



Technological pillars to enable Smarter (Collaborative + Inclusive) Environments: Internet of Things, Web of Data and Citizen Participation

Workshop Co-Creating of Inclusive and Mediated Public Spaces

13-16 February, Lisbon, Portugal

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<http://www.morelab.deusto.es>

Agenda

1. Introduction: Technological and methodical pillars for Smarter Environment Enablement

2. Part I: Smarter Environments Theoretical Grounding

- What is a Smart Environment?
- Technological enablers: IoT, Web of Data and Persuasive Technologies
- Technology mediated Human Collaboration: need for co-creation
- Killer application domains: Open Government & Age-friendly cities

3. Part II: Review of core enablers for Smarter Environments

- Co-creation methodologies: Service Design and Design for Thinking
- Internet of Things and Web of Things
- Web of Data: Linked Data, Crowdsourcing & Big Data
- Persuasive technologies and Behaviour Change

4. Part III: Implications for CyberParks

- European projects on enabling Smarter Environments: WeLive, City4Age, GreenSoul
- Reflections on the need for collaboration among stakeholders mediated with technology to realize CyberParks

5. Conclusions and practical implications



Smarter Public Open Spaces

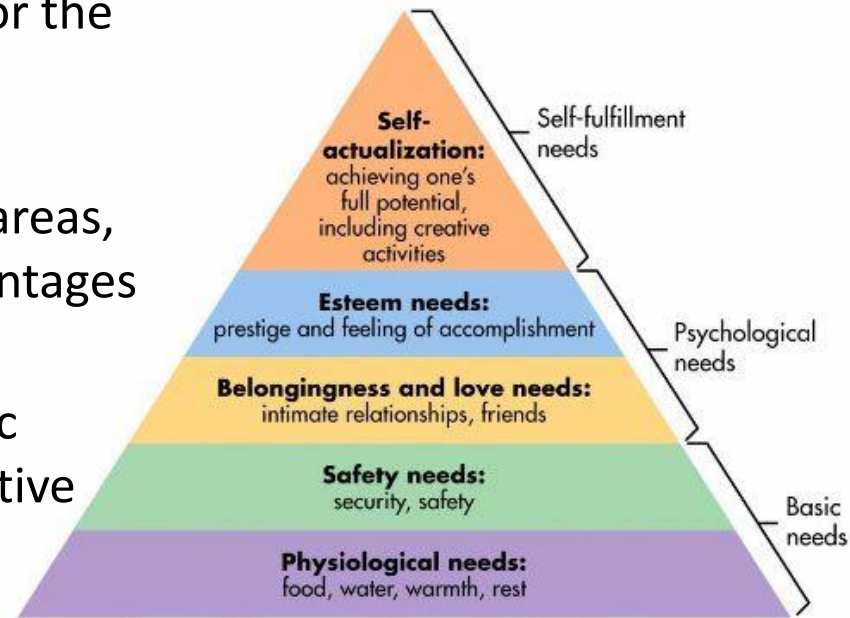
- **Smarter Spaces** → spaces that do not only manage their resources more **efficiently** but also are **aware of the citizens' needs**.
 - *Human/space interactions leave digital traces* that can be compiled into *comprehensive pictures of human daily facets*
 - *Analysis and discovery of the information behind the big amount of Broad Data captured* on these smart spaces deployment

