Specific Targeted Research Projects (STReP)

SocIoTal

Creating a socially aware citizen-centric Internet of Things

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D6.1 –Report on first year community interactions and detailed dissemination strategy

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	31/1	WP 6: comments: UNIS, UC, CRS4: The deliverable looks good as an umbrella but some parts can be cross-referenced.	RD
	18/04	WP 6 comments: UMU, UC, DNET, UNIS: WP6 as a whole thinks that the doc as it is needs more structure, as it is hard to read (citations) and the reader gets lost as the overall arguments are not entirely clear.	RD
	05/08	UMU adds Section 9 and provide a first review of the document	UMU
	10/08	Internal review by Carmen Lopez and Ignacio Elicegui	UC
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Content

Section 1 - Introduction

The main SocioTal objective is to unleash the full potential of the Internet of Things (IoT), going beyond the enterprise centric systems and moving towards a citizen inclusive IoT, sharing IoT devices and encouraging flow of information contributed by the people. To lower the barrier of IoT bottom-up development and adoption, some key aspects must be tackled: security, control, transparency and simplicity. These aspects are addressed through different blocks of the SocIoTal architecture, which are integrated and made available by means of tools. This work package is about creating scalable formats for interaction between the IoT Stakeholders:

- citizens
- developers in Meetups and Arduino/Raspberry Pi ecologies
- providers and enablers
- policy makers environments from local, regional, and EU.

WP6 is organizing local events, co-creation workshops and Meetups, involving citizens and developers' communities throughout the project duration. The aims of these activities is to interact with all participants and gather feedback regarding the potential usage of the project outputs as well as new requirements, potential additional functionality and features that the SocIoTal solution should provide.

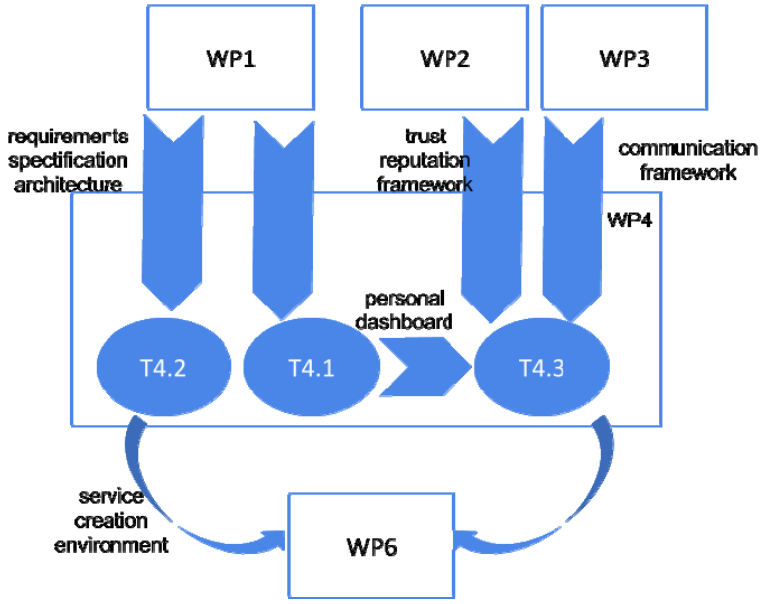

Figure 1 WP6 role

This report; Deliverable D6.1 provides an overview of the first year's community actions and will present a detailed plan for community engagement covering the project lifetime, focusing on year 2 objectives. It identifies the existing and emerging socio-economic roadblocks and barriers for citizen participation in an IoT through organizing dedicated workshops (year 1 focus), conducting surveys (year 2 focus) and implementing focus groups (year 3 focus). (T.6.1, M33). It feeds into D6.2 that will provide initial insights into technological and socioeconomic barriers identified by T6.1 and proposes several ideas for incentive mechanisms that will be used to encourage users during field trials and pilots, and D6.4 (M33) (RD) a report that will share the findings of the study performed on socio-economic barriers on citizen engagement and usefulness of different identified

incentive mechanisms. It will provide also provide best practices guide for local policy makers and cities.) (T.6.1, M33)

On methodology: In IoT-I (http://www.ethicsinside.eu) we identified a gap between the policy recommendations, Privacy Impact Assessment Frameworks and academic research on the one hand and the start-up reality of IoT on the ground with numerous Internet of Things Platforms, a growing group of attempts to build industrial IoT clusters, fuelled by the 2014 financial and economic boost as the influential Gartner 2014 report[1] puts Internet of Things, which promises a world in which every electronic device has a SIM card and its own presence on the net, at five to 10 years from actual productivity. Right now, it says, the concept is instead it is at the "peak of inflated expectations". If IoT is characterized by keywords it is dynamism, flexibility, speed, convergence and disruption. Finding formats of quality on which to base organizational decisions that go beyond the traditional surveys, research cycles and interviews, becomes as important as the technological choices that determine investments. As SocioTal is about novel and innovative ways of addressing barriers to IoT adoption of citizens, it also works on these new formats of quality in gaining data, information and knowledge. In Y1 the first iteration consisted on gaining input, feedback and information on IoT as a reality in business by forming Internet of Things Meetup Groups (Section 3), building co-creation formats for gaining structured input from endusers with the partners in the pilot cities (Section 1 and 4), doing co-creation workshops with endusers (Section 5) and desk research. In Y2 the interrelation will be investigated further. In Y3 (D6.4, M33) we will provide the validated iteration of the methodology as part of the SocioTal toolkit and best practices guide for local policy makers and cities.

- *How to identify the main concerns citizens have in sharing their IoT devices with others and under which conditions this may be acceptable to different end user communities?*
- *Which incentive strategies and mechanisms increase end user participation and how to evaluate their effectiveness and suitability for different user groups?*

The following section gives an Overview of the activities in year 1 of the SocioTal project.

Section 2 - Preparatory Meetings in the Pilot Cities

The preparatory meetings in the pilot cities helped to build local context for specific WP6 actions. It was beneficial to the project that prior to the co-creation workshops with the target groups for different use cases, to organise introduction workshops with the research teams and city officials of the pilot cities.

2.1 Novi Sad - Preparatory Meeting 1, October 21-24, 2013

The awareness and need for smart city developments in Novi Sad are on the rise, but at the same time in need of further marketing and promotion. During the first WP6 Community meetings the visited apartment blocks showed a positive attitude towards potential technological developments and solutions. *Civic* solidarity and c*ity* efficiency are not seen as mutually exclusive. Alexander Pavic from *Public Utility Informatika* organized three meetings in October 22nd and 23rd, respectively:

[1] at Public Utility Informatika with engineers and developers (22-10-2013)
[2] with representatives of the Business Management Faculty (a partly Cisco sponsored operation) and the Business Incubator in Novi Sad (22-10-2013)
[3] with janitors (12), building supervisors that are chosen by the flat tenants which service over 200 buildings. (23-10-2013)

Srdjan Krco from DUNAVNET initiated a meeting with a local neighbourhood committee which was hosted by Alexander Pavic and Rob van Kranenburg.

The conclusion from these meetings is that certain trends already exist, on which we can build on and make enabling factors operational, while trying to overcome identified barriers. IoT is seen as an *enabling factor***,** while introduction of connectivity is not seen as a technical challenge.
In the meeting with the local neighbourhood committee one of the compelling proposals was to add a noise detectors next to, or on the pervasive video surveillance systems. A younger representative recalled how when he grew up there was a recycling station and he wondered IoT technology could be part of bringing this back into the community. In the neighbourhood there are around 11 bars that consistently do not keep to their closing hours. They see introduction of the following as highly beneficial:

- City management: city sensors or other kind of noise sensors which would alert police and communal inspections, if noise levels coming from the coffee bars and restaurants are higher than allowed by law especially after closing time , as well as noise problems in the buildings
- Healthcare: quick calls to the accident and emergency units by the touch of the smartphone, with the exact location
- Education: introduction of ecological issues
- Building monitoring:
  - Detection of fire, gas leakage, flooding, etc.
  - Video surveillance:
  - *Crime recording*: in a building, by placing cameras at security critical points, such as doors, elevator, hallways. The existing surveillance systems in buildings resulted in capture, within 24 hours, for two serious offences, such as sexual assault and robbery
  - Crime prevention: video monitoring trough remotely accusable portal when neighbours are on vacation
  - Choosing the best bid for repairs (e.g. painting, fixing problems)
  - Networking with other citizens interested in energy efficiency etc.

In the meeting with the janitors the incorporation of video surveillance streams from the city was seen as very positive. One janitor asked for reporting on the water quality. In the meeting with the local neighbourhood committee a proposal was made involving leakage detectors in old buildings. A building dashboard for information sharing (that can be extended to other buildings in the community):

- about tenants
- between tenants (this can relate to health, for example in one building a recent story is a patient dying of a rare disease and a doctor who is a specialist in this disease lived in the same building)
- about local doctors and patient networks (provide NFC stickers)
- about new technologies – which can be purchased and shared
- share video surveillance
- share cars in the building (carpooling)
- on water quality
- provide local fix my street application
- between building supervisors
- about energy management solutions

Some janitors service over 200 buildings and can advise tenants on buying new applications or providing all in solutions. In both meetings the idea of providing a repository where citizens can send in ideas was seen as very positive. Alexander Pavic will investigate if something like Netvibes[2] and City Brain example of Santander can be made for Novi Sad.

From the above meetings the following barriers were identified, which might inhibit the adoption of IoT solutions:

1. **Legacy:** The main questions that were strongly raised by number of janitors: What will happen to the platform after the project? It was clear that they are able of giving requirements to a platform where they would put the information they are now putting on Facebook. Pointing out that Orkut, Myspace and other platforms have also failed and also FB can be less stable in 3 years is not enough of an argument. Authentication was seen as a major problem. Somehow it is strange that people trust more easily in the correctness of FB profiles. Still this is a reality. Questions were:

    - who is doing the registration?
    - who is hosting it?
    - how sustainable is it?
    - on which city level is it?
    - under which conditions are data shared with government agencies? (taxes)
    - who is administrating it?
    - who is moderating it?
    - who is financing it?
    - what about the elderly people, will there be workshops explaining it to elderly, and other interested tenants?

2. **Identity Management and Authentication**: distrust of identity providers. There is a strong potential for developing a system that combines extreme centralization (Wuxi One Id pilot, Estonian Ecard) and extreme decentralization: open data so that developers can provide niche services and build sustainable services.
3. **Lack of regional context for the service developers in the business incubators**: We carefully posit as a trend in the meetings with citizens that needs to be researched that two important non-technical barriers to adoption are legacy and identity management. This

means that building an inclusive environment for a service developer's ecology needs a strong interplay between local city council, business incubators and citizens. Besides a strong regional and interregional component, it needs a Stakeholder Coordinator.

2.2 Santander - *Prepara*tory Meeting 1, October 16-18, 2013

For Smart Santander SocioTal is a specific building block in the Smart Santander developments. This means that specific issues, such as discussions of legal frameworks around specific privacy laws that could hamper IoT deployment (for example, contrary to the Netherlands and Belgium, there is no CCTV on buses) have to be noted and identified, but cannot be a focus in the SocioTa project. We discussed three major areas of research:

1. The context and the importance of a good selection of scenarios.
The sensor deployment in Santander, within the SmartSantander[3] has been impressively swift and fast during a period of three years. However, for the citizens much of the deployment is under the radar. They are aware of different applications for their mobiles such as the "fix my street" [ref] where they can interact with the city council reporting incidents that should be fix. Also, they know about the parking, but actually may not at all know that it is 'smart'. In short, they know about some of the Smart Santander modules but they do not see the overall picture, being ignorant of what the Smart City could offer them at different levels. It is an objective in SocIoTal to make people aware of the possibilities that the Internet of Things can present to them.
Now that the infrastructure is in place, SocIoTal find a large field open to creative ideas in terms of scenarios and user-groups. From the many achievable possibilities within the platform, the more social ones would be the most interesting for the project, for SocIoTal there is openness to creative ideas, for example creating a local surfer community to create valuable information about the weather in the sea; for the farmers in a drone service, to offer insight in the best waves and to help find lost sheep and cattle (a regular and costly phenomenon) Choosing the right scenarios together with citizens and user-groups will be important to the rest of WPs in order to extract requirements to cover the needs and to show the WP1 solutions to IM and authenticating users into the SocioTal Platform as some scenarios build and ask for more trust then others.

2. How to create a sustainable context where the legacy of SocIoTal and related Smart Santander FP7 projects can be harboured in the creation of a strong brand such as Silicon Valley, Silicon Saxony, i.e. Silicon Santander. (See 4.2.2)

3. How to organize first workshops with chosen user-groups. Two initial ideas were chosen to kick-start the process.

- ***Restaurant owners.*** The smart parking helps car owners to find a parking space, reducing congestion, and personal frustrations. Smart Santander started with smart parking as one of the first deployments; recently this has been assessed as the best way a municipality can start with smart cities toolkits.[4] This deployment gives insight into actual use and can thus be used to model traffic as well as start dynamic pricing schemes. The idea is to give a specific set of restaurant owner's privileged access to the open spaces and start hyper local valet service. Organizing a meeting with them will bring out all the kind of questions we are facing when building new business models and incentive schemes.
- **Disabled citizens and carers.** Would disabled people benefit from specialized information from traffic management, hyper local weather news, and would certain groups, for example, blind people be able to contribute to creation of the Santander noise map more accurate and more helpful for the navigation? (See 4.2.1)

The main results of the preparatory meetings were:

- the realization that up until now the academic and engineering research teams have build the use cases for the projects and pilots from the ideas provided by citizens through the Santander City Brain platform (http://santandercitybrain.com). This led to the preparation and execution of one co-creation session with co-create expert Nathalie Stembert, in order

to familiarize the research partners with methodologies that will ensure structured input from end users in future co-creation workshops. (section 4)

- the realization that we need to build local IoT hubs for and with the EU project pilot cities (in this case Novi Sad and Santander), partners (Guildford, Ghent, Grenoble) and others (as proposed on the IERC list). This led to forming IoT Meetup Groups (Meetup.com): “Meetup makes it easy for anyone to organize a local group or find one of the thousands already meeting up face-to-face. More than 9,000 groups get together in local communities each day, each one with the goal of improving themselves or their communities. The Meetups flush out all IoT related activity in the area (section 3) enable focus group feedback for WP1-4 (section 6) and allow WP6 to build a format for managing stakeholder coordination in Smart City projects (section 6)
- the realization that in Novi Sad there was follow up possible from the preparatory meetings into a full co-creation workshop with the target group ‘janitors’ ensuring their input for the field trials and pilots in WP5 (section 5)
- the realization that one barrier to adoption can be the lack of input from citizens in use cases that have been formed with constraints of closed environments into more open ones where different constraints are working (section 6)

Section 3 - Meetups

How can we bridge the gap between the industrial solutions and the grassroots attempts at building IoT applications with a tool set that encourages interoperability and implements architectures of privacy and security to foster trust and thus encourage adoption? We choose to build our *focus groups* in an informal way through an existing format of the Meetup.

Currently around 58.160 people have gathered in Internet of Things Meetups. As this format simplifies administration and is easy to organise, we set up Internet of Things Meetups in Santander[5], Novi Sad[6], Guildford[7], Ghent[8] and Grenoble.[9]

Michele Nati, Surrey, explains: The meetup are organized as part of the Sociotal engagement strategy, however so far we never referenced too much to SocIoTal in our meetup as we will start to do that from our second year (of Meetups and Sociotal project, i.e., from September 2014 onwards). So far we are trying to create awareness about IoT and try to understand what could be the problem that IoT solutions could face and the gap that SocIoTal will try to fill with its solutions. The audience is quite mixed. We have many practitioners that wants to understand how to make money with IoT and other that wants to understand how IoT can help their own business, while other are more interested to social aspects related to IoT. We had many requests from people that want to understand how the IoT related to smart cities and our daily life.

The issues addressed and questions raised at the Meetups are in the heart of the current debate on Internet of Things in our societies, focused on four main groups of stakeholders that we want to reach:

- an ecology of enablers: Ipv6, RFID, Sensors, QR codes, barcodes,
- large service providers: Telco's and data integrators and corporate IT as well as SME and start-ups, and building blocks like mobile payment
- a policy ecology of local neighbourhood groups, city councils, regional incubators, national and EU policy makers
- developer communities that have sprung up over the past five years with the success of the Arduino, Raspberry Pi, Internet of Things Meetups (20.000 members globally) 3D Printing etc., accelerated by inexpensive open hardware, software, database storage and data analytics
- citizens that are invited to co-create scenarios that are meaningful to them

Currently the total number of members is *431* (on August 10 2014). As this is a self-selected group the level of IT and IoT expertise is high. In year 1 we held a total of 13 Meetups and organized speakers around all kinds of topics branding our Meetups as general IoT Meetups and only fronting SocioTall on the 'About us' page. In year 2 we plan bi-monthly Meetups, starting from September 18 2014, and start introducing SocIoTal research questions and later, in year 3 the SocIoTal tools on the 'About us' page.

SOCIOTAL Meetups

No	Location	Date	Attendees	Topics
1	Ghent	17-01-14	45	Smart City
2	Santander	21-02-14	19	IoT in Santander
3	Novi Sad	27-02-14	50	IoT in Novi Sad
4	Ghent	13-03-14	47	Local startups / SME
5	Guildford	24-03-14	29	Citizen IoT focus
6	Ghent	17-04-14	14	I-Minds Distr-Net
7	Novi Sad	24-04-14	20	EU Smart City
8	Guildford	12-05-14	34	IoT Trends
9	Novi Sad	29-05-14	9	Danube IT Conference
10	Santander	30-05-14	25	TST /Ear-It/Fablab San
11	Ghent	16-06-14	24	RFID / Hackercamp
12	Grenoble	23-06-14	9	Introduction Meeting
13	Guildford	15-07-14	27	Security
Total			352	

In year 2 we plan bi-monthly Meetups, starting from September 18 2014, and start introducing SocIoTal research questions and later, in year 3 the SocIoTal tools.

3.1 Ghent – SocioTal Meetups (4 meetups, 192 members)

3.1.1 Meetup 1[10], January 17, 2014

The most prominent feature of the IoTMeetups in general, is the huge diversity of the attendants. In Ghent, about 45 attendants are mainly with the technical background, working in all kinds of domains: from graphic design and art to health, urban farming and keeping bees in the cities, electronics, telecom, embedded systems, usability, and education. In terms of professions there are professors, developers, artists, entrepreneurs, consultants, hackers, researchers, coming from the startups and the industry. The Smart City officer of Ghent, *Jelle Monstrey*, explained the bottom up vision of Ghent – involving citizens from the start by referencing the project Zwerm in which participatory design played an important role.

