nothing is for free: the value of data", European Data Protection Supervisor. Conference presentation: The value of data and the safeguard of individual and societal values in data processing.

Alison Powell. London, September 21 2017-Papanek Symposium on Design and Ethics, Austrian Embassy. Conference presentation: Design and Ethics in the Algorithmic Urban.

Alison Powell. London, October 7 2017-FixFest International Festival of Repair. Conference presentation: IoT and Information Politics.

Irina Shklovski. Copenhagen, September (2017)- Internetdagen & Dansk IGF 2017, Denmark. Panel debate: Den farlige fantastiske app (The dangerous amazing app).

Irina Shklovski. Bornholm, August (2017)- BornHack Festival, Denmark. Panel debate on privacy and GDPR.

Irina Shklovski. Copenhagen, September (2017)- UNI Europa Professionals and Managers Conference Future World of Work by the Danish Society of Engineers (IDA), Denmark. Panel presentation: Engineers' view on technological disruption: threats or unique opportunities?

Irina Shklovski. Copenhagen, April (2017)- Women's Take on Tech event by the Danish Society of Engineers (IDA), Denmark. Public lecture: Machine prediction, human judgment and the problem of bias in AI systems.

Irina Shklovski. Bled, Slovenia, June (2017)- Keynote: Ethics and the Internet of Things. Where, who, how? Invited talk on ethics and IoT at Living Bits and Things Conference

Irina Shklovski, IT University of Copenhagen, February (2017)-Artificial Intelligence and Satisfaction of Desire. Public lecture at the Open IT event

Selena Nemorin. Geneva, June 6-9, 2017- IoT Week 2017, International Conference Centre. Conference presentation: Social and ethical implications of drones in the IoT.

Selena Nemorin. London, June 13, 2017. UK workshop: The IoT and Consumers Workshop, British Computer Society (BCS) and the Institution of Engineering and Technology (IET).

Virt-EU supported and organized events

Virt-EU kickoff event at ITU in Copenhagen January 12th. Event presentation: Open talks on legal, ethical and design aspects of IoT by Irina Shklovski, Alessandro Mantelero, Alison Powell and Annelie Berner.

IOT TrustMark meeting at LSE organized and supported by VIRT-EU in October 2017. Meeting activities: Virt-EU researchers facilitated an event on existing ethical frameworks on privacy.

Living Bits and Things in Bled, Slovenia June 19th. Virt-EU participated as a partner with Irina Shklovski delivering a keynote at the event.

ThingsCon Salon, TechFest Copenhagen September 6th. Virt-EU researchers organized an event on Ethics and Responsibility in IoT in collaboration with ThingsCon and TechFest. The event was oriented towards public and industry practitioners.

Dowse workshop at ITU, Copenhagen November 2nd. Virt-EU partners ITU and CIID organized the workshop in collaboration with IDA (Danish Union of Engineers). The workshop explored the potential of creating and reflecting upon tools that make IoT more visible. The workshop was run by Dyne.org.

Barcelona, 29-30 June 2017-IDP Conference - Managing Risk in the Digital Society, Universitat Oberta de Catalunya. VIRT-EU partners POLITO, ORG, ITU and LSE organized a round table: Privacy, Ethical and Social Impact Assessment of Risks in Data Processing, delivering initial results of the VIRT-EU project.

Other dissemination activities – blog posts on the VIRT-EU website

Can a black box be trusted? Alessandro Mantelero addresses the ethical dimensions of algorithmic decision making and the transition from an individual dimension of data protection towards collective data protection at the Alexander von Humboldt Institute for Internet and Society (HIIG). - written by Alessandro Mantelero (POLITO) Jan 16, 2018

Socio-technical affordances and the social, communicational processes of design. Virt-EU researchers continue to identify how values and ethics in technology design impact other central issues in social science. - written by Alison Powell (LSE) and Pasquale Pellegrino (POLITO) January 10, 2018

IoT as an Ethical Challenge. This is the first in a series of posts addressing ethics in IoT, through a range of domain-based case studies. - written by Ester Fritsch, Rachel Douglas-Jones, Irina Shklovski (ITU) in collaboration with Thor Hauberg (iIntelligence) Dec 28, 2017

Virt-EU-panel at IDP 2017. An overview of the 13th IDP conference hosting a Virt-EU panel entitled: Privacy, ethical and social impact assessment of risks in data processing. - written by Pasquale Pellegrino (POLITO) July 26, 2017

Virt-EU qualitative research methodology. An overview of the ethnographic research methodology applied in the Virt-EU project. - written by Selena Nemorin (LSE) July 25, 2017

Virt-EU quantitative research methodology. An overview of multilayer social network analysis applied in the Virt-EU project. - written by Matteo Magnani, Davide Vega (Uppsala) & Luca Rossie, Obaida Hanteer (ITU) July 20, 2017

An Ethical IoT? The Virt-EU approach to ethics in IoT development. - written by Rachel Douglas-Jones, Irina Shklovski, Ester Fritsch (ITU) & Alison Powell, Selena Nemorin (LSE). July 14, 2017