3.1.2 Meetup 2[11], March 13, 2014

Ben Vanhaegendoren, R&D Director Qeo at *Technicolor*, claimed that the "connected home is fragmented." Qeo is a communication framework made of a core set of modules from which can be developed fully-fledged software solutions for consumer devices in order to realize a full interoperability between them. Qeo in/and Technicolor is the kind of new entity that the Council predicted that would spin out of the Internet of Things. From domain specific knowledge based on the content (e.g. patent portfolio), to very specific media solutions, the common requirement is the connectivity between the devices and mobility, which opens a new space with the innovative solutions. This change in available technology also demands number of changes in people's attitudes, for example: in the management attitude (going towards open source), in the customer value propositions, in forming partnerships (Techicolor has joined the Allseen Alliance), and a mind-set change in the in house developer teams. So we see that a new language, Qeo, is being developed not from an abstract academic angle or a standard body, but from a real need and perceived business case that is highly anchored in the current use cases.

3.1.3 Meetup 3[12], April 17, in Leuven (IMinds)

Professor Danny Hughes is leading the Networked Embedded Systems team at iMinds-DistriNet, KU Leuven. He introduced LooCI, a platform with a low barrier entry for application experts. Scenarios need to build on self-motivated adoption of IoT in (self-) organized communities. The users are the drivers and the companies/businesses are consumers. Presence of key features fuel such community growth: (i) increasing acceptance (ii) building privacies friendly IoT infrastructures, allowing consent-based approach to IoT and full control over privacy issues for individuals (iii) user-friendly interfaces and dashboards.

3.1.4 Meetup 4[13], June 16, 2014

Anthony Liekens of Belgian Hackercamp (fri3d.be) embodied the enthusiasm and DIY spirit of the 3D print and hacklabs where all kinds of tinkerers gather to play with the technology. Focusing especially on education, he aims for more creative programming early in the curriculum. *Jan Merckx* introduced RAIN, an AIM Global Alliance. RAIN will promote awareness, education, and initiatives to accelerate UHF RFID growth and adoption in business and consumer applications worldwide. He also posited that the P2P Foundation, http://p2pfoundation.net/, and positions the IoT into the right philosophy of a new social model/a new economy opposed to the 'big brother' advocating. *Karel Vandenbroucke* states that IoT products are not yet designed based on the needs of a larger, non-technical group of end-users. Therefore, in this presentation, the AllThingsTalk Living Lab research track in which tangible end-user products are defined to be implemented on an online IoT platform is presented. More specifically, by using both qualitative and quantitative methodologies (i.e., desk research, online survey, probe research and co-creation) and by selecting different types of users (i.e., based on Rogers' adoption profiles) for these interaction moments, they were able to combine the input of these users to define tangible products that meet the needs of a heterogeneous group of end-users.

3.2 Santander - SOCIOTAL Meetups (2 meetings, 69 members)

3.2.1 Meetup 1[14]: February 21, 2014

The first IoT Santander Meetup was held on February 21 within the framework of the II Santander Social Weekend[15] so the room was full of people (about 200 attendants) who took part of this first meeting. Thanks to this atmosphere, there were too many different profiles: designers, technical people, social network experts, entrepreneurs, etc. apart from people invited through IoT Santander Meetup webpage and Twitter profile.

Luis Muñoz (Professor of Network Planning and Mobile Communications Laboratory in the University of Cantabria) kicked of the meeting with an introduction about what is a Meetup and its objectives, highlighting the importance of this first IoT Meetup in Santander. The next speaker was *Bruno Cendón (*CTO from TST http://www.tst-sistemas.es) who introduced the audience about Internet of Things with a nice and enjoyable presentation in which he presented how to connect gadgets to the internet with an Arduino or Raspberry Pi, an Internet connection and a bit of patience. The following talk was given by *Rob van Kranenburg* (SocIoTal community manager) who stood out how fast this is all happening in the Internet of Things, and the importance of seeing all as a whole. For Rob this is a moment of transformation and his words acted as a great stimulus to take part of that change.

Finally, *Rocío Muñoz* and *Ruth González* presented their ideas about how to apply the Internet of Things in our lives. Rocío firstly provided the audience with a presentation of her winning project in Santander City Brain platform that wants to offer better facilities for blind people when around the city using the Internet of Things, providing disable people an application to select the best routes to move from one point to another in the city without barriers.

Meetup 2[16] May 30, 2014

On May 30th, the Telefonica's Demonstration Centre in Santander hosted the second IoT Santander Meetup. All people who had booked a seat for the informal meeting attended and could enjoy three entertaining talks plus a guided tour of the Demonstration Centre. Firstly, *Sergio Martín*, from the Cantabrian enterprise TST presented the idea they carried out to celebrate the IoTDay on May 9th. He explained how, with MQTT (mqtt.org) protocol support, people could answer questions from an IoTQuiz and with each hit, through a MQTT Server, move a little F1-car remotely. After the explanation he showed a nice demo where we took control of Vettel's car.
Second talk came from the IoT team of *FABLAB Santander* (http://fablabsantander.org) They explained the audience what is a Fablab (dispersed throughout the world), including some interesting projects developed within Fablab Santander, such as the InternetofBees or one focused on help disabled people and their caregivers through IoT.

The last talk was led by *Johnny Choque*, researcher at the University of Cantabria, who presented the project EAR-IT (http://www.ear-it.eu). During his presentation, Johnny explained how this project works to analyse the acoustic in the city detecting events and patterns to help citizens and add a new dimension to the Smart City. Finally, *Pedro Anabitarte* from Telefonica made a guided tour around the Demostration Center, showing demos about technologies linked to the Smart City and IoT services about Urban mobility, Energy, Environment, Tourism, etc.

Although the event was supposed to take about 45-60 minutes it took around 2 hours, because people were really interested, producing much interaction with the speakers.

3.3 Novi Sad - SocioTal Meetups (3 meetings, 56 members)

3.3.1 Meetup 1[17], February 27, 2014

Srdjan Krco from DunavNET presented the company's activities in IoT/smart city domains with a particular focus on the Citi-Sense project and the concept of citizen observatories (http://vimeo.com/81406033). The concept of Constrained Application Protocol (CoAP) has also been introduced as an important application layer protocol that is typically used in resource constrained IoT and M2M devices as it brings the Web in the IoT by enabling integration with Web applications, interoperability and scalability: http://www.slideshare.net/waltercolitti/iotgent-presentation-walter.

Presentation concluded with a demonstration of the MindWave Mobile Technology using the EEG&EMG NeuroSky wearable sensor device which measures the brain activity (attention) level by digitally processing the analogue electrical brainwaves and determining in this way the person's attention level. This data is sent via internet to a smartphone where it is processed using the devoted application and then sent again to a smart lamp where the attention level is presented as a mood, i.e. high attention or low attention.

Rob van Kranenburg from Resonance Design gave a talk about the bottom up IoT events http://www.cooking-hacks.com/blog/maker-movement as well as the top down policy frameworks.

Lectures were followed by good discussions on ways to engage end users in building the ecosystem of citizen centric devices, where people see the interest/need to have such applications and on the potential privacy issues and how they can be minimised.

3.3.2 Meetup 2, April 24, 2014

After the 1st successful meetup in Novi Sad, which raised interest from the variety of stakeholders, from the researchers at the University, coming from various departments, software developers and people from other non-technical background, the 2nd meeting provided continuation in terms of presentation of other examples of IoT technologies. This meetup was intended to form wider interest group, continue discussions from the previous meetup, and hopefully lead to ideas for new IoT projects and collaborations. *Dr Stevan Jokic* gave a presentation on IoT in medical field, by explaining his affordable ECG device and its design. Besides the reduced price, in comparison to

available market solutions, presented ECG device is attractive because it can capture ECG without the standard placing of electrodes. ECG signal is then analysed using the developed mobile application. The mobile application provides the interface for displaying the real-time ECG signal as well as reporting screens with the relevant user messaging. From the application, user can send emails with attached signal or upload signal to the server for the remote access.
Stevan also presents the application for the heart rate detection and analysis that uses only the mobile device camera. Heart Rate Variability analysis can estimate the user's level of stress. It is also possible to use the heart rate values during the cardio training and adjust the training accordingly. This application can also control the smart IoT lamp and visualize the heartbeats as well as the results of the analysis.
The presentation was followed by a constructive discussion with the audience where numerous ideas for the new smart city healthcare services are created. These include the smart mood analysis, elderly people monitoring and etc.

Nenad Gligoric presented application of IoT technology in the smart classroom for automatic recognition of level of students' interests during the lecture. The presented system is based on the machine learning algorithm using a training dataset collected from 20 lectures. The system is implemented in Matlab and is capable of recognizing patterns from the sound (i.e. spectral entropy and formant frequency), images (i.e. descriptors of students' motion) and a 3-axis accelerometer (i.e. lecturers' motion descriptors).
Discussion that followed presentation was mainly about technical details and the approach used in the research as well as about utilization of the system in education and the overall impact it may have.

3.3.3 Meetup 3[18], May 29, 2014

The third Meetup in Novi Sad was aligned with the Danube IT Conference 2014 organized by Vojvodina IKT klaster Being part of this broader IT cluster enabled SocIoTal to brings its citizen centric focus on Internet of Things to a large group of IT developers. By introducing a strong focus on the enduser in developing usecases and co-creation as a methodology of doing so, SocIoTal spreads the message a pure technological focus in a real world environments and everyday practices of ordinary citizens will not lead to IoT adoption beyond gadgets. This meetup event offered an opportunity for everyone interested in IoT to hear what the latest trends are in Europe and in the world and to meet speakers and lectures which actively work and collaborate on many European projects covering this area. The active engagement of conference participants also happened through several workshops (unconference sessions) defining and discussing key topics and application areas related to IoT. These engaged around 10 participants per subject/group.

3.4 Guildford - SocioTal Meetups(3 meetings, 87 members)

3.4.1 Meetup 1[19], March 24, 2014

The Guildford Meetup drew a surprisingly large number of participants. More details can be found on the Internet of Things Guildford Meetup page. There are a variety of people interested in Internet of Things as they think it is relatively new concept, which is on the one hand very concrete, while on the other hand encompasses wide variety of applications, devices and technologies. It can be about tagging objects to trace and track them and connect that data with other items to find new patterns. It is about installing monitoring equipment - sometimes industrial sensors, sometimes more bottom up made boards - so as to trace energy use or air pollution in a collaborative way. It is about web apps becoming linked with personal and static sensors so individuals can get a holistic view of their health. But it is also about a change in how we as humans interact with media and the world around us that is dominated already by screens and now seems to be augmented with a kind of invisible world full of databases crunching numbers but no longer showing us a keyboard or a mouse. The transparency in IoT can be extremely disruptive. as Sarah Lay wrote in her article „The Digital local government: a future in Google Glass and the internet of things""[20]: "Digital technology is also an opportunity to engage with residents. Social media is now widely used, with more councils giving access to frontline staff and using it as a

conversational rather than broadcast tool. Many types of council also offer email alerts, newsletters and social media updates instead of printed material. What next for local public services?" One of the questions in the first Meetup was if there are contacts with the local IT department of the City and regional Councils. This has led to a SOCIOTAL Meetup Member initiating contact with the local Council.

3.4.2 Meetup 2[21], May 12, 2014

The second SocIoTal IoT Meetup in Guildford drew over 30 participants to the Keystone. After the first two Meetups mainly focused on providing an overview of Internet of Things (IoT) and what IoT could do for the community and industry, what was asked for the next time is some kind of success story, and some more technical presentation that shows how someone made his business and placed itself in the IoT world. It is clear that the people interested in the Meetups are focussing on possibilities, rather than, hurdles and problems. They see a huge IoT market and imagine that they could find a place in this arena.

Justin Anderson, CEO Flexeye Ltd, www.flexeye.com, is building an ecosystem of partners across both horizontal and vertical IoT axis. Flexeye's IoT 'Upper Middleware', Eyehub, is a configurable platform with a policy driven, virtual representation of 'things', with APIs for easy integration & deployment of powerful Enterprise Applications and secure authorisation of two way data streams. Many applications that made our life safer and easy, such as the MyGuardian and the MySurrey app have already been developed by making use of the IoT data that the Hub can easily collect from user smartphones and share within community. Justin explained how is he, currently taking this data sharing and interoperation of different data streams across different domains to the next level. A large bid aiming at horizontally integrating many IoT vertical domains is currently under preparation. *Lorenzo Stoakes* explained how Resin.io makes it easy to push code to capable devices like the Raspberry Pi without the hassle of having to configure and maintain them manually. Resin.io makes it easy to deploy instant code updates to any number of such devices via a simple git push so updating your cluster becomes as simple as writing code and deploying it from wherever you happen to be in the world. *Alex Gluhak* is a member of the Intelligent Cities Lab team of Intel Labs Europe and based in the ICRI Cities in London. He works as a technology strategist alongside other ICRI researchers to identify synergies among ICRI research and opportunities for their potential exploitation within Intel Labs. Alex is responsible for building new European research initiatives of strategic importance to ICRI Cities and helps shaping the ICRI Cities research agenda. He also drives technical contributions in ongoing research projects.

3.4.3 Meetup 3[22], July 15, 2014

Gregor Vučajnk, "an independent WLAN professional, tried to analyze why WiFi can represent an important technology to connect IoT device, although in practice the security mechanisms provided by the protocol are not adequate to simple and embedded devices. *OpenTRV* sets out to make it easy to save lots of energy by not heating rooms that you're not in, and by no longer trying to use a single thermostat to get your whole house comfortable. It is designed to be simple to (retro-)fit to existing UK housing stock with radiator central heating. Mark Hill - presented his way to reduce energy consumption at home, by means of a smart device that is able to control temperature and radiator activity in each room in a house. Mark works as the contractor in London but has passion for IoT. The solution he provides is very cheap and open source and can be realized at home, with a 3D printer.

EVRYTHNG makes products smart, interactive and trackable by connecting them to the Web. The Web is the global application integration platform.
Iker Larizgoitia presented a success story: the Evrythng view to connected objects. He explained how internet of things is evolved into the web of things, giving the possibility to enhance the experience that every customer can have with his favourite product, turning the IoT in a business for brand management followed by many big customer, and the importance which has been recently recognized by Cisco with a large investment of private funding to the company. *Todd*

O'Brien from Dell's Centre for Entrepreneurs explained how the Open Interconnect Consortium intends to deliver a specification, an open source implementation, and a certification program for wirelessly connecting devices. The first open source code will target the specific requirements for smart home and office solutions, with more use case scenarios to follow. Tod mainly addressed security and privacy issues in IoT with a more interactive presentation that tried to leveraged attendants participation in order to understand which IoT sector faces the security and privacy problem, therefore solutions should be provided. The crowd could interactively participate in the poll and some interesting conclusions have been reached.

3.5 Grenoble - SocIoTal Meetup (1 meeting, 27 members)

3.5.1 Meetup 1, June 23, 2014

The first Meetup drew a small number of participants but raised significant interest in subsequent meetings. [23]

Section 4 - Co-creation with the Research Teams in Santander and Novi Sad

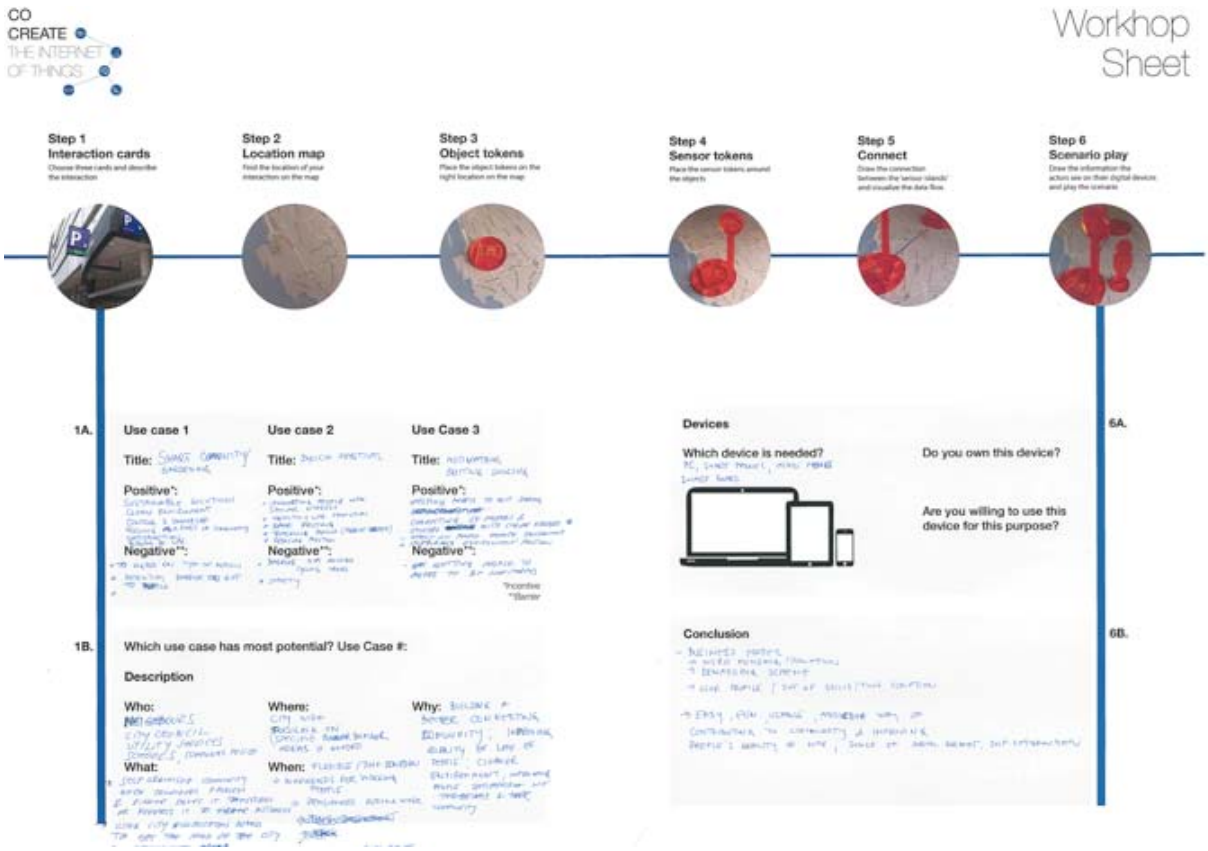

Figure 2 Example of a Work Sheet

4.1 Co-creation with Researchers in Santander

1.1.1 Notes from Rob van Kranenburg (RD, WP Leader)

The co-creation workshop was prepared and executed by Nathalie Stembert of cocreatetheiot.com. One of the first conversations Nathalie had arriving in Santander was with a taxi driver who very proudly explained that the taxi's in Santander are part of Smart Santander and deliver measurements of temperature. When she asked him if he would be interested in receiving information based on aggregated data from the other taxis in the city, he could not see any need to do so. Nathalie said that maybe connecting that data with the incoming Ryanair flight data might be useful.