Looking for IoT manifestos, standards, guidelines and best practices. Invitation IoT developers to share their manifestos, guidelines, checklists, standards, best practices, legal regulations, post-it notes and so on to better understand innovators, developers and designers working with IoT. - written by Ester Fritsch (ITU) & Pasquale Pellegrino (POLITO) July 13, 2017

What's the PESIA framework? Overview of the PESIA framework including an interview with Alessandro Mantelero. - written by (Pasquale Pellegrino) June 26, 2017

Living bits and things. Impressions from conference participation - written by Irina Shklovski (ITU) & Pasquale Pellegrino (POLITO) June 19, 2017

Virt EU's Interview with Serena Cangiano and Zoe Romano. An interview with Serena Cangiano from Supsi and Zoe Romano from WeMake on the potential of positive outcomes envisioned in open hardware projects such as UGO and MobileECG. - written by Pasqualle Pellegrino Feb 20, 2017

Researchers want to make Internet of Things ethical. Account of the Virt-EU research project. – written by Vibeke Arildsen January 5, 2017

3.2.5 Deliverable and milestone list

	Deliverables WP7					
Num.	**Name**	**Lead**	**Type**	**Level**	**Date**	**Subm.**
D7.1	Revised Dissemination Plan approved by the consortium and ready to implement	POLITO	R	PU	M02	Feb 28, 2017
D7.2	VIRT-EU gateway (a dedicated section will serve as open- access data repository).	POLITO	DEC	PU	M03	Mar 31, 2017
D7.3	Local Briefing Sessions: (one per each year at three different locations), Opening and Closing Conference.	POLITO	DEC	PU	M30	Pending

D7.4	Curriculum development material accumulation	POLITO	R	PU	M24	Pending
D7.5	Initial publications in peer reviewed journals and conference proceedings, according to the criteria of the dissemination strategy.	POLITO	R	PU	M18	Pending
D7.6	Open-access data repository: Research material to be submitted to identified developer community open access data repositories. Includes archive of co-design outputs, videos, infographics, digital visualizations, scenarios and tools produced in **WP6** and **WP7**	POLITO	DEC	PU	M36	Pending

Milestones WP7

Num.	Name	Estimated Date	Means of verification
M7.1	Detailed Dissemination Plan approved by the consortium and ready to implement	Achieved on 02/2017	Internal report
M7.2	Launch project website	Achieved on 01/2017	Public Event

Table 5. Deliverables and milestones for WP7

4   Open Research Data Management Plan

In a research project on ethics, the ethical treatment of data is particularly paramount, and also a site through which the team can reflect on the nature of ethics-in-practice. The DMP (**D1.6**) produced for VIRT-EU is a living document, responsive to the regulatory environment. Through it the VIRT-EU team analysed the data collection lifecycle involved in the our project, and observed that no vulnerable populations are involved in our study, and the data collected will represent no more than minimal risks to participants beyond what is normally entailed in their participation in developer communication, collaboration events and networking. We organized the DMP around the *three research objectives*, which correspond with the time progression of the project. Therefore, data collection under Research Objective 1 is currently the most elaborated. Below, we review the good practices already underway, prospective changes to the DMP and a timeframe for add.

4.1   Data collection activities

4.1.1   Research Objective 1: Empirically identify how local culture and network society influence the understanding and movement of particular social values among *technology developers*.

Over the first year of the project, data collection has proceeded both online and offline (**WP Task 2.2, D2.2**). Data collected has been securely shared using encrypted servers and anonymized where necessary. LinkedIn

data has been removed from our collection objectives (see **section 2.1.2**), however since this is not an additional data source nor a new way to handle data the data management implications are null. A custom database has been built to create a multiplex network data model. This is securely hosted and access restricted to project members. As we develop the network data model, we also test its premises for ethical implications.

Researchers participating in ethnographic data collection are trained in reflexive attention to ethics throughout data collection and analysis. The DMP Research Information Sheet is in use, after being tested with non-native speakers.

4.1.2   Research Objective 2: Develop a Privacy, Ethical and Social Impact Assessment PESIA framework. Data collection and analysis has been predominantly desk based. It has involved the identification of ethical and social values underpinning data protection regulation and contestation, in order to create a PESIA model that addresses the salient issues identified. No additional ethical concerns have arisen in the generation of data for Research Objective 2.

4.1.3   Research Objective 3: Systematically consider and implement the PESIA framework by co-designing self-assessment tools with technology developers. This phase of the research, addressed in the DMP, has not yet commenced. The DMP Research Information Sheet and Consent Form have been tested with non-native speakers and finalized. No changes are as yet foreseen.

4.2   Data Storage and Processing Foresight

Quantitative data collected so far on the project is held on University servers in Denmark and Sweden. As outlined in the DMP, PII is actively minimized. Initial collaborative coding of qualitative data began with an article based on IoT manifestos (see **section 2.1**) however, collaborative coding based on fieldnotes has not yet taken place. However, we anticipate that this will begin in the next 6 months (see **section 2.2.4**). We have prepared a de-identification process for research fieldnotes and a coded anonymization matrix for interview transcripts.

4.3   Ongoing

- Data collected are evaluated for their potential inclusion in the Open Research Data Pilot (see 1.2)
- Revisiting DMP: to be addressed at Consortium Meeting planned for **Tasks 3.5 & 4.5** to commence in April/May of 2018. The review of GDPR data protection and data management principles and ensuring project compliance is part of the planned meeting discussion. ORG and POLITO partners are experts on GDPR in particular and have been heavily involved in data management decisions of the rest of the partners.
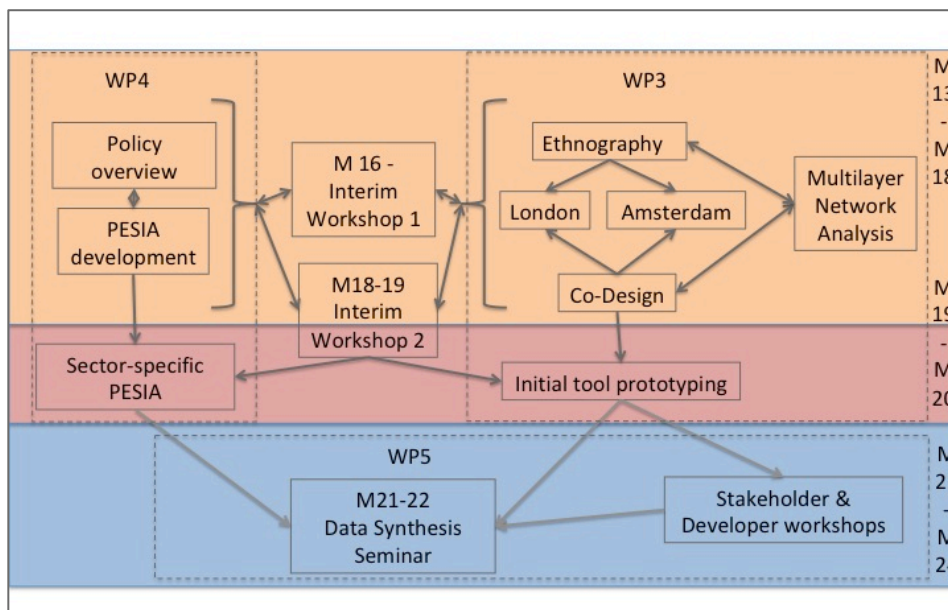
5   Roadmap for Year 2

As the VIRT-EU project begins the second year, we have concrete goals that we are looking to accomplish. Going back to original project objectives, Year 2 is where we expect to accomplish the majority of these, laying the groundwork for practical applications in Year 3. To reminder, the project objectives are:

1. Empirically identify how local culture and network society influence the understanding and movement of particular social values among technology developers and how local difference and networked commonalities can influence the development of ethical subjects from a virtue ethics perspective, using data mining, social network analysis (SNA), qualitative inquiry and design methods. (**WP 2** and **3**) - partially completed in the first year
2. Develop a Privacy, Ethical and Social Impact Assessment (PESIA) framework shaped by state of the art legal research and empirical data, to enable developers and other societal stakeholders to reflect upon, evaluate and take into account not only the data protection, security and privacy aspects of new technologies but also the ethical and social concerns embedded within that challenge autonomy and freedom. (**WP 2, 3** and **4**) - significant progress made in the first year

3. Systematically consider and implement the PESIA framework by co-designing self-assessment tools with technology developers, who may not be able to anticipate the future use of their projects and their clients and partners, grounded in existing developer practices and based on quantitative, case study and design research that identifies how ethics operate as process. (**WP 3, 4** and **5**)
4. Leverage expert civil society partners to engage SMEs, makers, advocates and other stakeholders in implementation of co-designed tools and processes working towards alignment with the changing European data protection landscape in order to build collective and social resilience in an age of individual subjectivity (**WP 5** and **6**)

We expect that we will be able to reach objectives 1 and 2 in Year 2, laying the groundwork for objectives 3 and 4. In particular empirical activities in **WP3** will enter a new phase, engage deeply with the field of inquiry quantitatively and ethnographically. In concert with this process, design engagements will capitalize on ethnographic practice. At the same time ethnographic research will be enriched by experiences and data gained through co-design workshops. Quantitative research will build on data coming in from ethnographic research and co-design workshops and inform these in turn. We expect such dynamic to go on M13-M15 while policy and legal research develops theoretical and policy concepts. In M16 we expect to bring all of the consortium partners together for an interim workshop to ensure that theoretical and policy developments can draw on empirical data, while empirical research is enriched by policy and theoretical innovations. A second knowledge exchange workshop will happen in conjunction with the project review planned in M18 or M19. This will allow us to prepare for the simultaneous development of the initial PESIA model and initial tool prototypes by M20-21. The rest of Year 2 will be devoted to further developing the PESIA model as well as testing and refining the prototypes. Figure 2 illustrates the plan.

Figure 2: Year 2 Roadmap