The purpose of the co-creation workshop is to liaise with end users in order to uncover their needs, to find the positive and negative points of connectivity in the scenarios and build interfaces together to the devices/sensors that will be deployed, in short to make IoT beneficial for the end user. The process serves a double purpose: firstly to identify the needs of the users in a structured way, and secondly to make them more aware of the sensors and what they are doing.

The overall object of WP6 was to build awareness among the SocIoTal partners that are preparing use cases that it is possible to receive structured input from end users as early as the initial brainstorming phase. If the use case was already defined the object was to find a productive way of engaging targeted end users to assist and co-define the prioritization of activities.

The following notes are meant to complement Nathalie Stembert's notes and the evaluations of both the researcher teams in Santander and Novi Sad. They focus on the dialogues that occurred as the teams executed the workshops in six main steps.
In step one, choosing the cards with everyday situations portrayed, it was observed what a difference this made in relation to the old procedure of starting brainstorming a use case from scratch. As the situations portrayed are context-aware and complexity-friendly, they invoke scenario building in a dialogue-friendly way.
The first observation is that in both workshops the steps in the method are basically moderating and need only brief explanation, although at all steps it is clear that the guidance of the moderator is important to insist on looking from the perspective of the end user in relationship to the overall technological landscape. The dialogue flows very naturally from the first step when the participants are asked to pick images that portray everyday situations.

These are examples of a person picking three cards:

Card 1: "There is a doll. I can imagine I want extra information from it with a barcode or QR code or NFC. Where is it made? Who made it? I can also imagine that dolls can interact when they meet each other."
Card 2: "A P&R, Park and Ride. A large outside parking connecting people that want to share cars for long trips. Should also be well connected to bus and train."
Card 3: "Kids planting trees. This is about education. I use humidity sensors to teach them how the IoT can help them grow their plants. There are new programs for a more technologically friendly educational paradigm in Spain but much more could be done to educate people into what it means to live in a smart city. Especially the younger generation will become more dependent on technology. Also, they could act as teachers to their older generations explaining what they have learnt to their parents, grandparents, etc.

Card 1: "This is an image of an accident. You want to block certain lanes. You want real time congestion data and the preferred route to the hospital for the injured, as well as for their relatives who are being notified and on their way to the hospital in a state of shock. You want data pushed to the hospital on injuries and particularities of the injured."
Card 2: "An angry driver. Maybe he has run into a traffic jam. He is shaking his fist out of the window and looking really angry. How could IoT help? Traffic flow meters related to real time apps might avoid situations like this. It might also have advised him that particular time of day to take a bus.
Card 3: A park where people go to play.

The three cards can lead to a potentially coherent starting point for a use case. The second step is then to assess the positive and negative aspects. In the case of traffic management, a negative aspect could be privacy and citizens getting dependent on technology in the long term, also, the notion of ownership of a car and being in control has some cultural dependencies. In the case of stimulating creativity and the use of IoT through environmental education to young and old, explaining what sensors are and what they are monitoring could be a strong part of gaining acceptance and adoption through apps on smartphones. Peer education, people with similar backgrounds teaching each other might be a way to educate parents through their children, who are much more tuned to connectivity and for whom it is quite natural.

The Smart shopping idea was selected for more in-depth analysis . Benefits for the customer and producer were: traceability of the good (the doll in this case being made 100% in Cantabria), easy access to all the product information, potential just-in-time-stocking based on real demand, improved visibility for the product and rapid market representation. The other side of this is the potential risk of losing human contact; in the shop as all interaction goes through your smartphone ("You are no longer asking the price or some information to the shop attendant.") and also privacy because of the traceability of the goods. Smart shopping involves more actors that are normally

hidden from the end user: the manufacturer, the distributor ("Might this channel become extinct like so many internet middle men in the 90s?"), and also the doll's ecological footprint becomes visible as an 'actor' or 'indicator' for purchase.

IoT can be many things: RFID, NFC, barcodes and QR codes could be used for traceability and added functionalities like microphones and movement sensors in the doll itself. So how does the end user get in touch with it, where is the actual discover taking place? Is the doll broadcasting information? Or could the actual start of a grandfather looking for a present for his granddaughter take place at home, while searching online? If I have more information I can make a more informed decision. If there are brands involved, I can avoid fakes. The dolls themselves can connect to the manufacturers cloud and authenticate themselves."

In the workshop the concrete steps of: who does what, where, when and what, and the sensors placements, are made tangible by the representative objects that were purposefully made. . One workshop step is putting the objects on the map in the city, encircling those that send, listen, collect, or see as intelligent objects with a particular token (a ring) and then drawing the actual data flows of the intelligent objects to the devices that end users have either on the move (tablets and smartphones) and/or at home (computers).

One of the final steps in the workshop is to always question whether the actual end users have the devices on which they are supposed to act or receive information. This became quite apparent in the second use case that was being worked on: carpooling. The question rose whether, apart from car owners and carpoolers, the platform itself was an actor. This question led to an advanced option to be discussed as *opportunistic carpooling*[24], where "I have a car and a destination and I publish that in a real-time on the platform, declaring my route and available seats". Such an advanced case would resemble the Uber service (https://www.uber.com) and be an interesting case to debate with a particular group of stakeholders: the taxi-drivers. The discussion then focused on where the intelligence of the system resides: the person with the smartphone in the car only, or in pick up points as well, or in the car itself as well at some point.

As general feedback the Smart Santander team decided that this workshop process could help rank the necessities – the must and should haves – with end users in the current use-cases, as it will draw good and structured feedback from the real users: "In the first IoT Meetup in Santander (3.2.1) there were two local speakers who had ideas and concrete projects to build on top of Smart Santander. Rocio Muñoz was one and her project is about getting more real time feedback from city services. It is clear that a workshop like this could help align her needs with our expertise."

1.1.2 Notes from Nathalie Stembert

From scepticism to enthusiasm! The researchers started a bit hesitant with the co-creation workshop, giving it the benefit of the doubt. The first step, deriving three use cases from the interaction cards, needed explanation. The reasoning behind the steps was explained during the process, moreover it was emphasized that the workshop is designed for collaboration with the target group and that several aspects are therefore simplified. Soon the researchers, assembled three use cases, describing and evaluating them by means of positive (incentives) / negative (barriers) aspects. After which they decided to work out the use case about smart shopping. At this point they already became more convinced about the purpose of the workshop and discussions were fruitful. When the co-creation artefacts appeared on the table to whole process and its steps became clear to the researchers. They mapped the activity chain of the use case, by means of the metaphorical objects and sensors, while discussing the interaction in the mean time. The data flows were visualized, the scenario was played out with the actor artefacts and the interfaces were visualized on the device templates. Conclusions about the use case were written down, to subsequently end in an enthusiastic discussion about the benefits of the co-creation workshop.

Accomplishments

- An entirely new and feasible use case was developed.
- The use case was visualized in terms of location, objects, intelligence (sensors and network), data flow, interface input/output and actors involved.
- The use case was evaluated in terms of incentives, barriers, devices and willingness to use these devices for the purpose of the use case.
- By playing out the use case insights were gained in the interaction of the target users with the Internet of Things network.
- The workshop led to a number of requirements for the old and new use case.
- Moreover it enabled SocioTal researchers to prioritize requirements (based on the needs of the target group).

Improvements

- The device icons can be removed from the object tokens.

Recommendations for the workshops with the target group

- Discussions are the most important to elicit.
- Time has to be managed carefully; one use case only can be elaborated per workshop.
- Participants have to be selected according to their level of technical expertise.
- Collaboration between the researchers and the target group is important to guide the participants (the process can be still too technical), yet also to let the researchers engage with the target-group to uncover their needs.
- Objects for the use-case concerning disability and parking have to be developed.

1.1.3 Notes from the Researchers in Santander

Six people within and out of the SocioTal project were involved in the session. After the welcome and a brief introduction about the different steps to follow in the co-creation workshop, we started the first of the two main parts of the activity, which was to create a use case (UC) from scratch. The creation process was started using cards where different situations in a city were represented. From the cards we were asked to select those which present situations where IoT could offer some benefits. After a bit of discussion, three cards were selected, one related to the transport, other related to IoT in education and final about Smart Shopping. After initial description of the use cases extracted from the cards, and after establishing the pros and cons for each of them, we selected the Smart Shopping for more thorough analysis.. We analysed the UC looking for *who* (who are the actors?), *where* (places involved in the UC), *what* (the process, different steps, on the UC) and *why* (what necessities does the UC fulfil?). After that, we translated and represented the descriptions on a Santander map, establishing the objects, the intelligence and the connections between them using different pieces and totems. Also, we selected the devices needed and analysed how the user would observe the use case through them. Finally, we finished this first part with some conclusions, highlighting the benefits added by the UC, the barriers that could be found, and also benefits from the activity per se (sum up in the next section).
During the second part of the session we explored the car-pooling UC described by the University of Cantabria in the SOCIOTAL project. We carried out the same previous process, observing that different points of view, extensions of the UC and new ideas.

Conclusions to highlight

- The structure of the session easily guides users to create a complete description of a new UC
- In the case that the UC is already described, it allows to discover the point of view of the final user who could identify new requirements, and descriptions about what really are new valuable functionalities for them

- It is a more visual, enjoyable, and collaborative way to introduce people within the IoT and to take advantage of all their ideas to elaborate or re-elaborate the UCs
- The materials used allow the users to visualise abstract ideas
- Allows us to discover users' reaction to the UC, acceptance and barriers. Also, it allows to explore the availability of devices which at the end could be translated into the acceptance of a new service or the necessity of change technological aspects of the UC
- It is interesting way to capture potential users in pilots and trials
- In order to have success in future co-creation workshops with final users, it would be necessary to select appropriate UCs to explore in these sessions and to find people with profiles that could enrich the proposed UCs

Figure 3 The Santander researchers at work in the co-creation workshop

Figure 4 Co-creation workshop props

4.2 Co-creation with Researchers in Novi Sad (28/02/2014)

1.1.4 Notes from Rob van Kranenburg

The first observation is that in both workshops the steps need only brief explanation, although at all steps it is clear that the guidance of the moderator is important to steer observations towards the perspective of the end user in relationship to the overall technological landscape. The dialogue flows very naturally from the first step when the participants are asked to pick images that portray everyday situations.

These are examples of a person picking three cards:

Card 1: “I like the bicycle idea. It is useful, mobile, and dynamic. In demanding more space for bicycles, drivers take more care.”
Card 2: “This looks like a ‘smart environment’.”
Card 3: “On this big screen in the middle of the square you could show very personal messages (I lost my dog) or hyper local news (there is a roadblock in the next street, a lady four high in an apartment store is ill and needs groceries, an elderly couple in the street needs to move some furniture but it is too heavy….), or it could be a sharing distant friends portal where you can say hello to your friends who have left for economic reasons and are working in Ireland, Canada, or share a party! “

Card 1: “I see a person smoking. Things like Fitbits, health monitoring and Quantified Self come to mind. A lot of people are monitoring bodily functions. Could there be something for smokers to help them quit? What if you smoke a signal goes to your friends? Could they help? Or could the feedback be on finances, for example showing the total amount of euro you have smoked so far or will be spending? Taking this a step further to drugs, could there be a way of giving young people that start with soft drugs some feedback about what happens when they move on to harder drugs?”
Card 2: “There are elderly people biking. Hmm, a network for bicycle riders? The City is building some tracks at the moment. Could the bicycles be tagged, could they be networked?”
Card 3: A lot of people at a huge event (could be like the summer music EXIT festival?). What kind of information could be shared there? People like to know where their friends are and the next best

gig is. The planners want to have strong crowd control without this being visible, it must be fun. These could be inputs for the city visualization use case? The data could be send to the police but maybe also to citizens? If something is build for EXIT it could be used during the year for small local events: Come and see!"

The steps in the method then facilitate how quickly a first idea for a use case is prototyped by bringing the ideas together, mapping the actors (who is involved), the timeline (when are things happening), what type of sensors are needed (what sends, listens, sees, receives) and how the particular use cases can be combined in a broader vision that inspires the view of a 'smart city'. In this case the workshop was done with the SocIoTal team of NS researchers and not end users, but it was clear that structured results can be obtained that allow input from non expert citizens not to interfere with the contextualized knowledge of the engineers and city planners in a negative way, but on the contrary enrich this contextualized knowledge with a knowledge of the locus, the specificity and history – memory - of the location.

One of the key elements that ran as a thread through the ideas was the notion of exchange and facilitating exchange. It build on the fix my street and the smart gardening use case in NS where the idea is that incentives drive behaviour: "As the area gets cleaner, all the people in the street benefit. As you have helped to make the street cleaner or water the plants you feel more part of the process, you get a feeling of self-satisfaction and maybe a feeling of ownership, like in I did that! This feeling of "pride" and being recognized for having done what you did in the street can give more motivation then money. And from these small steps we have to work on the mentality change that is needed. Positive feedback is essential for everybody in the process to stimulate self-organization and a sense of community."

It was therefore decided that the second co-creation workshop in NS will be around this exchange platform with the key stakeholders in that case; the building janitors and selected occupants.

The key elements of the vision as they were voiced during the discussion were:

- a mentality change: "How can we all (ourselves included) make the switch from 'This is their building', to 'This is our building, our street, our park?. This is a mind-set change and extremely complex. Pretty much a lot of citizens are depressed. Youth unemployment is very high. There is a sense of togetherness that is missing."

- mixing public and private responsibilities: The funding should come partly from the government and partly from crowd funding and private donors as ownership must be taken by citizens and it should not feel as if everything is already decided. A business model could be on some basis of vouchers: I can donate time, money or can I buy a plant or tree? I have certain skills, can you use them? In exchange of what?

- not reinventing the wheel: use for example taskrabbit.com in the idea for the portal where citizens can log in and subscribe to donate a gift – time, money, a tool to a problem or cause in the street or neighbourhood.

Specific problem sets that can be addressed by WP1-5:

- If we build a platform where people can list their skills: how reliable is the information that people give about themselves?
- If a problem is reported it first has to be decided by the community if it is fixable with local expertise, only then it goes to the city authorities? What does such an algorithm look like and how does it learn?
- What is the right amount of 'fun and feedback' factor – gamification- that is so important in social networks to make this platform where you get both positive feedback in the real world

(from a neighbour or street cleaner or police officer) as in the platform (vouchers, points, exclusive offers…)

1.1.5 Notes from Nathalie Stembert: Co-creating the IoT workshop evaluation

1.1.5.1 Comparison to the workshop in Santander on 22/02/2014

The workshop in Novi Sad was similar to the workshop held in Santander.

- The workshop materials remained the same.
- The workshop was documented similarly with pictures, workshops sheets and transcripts.
- In Novi Sad there were two more participants (a total number of seven).
- One full workshop cycle was completed, there was not preceded anymore with the use case of the “Smart City Dashboard”.

1.1.5.2 Notes - Workshop Novi Sad on 28/02/2014: From a facilitator point of view:

The workshop started with a total of seven participants, among which a number of SocIoTal researchers. During the session three other participants walked in and out to observe and contribute to different parts of the workshop. The workshop started with a short introduction, after which the participants were provided with a stack of interaction cards. After half an hour all participants presented their use case scenario and during the presentations one more use case was added (selected as final use case). Through a voting system three use cases were selected relatively quickly. This method was chosen over the method used in Santander, since there were three more participants present and there was assumed that the foreseen discussion would take up too much time. After the selection, the participants preceded by building out the use cases concerning the barriers and incentive to participate in the use case. Already during this task the preference for one use case became clear and there was decided to work out the use case involving the “Smart Community”. During the next step the participants described the use case very richly, making it harder for them to build and visualize the use case by means of the artefacts. It was necessary to steer them to simplify the initial concept by scaling it down to only one interaction. When this interaction was defined the participants easily put down the object artefacts, mapped the intelligence and visualized the interfaces on the device workshop sheets. During this time the participants were already moving to the discussion. The participants were therefore asked to take their seats again, wrapping the workshop up with an enthusiastic conclusion and discussion.

Accomplishments

- Time management went well, the workshop took exactly 2,5 hours.
- The participants shifted and moved through the different workshop steps very smoothly while discussing.
- Seven new potential use cases were identified.
- From these use cases, three use cases were described in terms of barriers and incentives to participate and one use case was selected collectively.
- The selected use case was visualized in terms of location, objects, intelligence (sensors and network), data flow, interface input/output and actors involved.
- The use case was evaluated in terms of devices and willingness to use these devices for the purpose of the use case.
- By playing out the use case insights were gained in the interaction of the target users with the Internet of Things network.
- The workshop let to a number of requirements, but also covered a number of possibilities to incorporate a number of business models for the new use case.
- An entirely new, feasible and meaningful use case was developed.

Improvements:

- Seven participants is the largest number of people one group can host, ideally a group consist of 5-6 participants. If there are multiple facilitators, multiple groups can participate in the workshop at the same time.
- The setting of the workshop should be set-up before the workshop. A table where all participants can gather around and reach the workshop materials is essential. Next to the table ideally a side table will be available to lay-out the workshop materials.
- The use case derived from this workshop was very rich, this made it difficult to oversee for the participants. By breaking it down in smaller scenarios, the foundation of the use case became clear. More difficult use cases, could be taken to a second workshop solely focussed on visualizing and defining all the possible scenarios and interactions, elaborating on and working the concept out as a whole.

Recommendations for the workshops with the target group:

- The workshop with the target group ideally is recorded on video. This ensures that all valuable data are captured, but also that two facilitators are free to moderate, facilitate and make pictures of the workshop.
- The data can be analysed according to the method of “statement card analysis”.
- In the contrary to the Santander SocIoTal researchers, the SocIoTal researchers in Novi Sad do want to start the workshop with the interaction cards, in order to get insights in the aspects that are important for the target group and to discover new use cases.
- A duplicate of the artefacts has to be laser cut, in order to do the workshop with two groups.

1.1.6 Notes from the researchers and City of Novi Sad

As Nathalie and Rob pointed out IoT is not only a business case and/or a technological development. This is about a concept that involves us all. We all learned how it will have a significant influence on our daily life. We were also directed to think how devices may share information with one another, which could lead to community-backed services such as an automated neighbourhood watch and how the futuristic storage system lets numerous wired devices such as heating systems or security cameras stream data into a storage layer, which then replicates the data into a secure off-site storage location, such as a public cloud, for sharing with other sensors in other homes.

In addition, we were invoked to create a platform to help people in a community to securely pool and share data between themselves and search for solutions on a horizontal level. Nathalie show-cased how the IoT is connects the physical world to the virtual/digital world. It can be anything and everything: from a broken bench or a fire alarm, landscaping of “urban concrete pockets”, painting of the building facades, to giving lectures to schoolchildren. The platform deals with Outsource Software Engineering where everyone may contribute and where the viral network strengthens the connections not just between the devices, but also between the people in different neighbourhoods. By connecting both worlds we will facilitate possible way of communication and dialogue on a horizontal level, thus giving strength to communicate ideas on a vertical level, i.e. with local authorities. In turn, local authorities may reward different projects and initiatives, by promoting IoT (by simply demonstrating the savings in the city budget or how it taught citizens to be more responsible, since this should all be about citizens’ initiatives and projects, not something imposed), by promoting “local heroes”, fostering projects with practical (in kind) contribution, for example.
Novi Sad Workshop also emphasized the point that IoT neighbourhood watch concept will empower citizens to take power back into their own hands. After all, it is up to us to determine how we take control and create new ways of life (and work).

Finally, it was concluded that this network may have the power to reshape our cities and yet it seems that it is being built with little public knowledge. Even more so, it may have huge implications on our wider society.

Next SocIoTal Workshop in Novi Sad will be held in April (see section 5), now with presidents of Novi Sad tenants councils, in order to disseminate and upgrade even further this concept, as well as to engage the citizens. As for us, at this stage, we will also try to engage more LG stakeholders.

Figure 5 Co-creation workshop with DUNAVNET researchers and Novi Sad City officials

Section 5 - Workshop Novi Sad: Developers (29/05/2014)

5.1 The Process

Nathalie explains her background and earlier work (1) in SocioTal with her start–up *Co-creating the Internet of Things.* She begins with a quick introduction round (2). The group consists of :

- developers from DUNAVNET,
- independent software developers,
- a local IoT startup (including its lead-architect),
- the Belgian/Serbian startup allthingstalk.com

She starts the workshops explaining steps to follow thoroughly. The first step consists of handing out cards with images that are specific to the context that we want to investigate or can be as broad as possible and generic. (3) Each participant picks one card out of a set and explains why he or she has chosen that particular one. All cards are then put on the table and the participants are asked to make stories, scenarios – narrative threads – with them. These are the beginnings of potential use-cases. She then asks which three scenarios are the strongest to follow up (4). Then when one particular use case is chosen the participants are asked to map out the Stakeholders (5) and the what, where, when, how and why (6). Then to visualize the entire story by means of pre-made tokens that visually denote the story (building, tree, light, a bench, a car, a lamp, a washing machine) (7) and once this done, they add connectivity by means of adding a ring to the object that will be 'smart' (8). The next step is adding the kind of connectivity through means of tokens that denote 'send', 'listen', 'talk', 'see' and 'brain' (Fog or Cloud). After that the communication patterns are drawn, who is related to who, where, when and how (10). The next two steps are part of the concluding phase where she asks how this entire process is interfaced to end-users (tablet, computer, smartphone).

5.2 The Usecases

1.1.7 Traffic and Congestion

One third of all cars at any given moment in the city are searching for parking in the center. Yet car sharing is not immediately an option for most people. It has to meet certain criteria and to be convenient. The negatives of too many cars are obvious: pollution, traffic jams and congestion of public transport as well. Currently, the timetables on the bus stops do not display real-time waiting minutes. In Novi Sad two main factors are the reason for rise in car commuters, a near doubling in size (to 300.000) in a relatively short amount of time and a higher income that allows people to lease or buy cars.

While discussing traffic management the group asked: what is currently an incentive to take the car, and what is a barrier to take the car? In car sharing money can be an incentive. Among the younger generation there is a need for mobility, not for 'owning' a car. The number of cars "purchased by people aged 18 to 34 fell almost 30%"[25]
As one third of all cars in the city are looking for a parking spot at a given time, sharing information about parking spaces in a real time would help to solve the parking problem, needless fuel consumption and traffic jams.

Third parties have to support this system, as a smart parking program is expensive. So you have to build an infrastructure that can support itself after the initial investments from the city or EU are made. In mapping the stakeholders we see who is involved: citizens, commuters, city council, city planning, maintenance, public transport, pedestrians, city bike - renting bikes, parking services, traffic police, and taxi drivers. The main issue is routing and timing. It takes places mainly in the

city center but also the problem is seen to be spreading out over the city. The problem gets worse during the morning (parents drive their children to school), at the weekend and when it rains. We have different groups of people who are faced with the issue for different reasons. It seems that what they need is some kind of *city dashboard* that shows weather, open parking spaces, traffic congestions, planned maintenance, alerts (fix my street) that pushes notifications to smartphone apps , on hyper local climate, hyper local news for individuals and groups (for example parents allow their children to bike to school through traffic free zones during the morning) offering citizens information on the best time to leave the home, which route to take, which people are taking the same route at the same time (potential car-sharing) and what type of weather is expected throughout the day. One added comment was that the app should learn and be proactive and very easy to use.

Key building blocks are:

- routing
- rain
- timing of activity

1.1.8 Cycling

The steps followed with this method facilitate quickly how a use case is setup by bringing all the ideas together, mapping the participants, the timeline (when are things happening), what type of sensors are needed (what sends, listens, sees, receives) and how the particular use cases can be combined in a broader context that inspires the view of a 'smart city'. The first workshop was organized with the SocIoTal team of NS researchers, who are not necessarily the end users as well. It was clear that structured results can be obtained that allow input from non expert citizens without interfering which will not interfere with the contextualized knowledge of the engineers and city planners in a negative way, but on the contrary, to enrich it with the specificity and history of the location.
Cycling was an important theme in building use-cases:
Card 1: "I like the bicycle idea. It is useful, mobile, and dynamic. In demanding more space for bicycles, drivers take more care."
Card 2: "This looks like a 'smart environment'."
Card 3: "There are elderly people biking. Hmm, a network for bicycle riders? The City is building some tracks at the moment. Could the bicycles be tagged, could they be networked?"
There is a Quit Now smoking app; "is a free service to help you quit smoking and remain smoke-free.[26]" Also in the second workshop it was asserted that Novi Sad has a very strong cycling environment with critical mass for mountain biking in the hills. How can this awareness of cycling life in the city be exploited? The culture is still that bikes are for poor people, you `have to own a car. Also, the information for NS and tourists and the grid of bicycle routes could be improved. Bike theft is also an issue.
First ideas are on how getting people to commute on bike, parking places for bikes and smart locks for anti-theft. Interesting scenarios evolve around microclimate: is it possible to predict hyper-local weather and thus steer biking routes in order to evade the occasional heavy showers in Novi Sad?
These three elements make a very interesting service:

- bike (and car) routing
- different target groups, (i.e. people on their way to work)
- microclimate, local temperature and moisture sensors and rain

1.1.9 Green Zones, Small (streets) and Big (parks)

One of the key elements that ran as a thread through the ideas of the first NS workshop was the notion of *exchange* and *facilitating exchange*. It builds on the *fix my street* and the *smart gardening* in NS where the idea is that incentives drive behavior: "As the area gets cleaner, all the people in the street benefit. The drive for a change needs to be made, by raising people's awareness, and

involving them in different community projects – showing other people that together we can directly influence living environment.
In the second workshop green awareness was high on the agenda again. The idea of more brought up for discussion: The following messages came across:

- we need more playgrounds and green areas for children to play
- we don't have enough green in our city,
- we have to teach the children how to appreciate plants and the environment,
- we have too much concrete — to cold —)
- if we have more playgrounds people would be brought closer together and exchange ideas
- each kid should have its own tree; education is a key issue

As the microclimate in streets is very different, a combination of temperature, moisture and pollution sensors could raise awareness about polluted spots in town that should have more greenery and less cars as a counterbalance.

An important stakeholder in this case is the city itself. One of the participants related how he had planted a tree himself and informed the city services about it for guidance on how to proceed, but was turned down and asked to remove all plants without discussion. He understands that it is difficult to plan if everyone does what he wants, but he is asking primarily for a discussion and debate.

5.3 Reflection on a Meta level from Developers on the Co-creation Process

The co-creation methodology was very highly rated. Allthingstalk.com immediately stated that it would use it by asking their customers to take pictures of their homes as input in building use-cases, "as without end-users systems do not make sense or have no purpose." The general comment of the startups was that this kind of process was exactly what they needed in order to get structured input from end-users and also in order to quickly asses basic flow of data between devices, and User Experience. With this method SocioTal thus influences developers and startups in not telling them but *showing* them how important co-creation in IoT.

Section 6 - Workshop Novi Sad: Janitors (28/05/2014)

One of the key elements that ran as a main thread through the ideas in the first workshop was the notion of *exchange* and *facilitating exchange*. It built on the *fix my street* and the *smart gardening* use case in NS where the idea is that incentives drive behavior, but not necessarily financial – making positive change and being part of the community can also be a driving force for a change. It was therefore decided that the second co-creation workshop in NS will be around this exchange platform with the key stakeholders in that case; the building janitors and selected occupants.
The group composed by janitors, building management professionals, presidents of apartment blocks (chosen by the inhabitants), maintenance professionals, and a representative of DUNAVNET commented that the group possesses a wide set of skills required for building and living area improvements. Janitors and building managers are pragmatic and solution oriented people, quickly decided to focus not on community issues around the houses and the neighborhood but on internal question in the building management. A recent law stipulates that every building has a chosen president, in the meeting we learned that some presidents want to professionalize more in what they do and service more buildings.

Could SocIoTal assist them and build incentivizing mechanisms for different stakeholders to facilitate this?

Inside the building a number of issues can be investigated: flat roofs leaking water, fire security not up to date, sewage and heating systems, security, the noise of different life-rhythms in community space, the community police not being taken seriously, and the issue of the maintenance of the elevators. The participants outlined the following as the key issues regarding elevator maintenance:

- new law requires certification, but there are only three institutions who are able to do this. Remote management would be a huge time gain as now the permits take very long and the elevator cannot function without the certificate
- every elevator has its own closed software system. There is no back up of its history, only a maintenance book that could be anywhere in the building and is a single copy that could get lost
- quality control could be ensured by monitoring the elevator
- monitoring the elevator could also give insight into its use

The notion of a passport for the elevator was proposed (which could be extended to 'heating', 'boiler'…) which could be triggered on a smartphone through RFID or NFC or a QR code. It would link to a webpage where data can be added and stored by different stakeholders: the owner, the companies, the building manager, the maintenance and the inhabitants of the building. It could also be read by the certification authorities that what need less on sight inspections. Such a system will bring transparency to the entire value model.
The key elements of the vision as they were voiced during the discussion in the first and second workshop were:

- a mentality change: "How can we all (ourselves included) make the switch from 'This is their building', to 'This is our building, our street, our park?. This is a mindset change and extremely complex. Pretty much a lot of citizens are depressed. Youth unemployment is very high, much to high. The sense of being a part of the community is missing."
- mixing public and private responsibilities: The funding should come partly from the government and partly from crowd funding and private donors as ownership must be taken by citizens and it should not feel as if everything is already decided. A business model

could be on some basis of vouchers: can I donate time/money or can I buy a plant or tree? I have certain skills, can you use them? In exchange of what?

- not reinventing the wheel: use for example taskrabbit.com in the idea for a portal where citizens can log in and subscribe to donate a gift such as time, money or a tool to solve a problem or cause in the street or neighborhood.

In the second workshop it became clear that the main prerequisites for a smart city supported by citizens is *transparency of the data and information flow for all the stakeholders involved*. In the context of SOCIOTAL this means:

- *an ecology of enablers*: RFID, NFC, QR codes, barcodes
- *a policy ecology* of regulations (local, national and EU) on elevators
- *developer communities* that will be invited to participate in the SocioTal toolkit and *professional communities* that SocioTal provides incentivizing mechanisms for (in this case the Novi Sad building community) for further professionalization in becoming a *Stakeholder Coordinator* in IoT
- *citizens that are invited to co-create scenarios* that are meaningful to them, in this case by giving input to and receiving better services

WP6 is planning a third workshop with this target-group, DUNAVNET and policy and regulatory bodies in Year 2. WP6 and DUNAVNET will prepare a mock-up or demo of the potential service, propose a business model and a data flow (where is the data going and how is it stored), and a privacy and security concept consisting of information bubbles.
The elevator case that was the result of co-creation with the end users and target group will be included by DUNAVNET in WP5 as one of the pilots. When it comes to field trials, it is not yet sure how it will organized i.e. whether the complete scenario will be used in the field trial (in this case we can have the elevator as well) or “we will field trial several components (building blocks) of the pilots (in this case the elevator scenario as a whole will not be a part of the field trial).” (DUNAVNET)

Section 7 - Activities in the Context of the IERC. RDI Chairs AC 8

The aim of European Research Cluster on the Internet of Things is to address the large potential of IoT-based capabilities in Europe and to coordinate the convergence of on-going activities.
The IERC is organized in activity chains and SOCIOTAL. SOCIOTAL leads ***AC8 - Societal Impact and Responsibility in the Context of IoT Applications.*** RD presented first ideas at IERC Athens (March 20-22), wrote and circulated a draft for IERC Marseille, October 7, 8, organized a co-creation workshop in Brussels (April 18, report[27]) and co-organized, and moderated the IoT ethics context at the York Conference on the Philosophy on the Internet of Things (report[28])

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We lack IoT success stories that speak to a big audience of ordinary citizens. There have been successes, but they are at the back end. Maybe the main reason for this was touched upon by Ben van Lier who showed how the old Shannon paradigm of communication allowed the engineers to port 'meaning' onto a different plane that not had to be considered in their work. This explains the huge speed and convergence of efficiency intrinsic system and applications only. It also explains that we feel somehow 'stuck' in 'selling' the platform to citizens who cannot articulate their need and do not see the offered services as something so amazing in the age of their own daily app agency with smartphones and companies like Google, and Facebook gradually spilling over into the real world objects.

The need for non-technical research in the area of machine to machine communication and internet of things, as the developments got closer to market and everyday lives of citizens, was acknowledged in the 1996 EU Call for Proposals of the i^3: Intelligent Information Interfaces, an Esprit Long-Term Research initiative. The aim of i³ (pronounced "eye-cubed") was to develop new human centred interfaces for interacting with information, aimed at the future broad population. This approach "was also the starting point and rationale for the EU-funded proactive initiative "*The Disappearing Computer*" a cluster of 17 projects by interdisciplinary research groups. Its mission was "to see how information technology can be diffused into everyday objects and settings, and to see how this can lead to new ways of supporting and enhancing people's lives that go above and beyond what is possible with the computer today."[29]The third research iteration of this approach was Convivio (2003-2005), a thematic network of researchers and practitioners developing a broad discipline of human-centered design of digital systems for everyday life. The coordinator of Convivio stated that human centered design "still has little influence either on governmental and super-national policies or on industrial strategies. As a result, it also has little impact on the quality of ICT in public and private life."[30]
However, in 2013 some 50% of respondents to a European Commission Public Consultation fell into the "interested citizen" category rather than belonging to a particular industrial, academic or other sector.[31]
In the co-creation workshop with the Santander researchers we touched upon the Santander carpooling case:

One of the final steps in prioritizing the real world scenarios is to question whether the actual end users have the devices which they can use to perform actions and/or receive information. This became quite apparent in one of the Santander uses case that was analyzed at the first co-creation workshop (see 4.1) carpooling. The question rose whether apart from the car owners and car-poolers; the platform itself was an actor? This question led to an advanced option to be discussed as opportunistic carpooling, where "I have a car and a destination and I publish that in real-time on the platform, declaring my route and available seats". Such an advanced case would resemble the Uber service (https://www.uber.com) and be an interesting case to debate with a

particular group of stakeholders, taxi-drivers. The discussion then focused on where the intelligence of the system resides: the person with the smartphone in the car only or in pick up points as well, or in the car itself as well at some point?

This discussion became relevant when in mid-April Neelie Kroes, vice-president of the European Commission, struck out against a court order banning Uber's ride-sharing service *uberPOP* in Belgium. Kroes said she was "outraged" by the decision and said it was designed to protect a "taxi cartel", rather than the best interests of passengers in the region.

Slamming the door in Uber's face doesn't solve anything," she added. Up until now, Uber has been running a ride-sharing service under the brand name uberPOP. It debuted in Belgium only a couple of months ago, and differs from the traditional service by allowing anyone to register as a driver….It sends a bad anti-tech message about Brussels, which is already in the 4G dark ages," she said. "People in Brussels are modern and open, they should have a chance to use modern and open services!"[32]

…

In her official communication she stated: "If Brussels authorities have a problem with Uber they should find a way to help them comply with standards instead of banning them."[33]

In June 2014, thousands of European taxi drivers snarled traffic in cities across the continent, protesting car-hailing services provided by Uber Technologies Inc. and others." The autonomous region of Catalonia in Spain „recently announced plans to fine drivers using Uber as much as €6,000 ($8,000), prompting the app-makers to tell that they wanted "open dialogue" with the Catalan government over the issue."[34]

This debate lies in the heart of SocioTal, will providing new services disrupt the old ones and what is the position of our current partners in the FP projects who are representing the cities? Research shows that the economy of sharing that is fostered by IoT and the changing roles of companies require a Stakeholder Coordinator who negotiates new business models with all stakeholders. Defining the requirements of such a Stakeholder coordinator will be among the foci of WP6 SocIoTal Year 2 activities in AC8.

Section 8 - Detailed Plan for Year 2

D6.2, "Initial socio-economic barriers and proposed incentive mechanisms" (M15) (UNIS) will provide initial insights into technological and socioeconomic barriers identified by T6.1 and will propose several ideas for incentive mechanisms that will be used to encourage users during field trials and pilots. D 5.2 will include actionable strategies to enhance community and citizen adoption of IoT and their validation. The full D6.4 report, "Socio-economic barriers and validated incentive mechanisms" (M33) will share the findings of the study performed on socio-economic barriers on citizen engagement and usefulness of different identified incentive mechanisms. It will also provide the best practices guide for local policy makers and cities.
SocioTal is a set of tools that is used in real world situations with real citizens and their relationships, and neighbourhoods as well as in particular platforms or a SocioTal ,platform. There is a gap between the policy recommendations, academic security research[35] and Privacy Impact Assessment Frameworks and the start-up reality of IoT on the ground. SOCIOTAL bridges this gap by offering easy to use "plug-and-play" building blocks for citizens and at the same time starting points for developers.
The initial technological and socioeconomic barriers identified through the Meetups, workshops, events and desk research are:

- Lack of third party trust providers
- Lack of oversight for SME's in technological landscape and success stories
- Lack of rich scenarios

In Y2 WP6 will investigate these barriers in detail with the *focus groups in the Meetups*, *the Novi Sad target group in the field trials*, *structured debate in the IERC*, a *survey aimed at a broad audience accompanied with in-depth interviews* and *co-creation workshops in Taipei*, the third pilot city in SocIoTal that RD brought into the Consortium. It will identify further different incentive strategies and mechanisms in order to increase end user participation and evaluate their effectiveness and suitability for different user groups (T 6.1)

8.1 Lack of Third Party Trust Providers

As Internet of Things becomes more mainstream and raises business interest, new alliances and applications find their way through the smartphone and app store, it becomes crucial to find out what the barriers to adoption on a wide scale by citizens as end users are, what the enablers are that can motivate quick and sensible uptake and incentive mechanisms need to be facilitated on local, regional, national and EU level. We assume that privacy is a barrier, yet we also know from ethnographic research that "many sociologists, psychologists, and anthropologists have focused on this very human inconsistency between what people say, what people say they have to do and what they actually do."[36] We assume security is a major enabler, yet the MIFARE card is hacked and open and still used by millions of people across Europe and globally every day. Security in real world situations is a business case and trade-off. We assume that convenience may be an incentive, yet maybe facilitating sharing cars, tools and even 'moods', is a stronger value proposition to a Europe in an economic crisis. We also see many more apps that facilitate sharing of all kinds of goods: cars, tools, clothes and even food. Trendwatching.com recently published *The Internet of Caring Things* predicting, "consumers will lavish love and attention on products, services and experiences that unlock new ways to serve these (and other) imperatives. In 2014, then, consumers will embrace a network of connected objects that does just that."[37]

Yet Andreas Kirsch in the IoT Expert Group remarked that the main point that emerged from the work of the subgroup on Privacy is that everyone will be affected but many will not realise it. It is vital that this realization is guided well. Internet of Things by default may have unintended consequences: **"**It was noted that most people use the same concepts when discussing IoT as

when discussing the Internet in general. There is a significant difference, however. IoT involves objects talking to each other without user consent, with possibly un-envisaged functionalities. Cameras, for example, might take on functions that are different from their overt primary functions. These possibilities, once perceived, may cause user anxieties to rise. Moreover, what is the role of user consent if objects may be able to talk to each other spontaneously? It will be very difficult to backtrack after the deployment of millions of chips employing a passive approach to connectivity."[38]

Privacy, security, and ideas in society about data storage and tracking can stall adoption when, for example, combining the analysis of supply and demand, energy enterprises will able to supply a more efficient demand shaping. They will not just give incentives to consumers, but actually turning off devices that are not needed (like the freezer for 20 minutes). Also most of this should happen automatically. In IoT we always face a heterogeneous scenario, in which diverse stakeholders are involved. Main actors are of course energy utilities, but also public entities will be important players. These services need to be coupled with educational programs that explain what is happening in reality.

MIFARE Classic is hacked but still widely used. The recent hole in OpenSSL encryption does not mean that the foundational security building blocks are compromised, but it does mean that we should look at security in a new multidimensional way combining it with trust provided by real world indicators and proximity algorithms like the ones SOCIOTAL is describing.

Nidhi Shrivastava, Director-Business Development, Nevales Networks, adds "High levels of connectedness will pave the way for unique security challenges in data privacy and security. An integrated security solution would be the best way to ensure security under the IoT. It's important that we understand the security aspect well, both as an entrepreneur who is entering the luring IoT array and as an end customer who is waiting to play with the IoT miracles in near future."[39]

In a WP2 discussion Yee Wei Law argued:

"There are cultural conflicts between the developers that shape our cyber world; the review effort must be rethought. It makes sense for the EC, ARC and other funding bodies to commit much more resources to research on not only security schemes, but also practical attacks. While we have been touting the benefits of multi-OS in a perilous cyber world, OpenSSL is one of those software's that straddle the major OS platforms. Perhaps it is time to make a clean-room alternative to OpenSSL?

OpenBSD's Theo de Raadt has shed some light on how the "OpenSSL culture" has contributed to the birth of Heartbleed, a vulnerability in the OpenSSL cryptographic software library. Basically; Heartbleed could have been avoided had the OpenSSL team not implemented a wrapper, apparently for a little performance boost, that defeated the security mechanism that the OpenBSD team has implemented. As users, we have been taking OpenSSL for granted, without ever being aware of the cultural conflicts between the developers that shape our cyber world. Although the code responsible for the Heartbleed has been reviewed, it was not caught. This implies the review effort was not thorough enough. With so many multibillion companies using OpenSSL, we might think some of these companies might have invested in OpenSSL, in the form of performing more tests. If companies were not interested, or showed unjustified trustin such an important piece of software, would the governments be?

The SocioTal notion of context-aware security and privacy is to make protection and sharing of data more controllable by the user and depending on context/behaviour more than a password, as Internet of Things which is mainly about data, before protecting the transmission of the data, we protect and regulate the sharing/access. So in principle, what Heartbleed seems to exploit is actually almost a security paradigm question in which classic password based identification may

need to be replaced, and any authentication may indeed require much more and much stronger means on the client/end user side, and this would involve as well the user control over their own data." (Internal WP2 mailing list)

As monitoring mechanisms will be built into devices themselves this becomes more urgent: "if a guest is charging their electric car at a friend's house, we should consider applications that will understand that the charge should appear on the guest's electric bill and not that of the friend."[40].

The janitor target group in Novi Sad saw identity Management, and authentication, as a key barrier to adoption (see section 5).

SocioTal is part of a wider solution. Mat Honan claims that "The age of the password has come to an end; we just haven't realized it yet." and as solution he projects that "… our new system will need to hinge on who we are and what we do: where we go and when, what we have with us, how we act when we're there. And each vital account will need to cue off many such pieces of information."[41]

And that is "pretty much where SocioTal is at home", according to coordinator Klaus Moessner: "this is a dimension of the future Internet of Things we see coming. Strong devices weakly connected to their cloud masters. Devices running complex, high-level code, making real decisions, and devices that continues working with or without network connectivity. This is not to say that the weak device scenarios are invalid, but the realities around network availability and use cases will make them quite often veer towards more autonomous behaviour."[42]

This kind of security hole makes our SocioTal objective to allow user increase their control over data they provide and to define some zones of security based on trust levels, more relevant. At its heart lies the "trust paradox". The paradox asks this question: how can we design our way out of a situation where people need to trust the environment in order for IoT to deliver what it promises, while they are being told at the same time that they cannot trust that environment?

The following contributions qualitatively support these findings. They are from entrances to the Global Internet of Things Day (iotday.org) organized by RD (Council) and Postscapes.com. The question was what can IoT bring to me and my community?

> *Alvin Zhang*: *In order for the Internet of Things to make the most impact on me it must first demonstrate its security on both hardware and software levels. Personal information must be kept private. Like the Internet, the impact of IoT will depend on the size of the community and its ability to leverage large sets of data. Weak security means less adopters. Less people, less data, less impact.*
> *Nagasai Panchakarla: " In order for the Internet of Things to make the most impact on [my community] it must first improve the quality and accountability. IoT will assist the people to improve the quality of products/services (e.g.: Nurses) they are providing. And it helps people to maintain accountability (e.g.: Reduce Corruption). (from the IoT Day launch questionnaire)*
> *Joachim Lindborg*: *In order for the Internet of Things to make the most impact on [my community] it must first be truly open and not controlled by centralizing cloud systems. Me and my community will participate in smart cities, smart grids, smart transportation etc. only when it is a choice that I can make to opt in or out. When I can take my devices and move to another service when the company breaches privacy rules or I find another that is better. Today all things are owned by provider Silos." (IoT Day)* [43]

1.1.10 Incentive Mechanisms

The SocIoTal **Toolkit offers novel and intuitive tools for developers and citizens to assist in overcoming privacy and security fears** that could hamper widespread IoT adoption including:

- intuitive mechanisms to the user for expressing in which way they want their environment to behave).
- a framework for privacy-preserving context-sensitive communication
- advanced trust and reputation management mechanisms.
- O3.3: Novel encryption techniques for IoT devices allowing the secure communication of data within an IoT device group. A secure communication framework, based on attribute-based encryption as well also threshold cryptography and cluster key management, for efficiently encrypting and decrypting user related information based on defined group and trust relationship, will be investigated and integrated in the communication framework for privacy-preserving communication.
- T2.3: Reputation management (CEA, UNIS, DNET, UME; M4-M30)
- Additionally to a dynamic trust management framework, it is needed in the context of IoT an advanced trust and reputation management mechanisms in order to select the most trustworthy services or IoT data provider. Normally this is done based on the feedbacks provided by other users who previously interacted with those services, but in the context of SocioTal a more dynamic reputation-based model is needed.
- T2.1: IoT Identity management (IdM) (UMU, UNIS; M4-M30)

As a baseline for the definition of a trust, secure and privacy framework, it is critical to define the concept of identity and identifiers translate into the world of IoT. How users' interactions with things affect the scope of identities inside IoT.

1.1.11 WP6 Year2 Activities Lack of Third Party Trust Providers

- WP6 will assist WP1-4 with structured feedback from the focus groups in order to integrate this into the SocIoTal toolkit.
- WP6 will create a format for this structured feedback together with WP1-5 (M14) and the focus groups in the SocIoTal Meetups in Guildford, Ghent, Grenoble, Novi Sad and Santander, in Meetup M16 (January 2015), M18 (March, 2015), M20 (May 2015)
- WP 6 will provide input to the IERC on Identity Management, through AC 8 Working Group IM

8.2 Lack of Oversight for SME's in Technological Landscape and Success Stories

The M2M vendors cannot interface their sensor capabilities beyond optimizing. No one is *asking* for an Internet of Things. Citizens have no clue as to what they can expect, and why they should hand over their washing machines to a local grid to ensure energy efficiency. Is there a positive story possible? A successful IoT means the best possible feedback on our physical and mental health, the best possible deals based on a real time monitoring for resource allocation, the best possible decision making based on a real time data and information from open sources and the best possible alignments of my local providers with the global potential of wider communities. It is "striking that 83 percent of the 1,606 wise women and men Pew and Elon University's Imagining the Internet Center canvassed agreed that the Internet of Things — broadly defined as "a continuing proliferation of tech screens, wearable devices, connected appliances and artefacts, 'smart' grids, and environments full of sensors and cameras" — will have "widespread and beneficial effects on the everyday lives of the public by 2025."[44]

1.1.12 Learning to Work with Unstructured Data

According to Mohana Ravindranath in his article "New skills are needed to work on Internet of Things"[45] the market "could also create demand for a new kind of IT specialist — those who can both engineer new products and process the data they collect; people who are a combination of data scientists and operation managers — people who have both an understanding of how to use data, how to use analytics, and also an understanding of their own business lines." "People need to be able to work with data — often unstructured data at very large scales, and need to be able to explore it," Saxenian said. "Then they need to be able to communicate it with decision-makers." In

their book *Decisive: How to Make Better Choices in Life and Work*, Chip and Dan Heath "described a decision-making process they called multitracking—considering several options simultaneously. The Heaths argued that if we consider more options, even if we ultimately choose not to opt for any of them, we will make better decisions. With the increasing demand for timely decisions, many business leaders may understandably fear that exploring more options will add extra time to the decision-making process. The more we can automate the processing and presentation of more decision-making options, the less we have to deal with any of those options becoming conflated with the ego of an individual decision-maker. Big data analytics, therefore, can enable businesses of all sizes to make better decisions in less time with bigger data and smaller egos."[46]

1.1.13 Learning to Deal with the Horizontal Effects of IoT

Companies are changing roles fast, not on the basis of strong survey results bur rather 'Business Moments[47]'. In September 2013 office supply retailer *Staples* became an early entrant with its announcement of Staples Connect. Comprising an app and a $99 wireless *Connect Hub*, Staples Connect is designed to give consumers a single point of control for their various connected household devices.[48] In the SocIoTal Meetup in Ghent this quickly changing role and need to be dynamic in business models was highlighted when Technicolor Director Ben Vanhaegendoren introduced Qeo, developed in-house from domain specific knowledge based on content and a patent portfolio on very specific media solutions demanding a change in management attitude (going towards open source), a change in customer value propositions, a change in preferred partners (*Techicolor* has joined the *Allseen Alliance*) and a mind-set change in the in house developer teams.

1.1.14 Zero Marginal Cost and the Disruptive Aspects of IoT

According Jeremy Rifkin: "a formidable new technology infrastructure—the Internet of Things (IoT)—is emerging with the potential of pushing large segments of economic life to near zero marginal cost in the years ahead. *Prosumers* (defined as persons who combines the economic roles of producer and consumer) can connect to the network and use Big Data, analytics, and algorithms to accelerate efficiency, dramatically increase productivity, and lower the marginal cost of producing and sharing a wide range of products and services to near zero, just like they now do with information goods."[49] In *RFID and the new carwash equation*, Ken Brott writes that "a new technology, RFID, is rapidly reshaping the way carwash operators evaluate their own businesses and interact with customers." When it was first introduced, in 2005, it was used to identify prepaid customers. Currently, in exchange for a monthly fee, people can wash their cars whenever they want with the RFID tag under the windshield. This "has set off a ripple effect that is changing the way carwash operators think about their business models – as well as the way customers view the carwash buying experience… carwashes. Carwashes that sell monthly passes had traffic volumes that were about 70 percent higher than other non-pass sites." The growth of RFID and monthly pass plans is creating what "we call *a "virtuous cycle"* in the carwash industry. Our theory of this cycle goes something like this: as more customers see other customers whizzing through an RFID-equipped self-pay station and completing their transactions without even lowering their window, they decide that they want the same time-saving convenience too." [50]

1.1.15 Platform Economics

According to Marshall Van Alstyne, a business professor at Boston University, companies have a "really difficult time with the mental models. It's fascinating. Most companies compete by adding new features to products. They haven't been in the business of thinking of how to add new communities or network effects. In many cases, the governance models have not been established. For instance, population density can be determined by mobile-phone distribution. A telecom company owns that data. How do you motivate them to share it? All these sensors are capturing data, but how do you divide the value? Those are the rules that need to be worked out, and that's the missing piece of most of these discussions about the Internet of things. You have to build economic incentives around it, not simply connectivity."[51]

1.1.16 Insufficient Resources in Small Business Communities

There is indeed very little integration as IoT is an ontological and horizontal change happening in all domains and under a lot of different names. There is a clear need: *"Many small business owners feel they have very little resources to help them navigate the vast tech landscape, according to a recent study. It revealed that 64 percent of small business owners still feel "overwhelmed" when it comes to technology. In fact, the study shows that 59 percent of those surveyed said there are "insufficient resources" available in small business communities to help them."*[52]Yet also there it is difficult to see which partner would pay for this service that could support SME on IoT investments. Trevor Harwood, Postcapes: "…it is indicative of the IoT itself in that it covers so many business types and verticals that it is difficult to narrow down into something cohesive to even track or monetize at the moment." In *The Internet of Things: Connectivity and Convergence*, Marissa Tejada, writes: "The Internet of Things is impacting the way businesses run and the business models they follow. A new study from market research firm Frost & Sullivan took a closer look at how IoT devices, from personal robots to 3-D printing to wearable gadgets, are slowly creating a new digital future. This future is accessible to midsize firms, but it requires considerable thought and planning."[53] One trajectory to be investigated is the Swedish cluster platform for transformative solutions[54] which is creating a tool that allows citizens to come together and "move from engaged individuals to clusters of entrepreneurs that deliver the solutions of tomorrow." In order to deliver tomorrow's solutions in an effective way, new tools for collaboration are necessary that bring together stakeholders that usually do not collaborate. Collaborative Cluster Development means that in order to move beyond incremental improvements in existing systems new collaborations are needed. With a virtual cluster platform stakeholders that otherwise would not meet can connect and collaborate in ways that have never been possible before.

1.1.17 Lack of Success Stories

After the first SocIoTal IoT Meetup in Guildford the most prominent question from the focus group was after 'success stories'. As IoT as an IT reality is recent, these is scarce. Scouting for success stories for a publication for the IERC, the editor Philippe Cousin, realized how difficult it was to collect these. The success stories in closed environments centre on predictive maintenance, efficiency strategies, cutting costs and greater transparency in organizational cost structures. 'Adding value', and creating new value, services and products is recent and not openly advertised.

1.1.18 Incentive Mechanisms

One observation in the area of Smart Communities is the proliferation of equipment in the city with a plethora of systems all built in silos: none of them can cooperate. New kind of service or content providers will arrive (car manufacturer/repair, energy provider, retailers) on top of the network operators. The notion of a *Stakeholder Coordinator* in the city centre areas to build strong links between providers, city furniture and infrastructure, retail, SME and small owners, maker spaces and consumer groups is paramount. In *What Stakeholder Theory is Not*, Philps, Freeman and Wicks explain why an integrated stakeholder framework is so difficult: "The term stakeholder is a powerful one. This is due, to a significant degree, to its conceptual breadth. The term means different things to different people and hence evokes praise or scorn from a wide variety of scholars and practitioners."[55] According to both "public and private organizations are increasingly employing stakeholder engagement as an important strategy for improving external stakeholder relations", because "Incorporating stakeholders' opinions is valuable for improving decision-making processes and project implementation." Currently, the prevailing practice domain for stakeholder engagement is largely characterized by complex and dynamic environments containing a wide range of stakeholders, from hostile to conciliatory, from obstructive to collaborative The Internet of Things "is largely characterized by complex and dynamic environments containing a wide range of stakeholders, from hostile to conciliatory, from obstructive to collaborative ", and as such it is an open and on-going environment characterized by change, real-time combinatorial innovation and the status of "experimental evaluation".[56]

The SocIoTal Toolkit offers novel and intuitive tools for developers and citizens to assist in overcoming the inherent uncertainty and lack of grasp of all Stakeholder groups – developers, citizens, enablers and policy – on this fast changing dynamics. WP6 will propose, describe and introduce the position of a *Stakeholder Coordinator* that will enable widespread IoT adoption by assisting the different groups in their own specifity.

1.1.19 WP6 Year 2 Activities Lack of Oversight SME and Succes Stories

- WP6 will investigate the requirements, business model and productivity of the role of Stakeholder Coordinator in the janitor use case in Novi Sad (section 5) (M24) and Taipei, the third pilot city that joins SocIoTal in Y2. This collaboration centers on IoT and‘ Commercial Districts. The contacts are Eva Yi-Yuan Yueh (Deputy Director General, IDEAS Institute, Institute for Information Industry), Shuo-Yan Chou (Distinguished Professor at National Taiwan University of Science and Technology) and Grace Lin (VP, Advanced Research Center, III).57
- WP6 will assist WP1-4 with structured feedback from the focus groups in order to integrate this into the SocIoTal toolkit. The Meetups open up the possibility to bring together all the Stakeholders in an informal setting. In Guildford one of the participants Philip Rambech58 enquired after the involvement of the local Council. He then actively pursued a contact in the Council. He approached Steve Wragge-Morley59 who writes: “I am very aware of the IOT and the possibilities and potential for public service – indeed this has been part of the focus of our Eyehub project and I have been helping develop public service IOT use cases. I totally agree that there is huge potential to harness these technologies for public service. Happy to have a discussion if you wish.” The important aspect of this communication is to realize that although the University Of Surrey is in all these projects the direct link between Sociotal and Eyehub is not made horizontally across the researchers in the projects but vertically from the outside through one of the members of the Guildford Internet of Things Meetups (focus group) who approaches a key figure that is a bridge between the Council and the academic R&D as a citizen and local inhabitant. The case of SocioTal – to encourage citizen participation – is in this particular case thus actively promoted by a citizen participating in just the first Meetup that took place.
- WP 6 will create a format for this structured feedback together with WP1-5 (M13) and the focus groups in the SocIoTal Meetups in Guildford, Ghent, Grenoble, Novi Sad and Santander, in Meetup M14
- WP6 lead RD will introduce the notion of Stakeholder Coordinator in a workshop that Unit "Network Technologies" organises on "Internet of Things: enabling the connection of citizens and regions of Europe" on Thursday October 9th from 9:00 to 10:45 at the Centre Borschette in Brussels.60 The workshop will focus on the opportunities for Internet of Things to create value for the citizens, in the local and regional contexts, finding the right balance and involvement of private and public sectors. Its aim is to exchange views on IoT main issues from both an industrial and societal perspective, nurture a collective understanding of the best practices and grass roots experience when it comes to citizen's use of IoT technologies in the areas of creative applications, smart environments and social innovation as well as large scale pilots.

8.3 Lack of Rich Scenarios, Use Cases and Pilots

From experience in EU projects WP6 leader Resonance Design, being previous Stakeholder Coordinator of IoT-A the technical work packages find it very difficult to believe that they can receive structured input from end users. Requirements that has been set before the project starts influence the scope of the use cases and more requirements after that phase cannot or hardly be accommodated. It is therefore that the Working Group Co-Creation of AC8 - Societal Impact and Responsibility in the Context of IoT Applications set up a gathering at Fo.am Brussels on April 18th, 2014, in order to argue that a separate Work Package Co-Creation and Stakeholder Coordination

(WP CC) is of utmost importance in any forthcoming EU Smart City IoT Project.[61] The WG Co-Creation misses involvement of multidisciplinary teams, end user involvement and meaningful solutions, still seeing a IoT of tech-push in 2014. The reasons are diverse:

- A faster iteration of research and innovation loops making 3 or 4 year output cycles less relevant
- A lack of co-creation methodologies tuned to the EU project format
- As IoT is becoming mainstream new stakeholders set up new dissemination formats bypassing the Conference and academic structures
- As IoT moves from controlled to uncontrolled environments insecurities and ambiguity rise
- Co-creation process and formats that have been developed in artistic practice have not been visible as effective tools

From the entries of the Global Internet of Things Day we find that positive aspects of IoT are stressed in terms of stronger agency of individuals and communities, and that example and best practice is lacking:

Youssef: For [my community] the Internet of Things will enable a better citizen experience, IoE has the potential to solve complex challenges in my city/ community, from achieving energy efficiency(smart lightning), reducing pollution, solving traffic congestion (can't build roads forever), to a high social inclusion and reducing crimes\. It will power up a sustainable economy growth.
Krithik Chandrashekar: In order for the Internet of Things to make the most impact on me it must first tackle the problem of accessibility to all. Including individuals at the base of the pyramid. Only then will the term ubiquitous computing ring true.
Colin Kelly: For [my community] the Internet of Things will enable seamless interconnectivity necessary to take the next strides towards improving quality of life through better health, increased safety, and a sustainable environment.
Milson Munakami: In order for the Internet of Things to make the most impact on my community it must first address the healthcare sector which is one of the most crucial and integral part for any community IoT can be more beneficial and social if we can monitor, manage and control the health care situations of individual and recommend and analysis the symptoms and diseases with more faster and effective way. Thus IoT will influence every individual life as well as whole community and can facilitate ease of governance.
Manjunath Goudar: For [my community] the Internet of Things will give voice to a section of society - lesser privileged, handicapped, women, activist, students, old folks have the power to communicate directly in times of SOS, corruption, abuse, proactively identifying health problems. Allow them to communicate to doctors, police, government, consumer-court. Logging of issues as proof via reading machine data.
Youssef: In order for the Internet of Things to make the most impact on [my community] it must first. get recognized by our leaders as an enormous opportunity for cost reduction (smart use + waste reduction) and Increase revenue (ability to match service/supply to the demand efficiently). IoE follow the meltcafe's law: the more people/process/device connected, the more value it adds. [62]

1.1.20 Pervasive Computing and Ambient Intelligence EU Research Benefits

In i3magazine 2003, Jakub Wejchert of Future and Emerging Technologies Unit, European Commission, project officer of i3 and Disappearing Computer Research Initiatives, said:
"In the long term, as we move towards a 'knowledge-based society', we have to ask: "Have we been supporting only one kind of knowledge up to now"? and "How can we best support different kinds of knowledge"? To do this we need to support a diversity of things we understand by 'knowledge' – ranging from the cognitively abstract, through to knowledge that is 'at hand' and embodied in our physical everyday world, to sequences of past events, and our memories of past experiences…This will involve rethinking what we mean by 'knowledge representation', constructing new forms of 'flows' between content and context, and exploring the balance between the 'global' and the 'local'. Perhaps in the future we will look back to our preindustrial roots as

inspiration – back to a reverence for 'place', 'location' and the importance of the 'being within the world' and the 'here and now'… Perhaps in the future, we will live in a world that is more 'alive' and more 'deeply interconnected' than we can currently imagine?"

In his 2003 text *Lessons learnt from LIVING MEMORY @ 1:3 - listening to and developing technology for ordinary people*, Steve Kyffin of Philips, involved in the *LiMe* project that build an interactive table to be used in the neighbourhood and be placed in community centres, bus stops and other local meeting spaces, says:

- "USEFUL ...listening to and developing technology for ordinary people sums up what we might refer to as Co-Creative design. Involving the end user in a core and proactive manner at all stages in the product or system creation process.
- RELEVANT ...listening to and developing technology for ordinary people is so relevant because the 'ordinary...ness' is the issue. Much of what we concentrated on in Living Memory was the means by which people interact with each other (the technology) and the interfaces to that technology, which we offer.
- IMPORTANT ...listening to and developing technology for ordinary people. The world of stuff is not enough... the design discipline is changing fast. Design must now respond to an economic model which supports the provision of converged and connected solutions, such as LIME, combining products and services to suit individual needs.
- SUCCESSFUL ...listening to and developing technology for ordinary people. The extent to which the project was successful is the subject of the complete review and validation process, which we conducted. Design is often seen as an applied discipline, where fine art may be regarded as the pure discipline. We believe that this is not the case and that it is possible to: research the 'pure' Design discipline in order to develop its future role in differing contexts; to use Design as a research tool to help us better understand and contribute to the changing nature of People, Culture and Society and in turn assist in the integration of emerging and future technologies into the lives of 'ordinary people'; to find more effective tools and research areas for Design to consult and investigate in order to provide more holistic and relevant propositions within our commercial practice.
- INSPIRATIONAL.... listening to and developing technology for ordinary people. Certainly, in all the ways mentioned above...inspired us to find NEW KNOWLEDGE: NEW ROLES FOR DESIGN: ways to integrate SYNTHETICAL and ANALYTICAL research: NEW IP: seeds for NEW OPEN PRODUCTS-SYSTEMS-SERVICES...
- DIFFERENT ... Research is by definition, DIFFERENT, especially when it is this trans disciplinary, collaborative, human focused, artistic and scientific driven end results in such enriched experiences for people... "

We can conclude that industry has been able to capitalize on the early ubicomp and ambient EU projects, enabling them to actualize the idea of the new more participatory user and user-cantered design.

1.1.21 Semantic Interoperability does not equal Everyday Life

Use cases are now often predefined and not always relevant by the time the project gets funding and starts. The content of the use case is then also in the DOW leaving little room to change. There has been no involvement of end users at that stage. Thus in reality the researchers build the use cases without real everyday world input. As the use cases are fixed when the projects start the only input by end users is feedback on what is already decided or prioritization within the use case. Therefore in new smart city projects and in the round of IoT Calls in September 2014 use case should only be described as methodologies and as real world context (body, home, mobility, city) and within the context of the overall IoT-A/Fi-Ware framework, but be open as to the actual content. When the project starts end users and target groups are involved from the beginning in the creation of the actual scope and scenario of the use case.

In terms of gathering requirements ethnographic research shows that even if you manage to give the perfect brief to people in order for them to respond to, you will always get a segment of contradictory results. This in itself is normal and can be used for further work. Often the fact that there is contradictory input is seen as the end of a consulting process, whereas it is a new beginning.

The project, to build a paper boat[63] is about building the boat, investigating the glue necessary for that. At the same time it is about creating awareness about recycling, by doing something that inspires people to do the same. The project, planting berries in the neighbourhoods' is a local gardening exercise that will surprise people into asking themselves ‚is it edible' and as it reveals our ignorance about what grows in our cities it also creates awareness about 'ownership' as that shifts from something belonging to the ‚Council' to something that can be owned by 'all', or by the 'street'. You can only create a sustainable co-ownership with citizens if they are enthusiastic *about* something first. There has to be story. Imagine that as an add-on to the story of local gardening there could be moisture sensors and temperature sensors that could be coupled with a knowledge component. One could imagine that that layer of technology would be seen as a logical and maybe even necessary meaningful layer. A project that presented people with a green cube that lit up when in an area with a lot of trees, based on an open data set from the City Council, was received so enthusiastically that the municipality opened up numerous other open data sets to the researchers and developers who before the project could not get access. A project that centres on how people use their washing machines, creates discussions on waste and water and energy, as well as a debate on what is shareable as services in a neighbourhood, as it searches the boundaries of the tangible outcome of what could be the key issues in making co-creation expertise visible as it facilitates the design of 'meeting', not 'making'. Knowledge comes from an embodied experience of being there.

The role of the co-creation toolset is to support others to take decisions and show them all the structural power dependencies in that process, to make things transparent and to make the decision process itself visible. It is therefore vital that Co-creation is involved in the initial creation of the use cases, their scope and particular scenarios.

Through playful interfaces co-creation can spark participation of communities, creating a temporary dynamic. Currently we see that it is very difficult to build more sustainable, long-term embeddedness. It is exactly at this intersection that the IoT opportunities in smart infrastructural smart city projects could provide this more long term potential for social interaction, provided that the tactics of how to embed these potentials (including the placement of the probes in the city) for self-organisation of citizens and appropriation has to be architected in the design process from the start and taken as seriously as the hard technological expertise. Conceptually this means that we need to make architectural theory of a comprehensive view of public and private in the build environment more actionable for the Smart City projects that still work with notions of public and private space that do not acknowledge that technology is blurring these zones creating an intersections of integration. At these intersections we can make meaningful and sustainable interventions.

Senior User Research Consultant Daniel Boos said*: "I would add that it is not just a tech push, but also some economic push promising mainly more management control or efficiency. I find that especially disturbing in the case of smart cities, because cities are not just about economic efficiency. Do we want to say that it is just co-creation in an artistic practice that is lacking and not yet proven to be effective? Or do we want to stay more generic and say that co-creation processes and practices are missing overall. What is our current understanding of co-creation? I mention this because according to my knowledge, there are still many open questions on how effective and useful co-creation processes are in business and research environments. Within my employer there is currently a belief that it supports an improved user experience and allows to better address user needs. Still there are also some sceptics. This of course also depends on how we define and*

understand co-creation and also if it actually should be effective or actually rather aims to involve participation of those affected. The latter would be more important for a publicly funded project. "Real" co-creation means that the use case is defined during the process. What about recommending to drop the requirement to describe a use case in the beginning and rather start with the description of a problem/issue that a project wants to resolve with the use of IoT technologies? Use cases (including validation, prototyping...) are then an outcome and not the starting point of the process. Next to facilitating the process to include user input, I also would like to emphasize that we should provide some concepts from sociology, (work,social)-psychology or ethnology helping to understand behaviour (and needs) on individual, group, organisational etc level. " (AC8 WG Co-Creation report)

1.1.22 The Collaboration Typology of Ezio Manzini and Rich Scenarios

As citizens' active involvement is the necessary precondition of possible success, according to Ezio Manzini, therefore we need "to take in account why and how people collaborate is a fundamental component: collaborative economies, collaborative services, collaborative consumption, collaborative innovation spaces, collaborative events are very diverse initiatives, with a common denominator: they all ask for collaboration. We can recognize these typologies:

- Vertical collaboration: individual citizens collaborating with solution promoters. Example: Fix my street.
- Vertical and horizontal collaboration: individual citizens collaborating with solution promoters and then, collaborating among them in a p2p way. Example: Carpooling.
- Horizontal collaboration: p-2-p collaboration among citizens. Example: Circle of care and Collaborative housing."

Rich scenarios embed all three types of collaboration:

"So far, all the creative community and collaborative organisations we have seen have been small initiatives. Their micro size is significant because it is the precondition to guarantee the quality of the human interaction within them and the possibility of direct control of what the organization is doing. This gives rise to an important question: can they change scale yet remain small? That is: can they increase their social and economic impact while maintaining the essential, direct collaborative participation they depend on? An observation of on-going trends would suggest that they might indeed be able to. In fact, while in the past century consolidating and increasing the impact of small, local initiatives inevitably led to an increase in size and bureaucratic structures, today, in the age of networks, there are other ways of changing scale: the most traditional, scaling up (or vertical scaling), can be achieved by integrating and synergizing several small projects in larger programs. Scaling out (or horizontal scaling) by replicating small initiatives in other contexts is another potentially very effective possibility. However, both require appropriate conditions, meaning that they need a supportive environment: an environment that is endowed with an appropriate, empowering, enabling ethos (empowering cultures) that is practically supported by different kinds of infrastructure, products and services (enabling ecosystems). Empowering cultures are clusters of ideas, values, visions and quality criteria that trigger collaborative organizations and amplify their impact. They emerge from critical discussion of both existing and emerging ideas and practices. Enabling ecosystems are different layers of artefacts (including services, products, places, communication artefacts, procedures and norms) that provide cognitive, technological and organizational instruments to make collaborative organization possible. They result from assembling existing artefacts or designing new customized, product-service systems." (personal communication)

1.1.23 Vertical Collaboration

The NY Regional Plan Association (RPA) "has created 10 profiles meant to represent — in a statistically true sense — the people who live in the region. The personas will serve as a sort of fictional oversight panel tasked with holding the plan accountable to its true mission. A bigger

problem facing RPA is how to reconcile the shifting nature of demographics in a region as dynamic as New York with the static format of a long-term plan."[64] The developers of the Hudson Yards on Manhattan's West Side and researchers at N.Y.U.'s Center for Urban Science and Progress are partnering up to create a "quantified community" that uses data science to study and improve the urban environment. Combining measurements of the environment, physical systems and human behaviour, said Steven E. Koonin, director of the N.Y.U. center, "*will open the door to understanding and modelling communities in new ways. "The real gold will be in combining the data science and the social sciences," Dr. Koonin said. One result, he said, will be to change traditional disciplines. Civil engineering, he said, has traditionally centered on physical systems rather than human behaviour. In the future, Dr. Koonin said, there may be careers in "human-centered civil engineering" or "civic engineering." Architects and interior designers, he said, study how people interact with buildings and rooms, but without much quantitative information. "Quantitative design," he said, may be a career of the future. "Disciplines will merge," Dr. Koonin predicted, "as a result of the data."*[65]

The SocioTal use cases are in line with the latest Smart City Applications that are competing for the 2014 Postscapes IoT Awards: "From the aqueduct to the automobile, new technologies have always transformed the urban environment. The Smart City award showcases projects that use today's data-driven technologies to shape the cities of tomorrow.[66] **Hello Lamp Post**[67] (907 Votes) "Most of Bristol's public infrastructure has a unique identifier attached to it (postal boxes have a six figure code, benches have seven, storm drains are outfitted with 14 digits). The team's *Hello Lamp* project made it easy for the cities residents to engage in a collective conversation with these tax funded objects and over time with one another using simple SMS messages (Specific objects are "woken" by texting the word 'Hello + the name of the object + its code')". **Points** (pointssign.com, 148 Votes) looks as one may expect a directional sign to look… three arms pointing in different directions, each displaying text of a nearby destination. It's when the arms begin to rotate around towards new directions and the text begins to update that you realize you're looking at something much more cutting-edge. You're looking at the future of how people find where they're headed next. **Sintelur** (54 Votes) is "an M2M sensor device driven by the Carriots IoT platform that is capable of determining the filling level of waste (glass, paper, cardboard, cans, etc.) in the containers."[68] **Streetline Parking Sensors** (streetline.com, 30 Votes) "aims to make smart cities a reality through the use of sensor-enabled mobile and web applications." **Bitlock** (bitlock.co, 39 Votes) "locks and unlocks your bike seamlessly without even having to reach your pocket! Simply walk up to your bike and press the button on BitLock to lock/unlock." The SocioTal use-cases are very much in line with the driving location based aspects that underlie many of these smart city applications. As we iterate and refine the use-cases with input from our four Stakeholder Groups we believe that 'sharing' and 'facilitating sharing' as well as 'collaboration' will become a main driver for adoption of smart city applications.

1.1.24 Vertical and Horizontal Collaboration

Placemeter (placemeter.com, 721 Votes) "was created to give people the power of knowing what a place is like before they get there. We collect and serve up-to-the-minute information like how crowded a place is, how long the wait is, and whether it will get more or less crowded in the next hour." **The Copenhagen Wheel** (superpedestrian.com, 1183 Votes) is a self-contained unit that snaps easily onto the back of any ordinary bicycle and turns it into an electric hybrid." **Thingful** (thingful.net, 65 Votes) "is a discoverability engine for The Public Internet of Things, providing a geographical index of where things are, who owns them, and how and why they are used." Thingful.net, created by technology firm Umbrellium, is a map-based interface that collates information from numerous external Internet of Things data sets. Making this kind of data available „can pay off – which is the philosophy behind much of the open data movement. Open source radiation monitors from **Safecast**, for instance, mapped Fukushima fallout and have shown that Hong Kong's architecture amplifies radiation from a nearby power plant. Users log in and identify themselves and their feeds publicly using Twitter, which founder Usman Haque hopes will start conversations about the data. The idea, says Haque, is "to build many-to-many relationships"

between the devices on the Internet of Things and the people who use them."[69] **The Smart Citizen Kit** (smartcitizen.me, 27 Votes) is "An Open-Source Environmental Monitoring Platform consisting of arduino-compatible hardware, data visualization web API, and mobile app."

1.1.25 Horizontal Collaboration

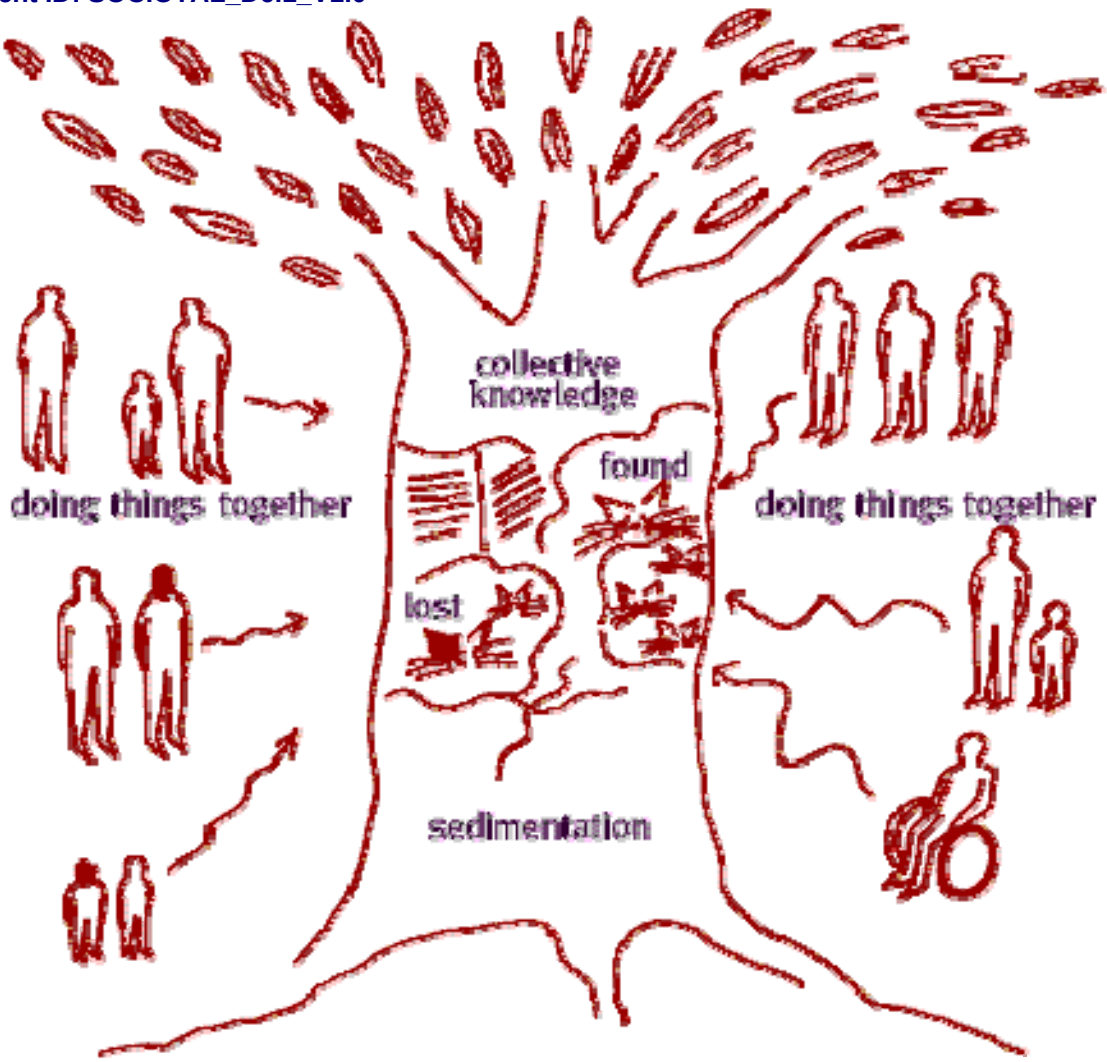
Mayo Fuster Morell did a statistical analysis on 50 cases analysing if the type of infrastructure (and infrastructure governance) might have an impact into the community activities. The research resulted that infrastructure cannot be considered neutral and that have an impact into the scale and type of collaboration engaged by the communities. To models of infrastructure provisions more empowering to users and communities were able to engage more interactive and collaborative communities. However, to engage large communities empowering conditions was not required. In other words, the thesis corroborates the hypothesis in that there is a correlation between infrastructure and scale. However, it is not the infrastructure more open that favours scale[70] : The power dynamic between governments, corporations, and citizens has not been totally overturned, but digitally empowered civil society actors continue to disrupt that status quo in ways that was hard to imagine even just a few years ago, and on a global scale that has surprised even the most optimistic among us."[71]

8.4 Storyfying Experience of Citizens

A large number of citizens are missing meaningful applications, fear that more jobs will be lost by IoT and that Big Brother is just around the corner. It is essential that IoT is storified *with* people, not piloted *at* people. An exemplary scenario that will be investigated is Living Memory. Together with the building blocks listed in this section a policy strategy of co-creation with all stakeholders could lead to realistic scenarios that *confront a Europe in recovery from crisis*, a much more productive vision then *confronting a Europe in crisis*.

1.1.26 Living Memory: Scenario

Living Memory "was a project founded by the European Commission which addresses the research domain if Intelligent Information Interfaces (i3). The programme for i3 was aimed at the broad population, and seeks to create novel interaction paradigms for interacting with information. Living Memory provided members of a selected community, who live and work in a particular locality or neighbourhood with a means to capture, share and explore their collective memory with the aim to interpret and preserve the richness and complexity of local culture. "[72]



1.1.27 The Societal Context

EU GDP ”dropped by 0.5 % during the fourth quarter of 2012, the largest contraction since early 2009”. Employment at EU level has been ”trending down since mid-2011, with positive developments only noticeable in part-time work… , the EU job-finding rate has decreased further, from an already low level, to 11.7 % in the third quarter of 2012, showing that it is ever harder for an unemployed person to find a job Worryingly, ”the share of people running into debt continues to rise steadily.” Unemployment “rose further in the EU in January 2013, to 26.2 million in the EU. It now accounts for 10.8% of the active population, and for 11.9%. In the euro area (or 19 million)… 23.6% of active young people were jobless in January 2013, ranging from 15% or less in Austria, Denmark, Germany and the Netherlands, to more than 55% in Greece and Spain. Italian President Giorgio Napolitano warned that Italy “could be plunged into violent social unrest unless the government swiftly introduced reforms to help struggling citizens, following a week of protests in cities across the country.”[73] The economist Mandel was “unwavering in his stance; technology is a job creator, he said, not a destroyer. And he strongly believes that the Internet boom of the 1990s is not complete. It was a "monoculture", he explained, and the Internet of Things is the "delayed next step" that will boost the economy once again.”[74] We describe this delayed step as the combination of IoT sharing *Tipping Point* and Jeremy Rifkin’s *Zero Marginal Cost Society.*

1.1.28 Sharing Tipping Point; sharing (leasing) is the new buying

Yahoo chief executive Marissa Mayer believes the Internet of Things and mobile will create a "tipping point" for businesses in 2014 that will change everyone's lives "like never before". Speaking at a panel discussion hosted by Forrester at the World Economic Forum (WEF) in Davos, Mayer also cited how "sharing economy" apps are revolutionising the world. She said: "150,000 people let strangers stay at their home last year through Airbnb; 1.5 million people assigned tasks to strangers through TaskRabbit; 56 percept would consider renting out their cars to strangers. "The Internet of Things makes connecting and trusting people easier. Part of this is the sharing economy, but through Internet of Things and mobile we can inspire and entertain people like never before."[75] The Internet of things is "transforming the world through… new business models: companies involved in the "Sharing economy" such as Zipcar can better utilize their vehicles through IoT technology."[76] Johan Corthouse: Sharing is the new buying. "Why would you buy a new lawnmower if you can borrow it from someone in the neighborhood? Why would you buy a new drill if you can lend one from your neighbour? Dutch websites like Wij delen (wijdelen.ggms.nl) are facilitating this. Sites like Thuis Afgehaald make it easy to share food with your neighbours or buy a meal from someone in your street, (thuisafgehaald.be). Autopia helps you to share a car within the neighbourhood, (autodelen.net) This is not a small trend. In the US over 80 million people are sharing goods, 23 million in the UK and 10 million in Canada. These figures come from research from Jeremiah Owyang who claims, "sharing is the new buying." According to Kris Moonen from Oksigen ecosystem for Social Entrepreneurship: "products are becoming services. The consumer is no longer paying for ownership but for the length of time of use." Companies are joining in and facilitate buying second hand". Clothing company Patagonia made a partnership with eBay. Patagonia (campaigns.ebay.com/patagonia/), eBay and You: "Together, we can reduce our environmental impact." Filippa K runs a second hand shop in Stockholm. Habitat buys back old furniture and sells them in a vintage store in Paris. BMW has started a program called Drive Now in which you pay 31 cents a minute and just drive. Leasing company Athlon Cars is offering tailor made leasing packages of full personal mobility: electric car, train, and bike. The Metabo drills of the future, says Kris Moonen, will have a chip that monitors how long and how intensively they are used. You will get a bill accordingly.[77] Connected homes are the most obvious outgrowth. But what about smart skateparks that record your best moves and let you download your stats when you get home? IoT is not just happening because society has become more comfortable with the idea of sharing data. What has changed is that technology now makes this possible. A new Internet address protocol being rolled out across the Web now allows nearly anything to have its own IP address. That's the game-changer that will eventually allow your porch light to automatically sense that your car has entered the driveway and turn on. Or being able to get pointers to put together furniture because your wrench has a tiny chip in it that communicates with your smartphone. That last example may arrive sooner than you think, because Ikea recently asked for unspecified concept designs from a Netherlands-based company that specializes in IoT, *The Incredible Machine*. New developments in IoT are cropping up daily. "Today, a Big Apple-based company, Bug Labs, is launching a Web-based app that allows anyone to collect and publish data from their stuff. The program, Freeboard, allows any device to "Dweet" its data — the machine equivalent of tweeting. But as cool as this all sounds, I'd be remiss if I didn't acknowledge the security risks posed by all these new points of entry for hackers. If I were an investor, I would put money into those companies offering IoT security, and then use my winnings to fund a serious IoT habit."[78]

"The problem is a lot of us can't afford expensive washing machines, and we take the cheap way out. And that results in more profits for cheap-machine manufacturers, more old appliances going to landfill sites and messing up the environment, and, ultimately, more waste of precious resources… Instead of buying and owning the expensive machine, you can rent it."

This service, called Bundles, "is available in the Amsterdam area at the moment. It offers Miele WKG 120 WCS machines, which cost about $1,800 new (roughly a third more than a basic model). Service plans start at about $26 per month (18.95 euros) for 15 loads, rising to about $30 a month

for 35 washes. An engineer comes to your home to install the device, and Bundles deals with any maintenance issues. Founder Marcel Peters has rented out 15 units so far. He keeps track of each one with a "smart plug" that measures electricity flows every two seconds. That tells him how often customers wash, how efficiently they're cleaning clothes, and whether the machine might need repairs (if it's wearing out, it will use more energy to do the same thing). If customers don't use up their quota of washes in any month, he hands back a refund: about 70 dollar-cents per load, up to three loads."[79]

1.1.29 The Work Ethics and the Millennials

"One in four adults between 18 and 34 years old say they have moved back in with their parents after living on their own and according to the Pew Research Center, only 54% of American adults ages 18 to 25 are currently employed, the lowest percentage since the government began collecting data 60 years ago… Millennials (those born from 1980 or 1981 to 2000.) want to work - and despite being shackled by debt, recession, and the jobs crisis- they aren't motivated by money. Rather, they're driven to make the world more compassionate, innovative, and sustainable. These young people aren't motivated by climbing the career ladder or their stock options. The majority of millennials have already changed careers and over 90% of millennials expect to stay in a job for fewer than three years… "There is no clear way 'up' anymore, it's just a *series of projects or jobs, one after another*."… Based on my interviews, I discovered that meaningful work allows you to 1) share your gifts, 2) make an impact in the lives of others, and 3) live your desired quality of life. Getting these three components to align is the goal, but it's certainly not easy."[80]

The massive and record youth unemployment figures in Europe, Spain and Greece, as well as Serbia cannot be ignored in building scenarios and usecase for Smart City pilots. At 57.7% in November, nearly two in three Spaniards under 25 had no job, "and the nail in the coffin for the "recovery" is that this rate is now well above the latest update from Greece, where the youth unemployment was "only" 54.8% as of September."[181]

1.1.30 Support to Decision Making Process

Key findings from the 2014 report, The Hansard Society's Audit of Political Engagement, the only annual health check on British democracy: "Levels of knowledge and interest in politics have improved this year, but the public continue to feel powerless." They feel that they have very little influence on decision-making and that their own involvement in politics will have little effect on the way the country is run…the desire to actually be involved in decision-making, both locally (43%) and nationally (38%) continues to outpace their personal sense of efficacy and influence…67% of the public say 'politicians don't understand the daily lives of people like me'.

1.1.31 Amplifying Interaction in Urban Space

In *Amplifying Interaction in Urban Space*, a position paper for the ArCHI2014 workshop he discusses the Interaction Amplification framework, "aimed to provide a language to discuss the spatial, social and temporal placement of urban interventions. Design recommendations and a deployment strategy are discussed which might aid to increase the impact of urban interventions."

"The goal of the engagement probe is not to develop design insights (although that might be a welcome side-effect), but to test the amount of engagement that is generated in a certain context. Observing hands-on engagement with a probe before final deployment, instead of simply conducting interviews or observing the context, can produce valuable insights. Engagement probes can either be prototypes of the intervention, objects with similar affordances, or artefacts that test the interest and involvement of the public with the general theme or topic. When a location is unsuccessful, a simple tactic is to move the intervention to another location. Care should be taken to offend nobody. Communicating on this strategy early can avoid misunderstandings. This method requires extremely mobile interventions that take only a few minutes or hours to set up." [82]

1

In the practice based PhD project TOWARDS TOGETHERNESS Rosanne van Klaveren "investigates the possibilities of artistry, creativity and new media to create a temporary feeling of togetherness during participatory practices. As a response to her experiences in community art and in contact with indigenous communities, she is investigating how it is possible to create a temporary feeling of togetherness." [83]

1.1.32 Incentive mechanisms

***Incentive mechanisms*: Co-creation workshops with research teams, companies and end users in the early stages of the brainstorm process** (see sections 4 and 5)

1.1.33 WP6 Year 2 Activities Rich Scenario

- **WP6 will organize a survey aimed at a broad audience accompanied with in-depth interview.** Two partners will be asked to join in this task, the DSI project and the UrbanIxD project. RD is part of the external *DSI Advisory Group* (AG) an EU wide research project on Digital Social Innovation. The European Commission has funded the project to build a living map of organizations that use digital technologies for the social good. The *UrbanIxD (urbanixd.eu) project* is collecting data on opinions on innovation in urban interaction design. Ingi Helgason, Institute for Informatics and Digital Innovation, Edinburgh Napier University says: "The project ends at the end of 2014 and we should have some results available in about 2 months. It would be interesting to discuss following up on this work." Discussions are on-going.
- **WP6 will prepare a Draft for the AC8 IERC arguing** that designing trust can not happen on the level of products and services alone but can only happen at a level of system, meaning that designers, engineers and architects should become more political in terms of taking responsibility for their design in the broadest level possible.

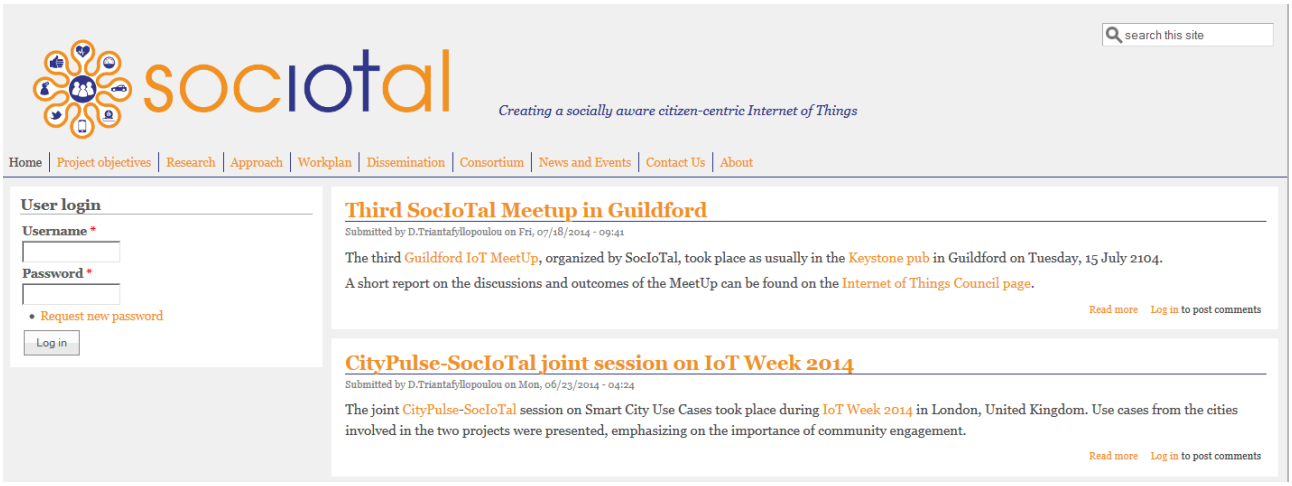
Section 9 - Dissemination Material

9.1 SocIoTal Logo

The project logo defines the project visual identity, creates an easily recognisable “image” and helps to improve the visibility. It should be used prominently in all dissemination tools and printed materials. Next Figure depicts the SocIoTal Logo.

9.2 SocIoTal Web Portal

The SocIoTal website (http://www.SocIoTal.eu) and the repository http://ccsrsvn.ee.surrey.ac.uk/svn/SocIoTal are set up as the basic framework tools. The website follows the EU Project Website - Best Practice Guidelines and it is composed of three main parts. Namely, the homepage with an overview of the project, the repository for hosting public and private documents as well as contact information of the consortium partners. Next Figure shows a screenshot of the SocIoTal web portal.



9.3 Conferences and publications

- Template A1: List of all scientific (peer reviewed) publications relating to the foreground of the project.

These tables are cumulative, which means that they should always show all publications and activities from the beginning until after the end of the project. Updates are possible at any time.

TEMPLATE A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES

NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers[2] (if available)	Is/Will open access[3] provided to this publication?
1	User-Centric Smart Buildings for Energy Sustainable Smart Cities	María V. Moreno, Miguel A. Zamora and Antonio F. Skarmeta	Transactions on Emerging Telecommunications Technologies: Smart Cities – Trends & Technologies	2013	John Wiley & Sons		2013	15 pages	http://onlinelibrary.wiley.com/doi/10.1002/ett.2771/abstract;jsessionid=59F7F562A11D08FECB327A5A4B0D7E96.f04t03?deniedAccessCustomisedMessage=&userIsAuthenticated=false	no
2	A Holistic IoT-based Management Platform for Smart Environments	María V. Moreno, José Santa, Miguel A. Zamora and Antonio F. Skarmeta	IEEE ICC 2014 - Selected Areas in	2014	Xplorer		To appear	6 pages		no

[2] A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to arti http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6803136cle in repository).
[3] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

			Communications Symposium ('ICC'14 SAC')							
3	User Role in IoT-based Systems	M. Victoria Moreno, José Luis Hernández Ramos and Antonio F. Skarmeta	IEEE World Forum on Internet of Things WF-IoT 2014	2014	Xplorer		2014	6 pages	http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6803136	No
4	A Framework for Citizen Participation in the Internet of Things	M. Victoria Moreno, José L. Hernández, Antonio F. Skarmeta, Michele Nati, Nick Palaghias, Alexander Gluhak and Rob van Kranenburg	International Workshop on Pervasive Internet of Things and Smart Cities (PITSaC 2014).	2014			2014	6 pages	DOI 10.1109/WAINA.2014.161	no
5	A New Location-Aware Authorization Mechanism for Indoor Environment	M. Victoria Moreno, J. Luis Hernández and Antonio F. Skarmeta	International Workshop on Pervasive Internet of Things and Smart Cities (PITSaC 2014).	2014			2014	6 pages	DOI 10.1109/WAINA.2014.160	no
6	SocIoTal: Creating a Citizen-Centric Internet of Things	Nenad Gligoric, Srdjan Krco, Ignacio Elicegui, Carmen López, Luis Sánchez, Michele Nati, Rob van Kranenburg, M. Victoria Moreno, Davide Carboni	4th International Conference on Information Society and Technology (ICIST 2014)	2014			2014	8 pages	http://www.yuinfo.org/icist2014/icist_registration.html	no
7	A soft computing based location-aware access control for smart buildings	José Luis Hernández Ramos, M. Victoria Moreno, Antonio J. Jara and Antonio F. Skarmeta	Soft Computing	2014			2014	16 pages	10.1007/s00500-014-1278-9	no

8	An IoT Based Framework for User Centric Smart Building Services	Moreno, María V and Zamora, Miguel A and Skarmeta, Antonio F	International Journal of Web and Grid Services	2014			To appear	24 pages		no
9	DCapBAC: Embedding Authorization logic into Smart Things through ECC optimizations	José L. Hernández-Ramos, Antonio J. Jara, Leandro Marín and Antonio F. Skarmeta	International Journal of Computer Mathematics	2014			2014		10.1080/00207160.2014.915316	
10	Internet of Things Security, Privacy and Trust Considerations	Antonio F. Skarmeta and M. Victoria Moreno	10th VLDB Secure Data Management Workshop (SDM 2013)	2014			2014	6 pages	10.1007/978-3-319-06811-410	
11	Privacy-Preserving Collaborative Anomaly Detection for Participatory Sensing	Sarah M. Erfani, Yee Wei Law, Shanika Karunasekera, Christopher A. Leckie, and Marimuthu Palaniswami	18th Pacific-Asia Conference on Knowledge Discovery and Data Mining	2014			2014		10.1007/978-3-319-06608-0_48	
12	Towards Privacy-preserving Data Sharing in Smart Environments	José Luis Hernández-Ramos, Jorge Bernal Bernabé and Antonio F. Skarmeta	3rd International Workshop on Extending Seamlessly to the Internet of Things (esIoT-2014)	2014			2014			
13	How can We Tackle Energy Efficiency in IoT Based Smart Buildings?	M. Victoria Moreno, Benito Úbeda, Antonio F. Skarmeta and Miguel A. Zamora	Sensor Journal	2014			2014	33 pages	10.3390/s140609582	

Table 1- List of scientific publications

9.4 List of dissemination activities

- Template A2: List of all dissemination activities (publications, conferences, workshops, web sites/applications, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters).

These tables are cumulative, which means that they should always show all publications and activities from the beginning until after the end of the project. Updates are possible at any time.

template A2: list of dissemination activities								
NO.	Type of activities[4]	Main leader	Title	Date/Period	Place	Type of audience[5]	Size of audience	Countries addressed
1	*Conference*	*Srdjan Krco (DNET)*	*Living bits and things 2013: "SocIoTal: Project overview and use cases"*	*13th November 2013*	*Bled, Slovenia*	*Scientific Community, Industry*	*50*	Eastern Europe
2	*Workshop*	*Srdjan Krco (DNET), Rob van Kranenburg (RD)*	*Iot Meetup#1: "Internet of Things in Novi Sad: Technology, the City, Society and Citizens "*	*27th February 2014*	*Faculty of Philosophy, Novi Sad*	*Scientific Community, Industry*	*40*	*Serbia*
3	*TV clips*	*Srdjan Krco (DNET)*	*TV Show "Naukovati" - Internet of things*	*24th May 2014*	*Radio Televizija Novi Sad*	*Civil society*		*Serbia*
4	*Workshop*	*Srdjan Krco (DNET), Rob van Kranenburg (RD)*	*IoT Meeup#2: "Second IoT Meetup"*	*24th April 2014*	*Faculty of Philosophy, Novi Sad*	*Scientific Community, Industry*	*40*	*Serbia*
5	*Conference*	*Srdjan Krco (DNET), Rob van Kranenburg (RD)*	*IoT Meetup#3: "Danube IT conference"*	*29th May 2014*	*Danube IT, Ribarsko ostrvo, Novi Sad*	*Industry (ICT SMEs)*	*100*	*Eastern Europe*

[4] A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

[5] A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).

6	*Conference*	*Srdjan Krco (DNET)*	*Living bits and things 2014: "Fostering End-user involvement into the Citizen-centric Internet of Things"*	*4th June 2014*	*Bled, Slovenia*	*Scientific Community*		*Eastern Europe*
7	*Conference sponsored*	*DNET, UMU*	*PITSaC, International Workshop Pervasive Internet of Things and Smart Cities (PITSaC 2013)*	*14-15 May, 2014*	*Alberta,Canada*	*Scientific Community,*		*Worldwide*
8	*Thesis (PhD)*	*M. Victoria (UMU)*	*An IoT-based Information Management System for Energy Efficiency in Smart Buildings*	*31st October 2014*		*Scientific Community, Industry, Other*		*Worldwide*
9	*Panel*	*M. Victoria Moreno (UMU)*	IoT Week 2014. Best Practices for involving communities in European IoT projects	*19th June 2014*	*London (UK)*	*Scientific Community, Industry*		*Worldwide*
10	*Panel*	*Antonio F. Skarmeta (UMU) Srdjan Krco (DNET)*	*IoT Week 2014. Semantic Interoperability; Security, Privacy, Trust & the ARM*	*18th June 2014*	*London (UK)*	*Scientific Community, Industry*		*Worldwide*
11	*Conference sponsored*	*UMU*	*8th International Conference on Ubiquitous Computing and Ambient Intelligence (UCAmI 2014)*	*2nd-5th Dec 2014*	*Belfast (UK)*	*Scientific Community*		*Worldwide*
12	*Conference*	*Srdjan Krco (DNET)*	*Fostering End-user involvement into the Citizen-centric Internet of Things, IoT week 2014*	*19th June 2014*	*London (UK)*	*Scientific Community, Industry*	*50*	*Worldwide*

Table 2- List of dissemination activities

9.5 Contribution to standards

Based on the initial standardization area considered by the project, a first attempt to identity more concrete areas of possible contribution has been defined. In that sense based on the previous standardization participation and the future interest of the partners, it has been defined as initial target:

- ISO TC21: DUNAVNET is analysing to contribute to this forum in relation to CoAP and security aspects. At the moment they are analyzing the standard and identifying gaps where contributions can be made based on SocIoTal work.

9.6 Cluster Activities and liaison with other projects

1.1.34 Liaison with other projects

In relation to the possible collaboration and liaison with other project, the following have been identified:

- SMARTIE (http://www.smartie-project.eu) – is a FP7 project in the same area as SocIoTal. The vision of SMARTIE is to create a distributed framework to share large volumes of heterogeneous information for the use in smart-city applications, enabling end-to-end security and trust in information delivery for decision-making purposes following data owner's privacy requirements. A secure, trusted, but easy to use IoT system for a Smart City will benefit the various stakeholders of a smart city: The City Administration will have it easier to get information from their citizens while protecting their privacy. Furthermore, the services offered will be more reliable if quality and trust of the underlying information is ensured. UMU and DNET participate in this project, where some of the results related to the security and privacy management on the smart objects solutions could allow to cooperation.
- CITYPULSE (http://www.ict-citypulse.eu) – is a FP7 project looking at Real-Time IoT Stream Processing and Large-scale Data Analytics for Smart City Applications. CityPulse aims at mechanism sto integrate dynamic data sources and context-dependent on-demand adaptations of processing chains, during run-time. The reason for this is that such an approach will help bridging the gap between application technologies for Internet of Things applications and real world data streams. The approach exploits not only data obtained from sensors and IoT devices, but also from social networks, (big) data analytics and intelligent methods are used to aggregate interpret and extract meaningful knowledge from the various heterogeneous datastreams available.
  Initial collaboration between SocIoTal and CityPulse has already been established and a joint session has been organized and implemented during the IoT week 2014 in London in June 2014. Common areas of interest are the approaches to define and verify the use cases that involve larger numbers of end users.
- COSMOS (http://www.iot-cosmos.eu/) is a FP7 project aims at providing mechanisms and means to facilitate smart objects. COSMOS – Cultivate resilient smart Objects for Sustainable city applicatiOnS investigates mechanisms to make things (or their digital representations/instantiations) sufficiently smart to evolve in the way they support services and can be used in smart city applications. The approach aims at enabling things to learn based on experiences (that other things may have made), this, together with situational knowledge will make things aware of conditions and events that may have influence on their behaviour. COSMOS defines the relevant mechanisms and a system architecture based on decentralized management of (smart) things, the ability to adapt during run-time and introducing a suitable security system.
  There is the potential for SocIoTal and COSMOS to cooperate in particular on the platform related issues and initial contact has been established.

- IoT-Lab (http://www.iotlab.eu) - is an ongoing EU FP7 Project which aims at researching the potential of crowdsourcing to extend existing IoT testbed infrastructure for multidisciplinary experiments with more end-user interaction. By federating different and heterogeneous testbeds from the FIRE community and empowering their interaction with the power of virtualization and the cloud, and extending their scale with the inclusion of hundreds of mobile users connected through their mobile smartphone, new and otherwise impossible experiments can be envisioned. Core of the project is the realization of a set of crowdsourcing tools that will allow from one hand experimenters to easily design and deploy their experiments to a large number of participants by including their mobile phones into the existing testbed infrastructure and on the other hand participants to actively participate to experiments by sharing their data, perception, feedback in a privacy preserving manner. The creation of societal value and the identification of profitable business models are key aspects that will be also explored to guarantee success and sustainability of the proposed model.
  Due to the involvement of UNIS and DNET in both projects, collaboration between the SocIoTal and IoT-Lab is taking place along multiple dimensions. Being a common aspect to both projects, discussion on privacy, security and trust could be aligned and fostered during the overall course of both projects, with sharing of solutions produced by both projects in order to achieve a holistic solution of the problem. Additionally, the two projects could perform discussion and sharing of idea in order to identify the most promising methods for calculating reputation scores for data contributed by crowdsourcing user devices
  Finally, collaboration between the two projects could explore the possibility to develop joint trials about possible service with added value for citizens that could be supported using the tools provided by both project and leverage on combined incentive mechanisms for crowd participation and continuous engagement (i.e., IoT Lab citizen forum and priority list).

1.1.35 IERC Cluster Activities

The European Research Cluster on the Internet of Things has created a number of activity chains to favour close cooperation between the projects addressing IoT topics and to form an arena for exchange of ideas and open dialog on important research challenges. The activity chains are defined as work streams that group together partners or specific participants from partners around well defined technical activities that will result into at least one output or delivery that will be used in addressing the IERC objectives.

In relation to the IERC chain activities, based on the expected results from SMARTIE and the scientific challenges considered, the following activity chains have been identified as relevant

- AC1 - Architecture approaches and models. AC1 – Architecture and Open Platforms: SocIoTal will contribute to the architecture and platform activities of the IERC cluster. More specifically, it will take the Architectural Reference Model (ARM) created by the EU FP7 IoT-A project as the basis for its architectural work. The ARM has been embraced by the IERC as a common basis for discussing and aligning architecture activities in the cluster. As SocIoTal is working on a secure IoT framework, it will take the respective AC1 activities into account and actively contribute on security, privacy and trust aspects. SocIoTal has participated during the IoT Week 2014 in the session Semantic Interoperability; Security, Privacy, Trust & the ARM.
- AC8 – AC8 was created by SocIoTal project. In AC 8 we focus on four groups of Stakeholders:
  - A technical ecology of enablers: Ipv6, RFID, Sensors, QR codes, barcodes, large service providers: telco's and data integrators and corporate IT as well as SME and startups.

- A policy ecology of local neighbourhood groups, city councils, regional incubators, national and EU policy makers.
- Developer communities that have sprung up over the past five years with the success of the Arduino, Raspberry Pi, Internet of Things Meetups (20.000 members globally) 3D Printing etc, accelerated by inexpensive open hardware, software, database storage and data analytics.
- Citizens that are invited to co-create scenarios that are meaningful to them.

We want to investigate with each of them: the main barriers to adoption of IoT devices and tools, the main enablers of uptake of IoT devices & tools and incentive mechanisms to facilitate and accelerate the uptake. In this direction, Francesca Bria, Nesta, co-cordinator AC08 - *Societal Impact and Responsibility in the Context of IoT Applications* was in the panel of *Best Practices for involving communities in European IoT projects*: One of the crucial points for the success of European Projects is the adoption of technologies and frameworks. While there are dedicated resources for dissemination activities (including mostly participation in exhibitions, conferences and workshops, as well as the deployment of diverse Pilots), it is quite often that Projects fail to create a sustainable community of stakeholders (end users, businesses, entrepreneurs, etc.) that uses, maintains and improves the outcomes of the Projects. On the other hand, communities and IoT are two notions tightly bound to each other. Thanks to open source hardware and software and the communities of makers and DIYers we have seen the biggest exploitation of IoT technologies in building both open source and commercial projects in the domains of home automation, eHealth and the QuantifiedSelf and the Smart Cities. This session aimed into bringing together community building and dissemination experts of IoT Projects for discussing the best strategies in actively involving communities in the evaluation and adoption of European Projects. Victoria Moreno also participated for the project SocIoTal.

1.1.36 IoT Forum

The Internet of Things International Forum (IoT Forum[6] mission is to support a collaborative environment between industries and research, and drive programs for the adoption of the Internet of Things in existing and new markets in order to create an economically and societally sustainable future by harnessing the disruptiveness of the Internet of Things.

To address industry needs, the IoT Forum will initiate and drive all the necessary activities to ensure a growth of the Internet of Things market, technology and related products and applications as well as education and policies. To achieve this, the IoT Forum will draw on the most recent results from the global Internet of Things research community.

The IoT Forum,has taken over the Architectural Reference Model (ARM) from the EU FP7 IoT-A project. Beyond maintaining the ARM in its current form, it is planning to define specific architectural profiles for which key design decisions, originally left open in the ARM, will be taken. Compliance to such a profile can then be tested and the IoT Forum is planning to introduce labels that certify this compliance. As one such profile, the IoT Forum will establish a security profile. SocIoTal is planning to contribute to the creation of this security profile. DNET, as a member of the IoT Forum, will coordinate this work.

[6] The IoT Forum is a partial result of the European FP7 IoT-i project and was transformed into an autonomous organisation at the IoT Week 2013 by an international set of founding organisations working in the Internet of Things domain. http://iotforum.org/about/

Section 10 - Conclusions

The encountered barriers to IoT adoption that we have identified are not surprising in themselves, but the speed of the adoption rate of IoT by consumers, the fact that IoT was identified by Gartner to top the Hype Cycle and the August 2014 findings that “69 percent of consumers are planning to buy an in-home device in the next five years”[7] show that in balancing the identified barriers towards the different stakeholder groups, it is important to know which particular barrier relates most to which particular stakeholder, in order to storify the enablers and incentive mechanisms in such a way that a maximum transparency is negotiated. This requires procedures that are able to quickly assess dynamic and ongoing events in the IoT space, as well as new formats of quality that match the objectivity of academic papers with the tyoe of content that SME and IoT startups require to feed EU IoT research into their daily practice. With the combination of IoT Meetups as focus groups, co-creation with researchers as well as target groups and desk research based on general IoT resources as well as academic research, SocioTal has set a basis in the first year to refine further into a stakeholder methodology toolkit in year 2 and 3.

[7] 2014 State of the Internet of Things Study From Accenture Interactive Predicts 69 Percent of Consumers Will Own an In-Home IoT Device by 2019. Study Also Finds Ownership of Wearable Devices Will Double in the Next Year. http://www.acquitygroup.com/news-and-ideas/news/article/detail/2014-state-of-the-internet-of-things-study-from-accenture-interactive-predicts-69-percent-of-consumers-will-own-an-in-home-iot-device-by-2019

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