**Smarter Places= Co-Creation/Citizen Participation +
Internet of Things + Broad Data + Analytics**



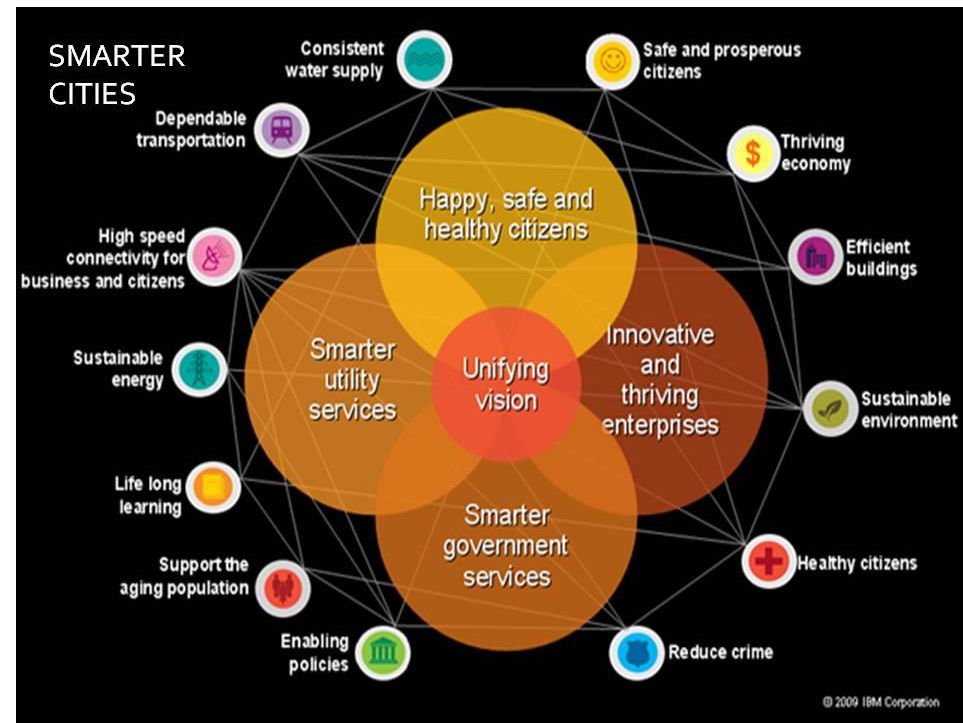
Smart Environments

- **Smart City** is a place where **urban services are improved** in efficiency by applying **ICT**, for the benefit of its inhabitants and economic development
- **Smart Territories** innovative geographic areas, able to build their own competitive advantages taking into account their context
- **Smart Places** → balance among economic competitiveness, social cohesion, innovative creativity, democratic governance and environmental sustainability
 - Satisfying the **basic and self-fulfilment needs in the Maslow pyramid**



Challenges for Smarter Cities

- **Enable life, work and leisure environments** which allow our self-fulfilment without disregarding basic needs and their development in welfare society
- **Answer to the urbanization demands** in a economically feasible, socially inclusive **and sustainable manner**
 - BUT... apply **traditional solutions** to the needs of urban development → **unsustainable urban ecology footprint**
 - Generate more electricity or new water resources not addressing inefficiencies in distribution



ICT as levers of Smarter Cities (I)

- ICTs will help in the urbanization and ageing problems associated to cities **iff the following 3 premises** are fulfilled:
 1. **Social equity**
 2. **Economic feasibility** and
 3. **Environmental sustainability**
- ICTs are key to leverage the existing urban infrastructure and maximize the socioeconomic throughput
 - **A more rational and extensive usage of ICT in cities and places** → a quicker and more economic fulfilment of urban challenges



ICT as levers of Smarter Cities (II): Big | Open | Personal Data

- Big potential for enterprises, social entities and governments if there is a **better usage of infrastructure and information** (IoT + Open + Personal data) **in urban environments**:
 - ***Big Data***: extensive analysis of heterogeneous urban data to **offer answers, indicators and visualizations** to help improving the decision criteria upon the challenges of cities and territory management
- It will allow us to **progress towards more disruptive approaches**
 - All agents should benefit from a more efficient usage of data processing technology to give place to ***Urban or Physical Spaces Analytics***
 - ***Great potential but huge difficulty associated!***



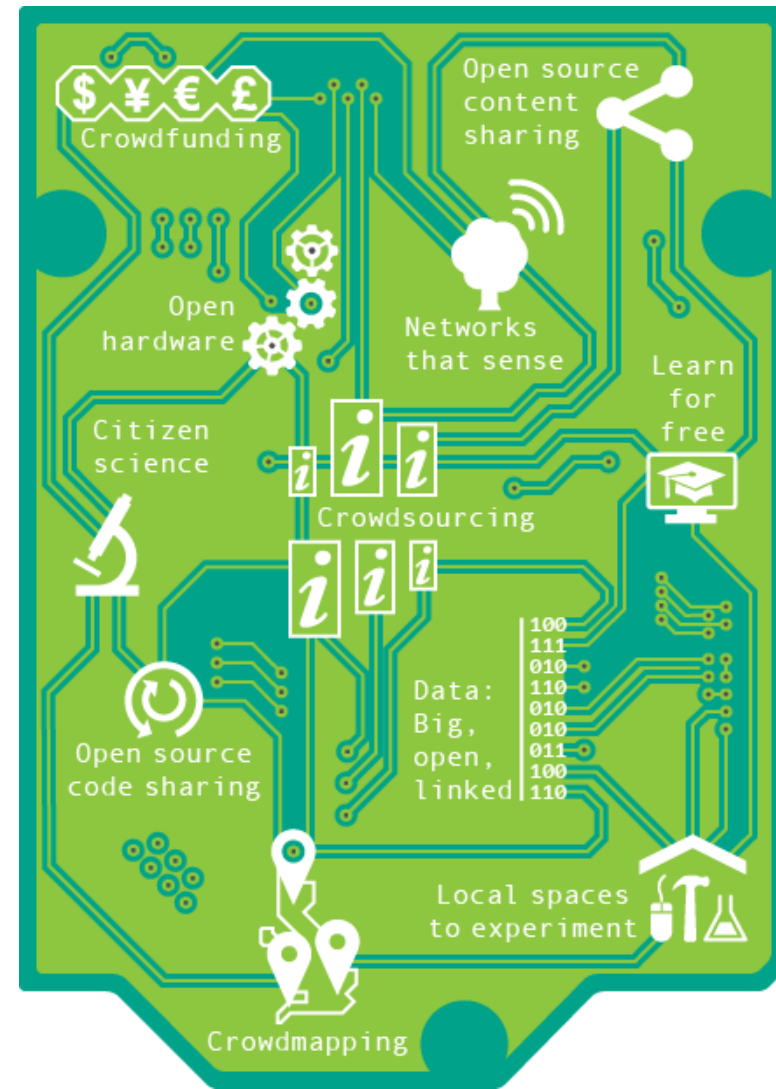
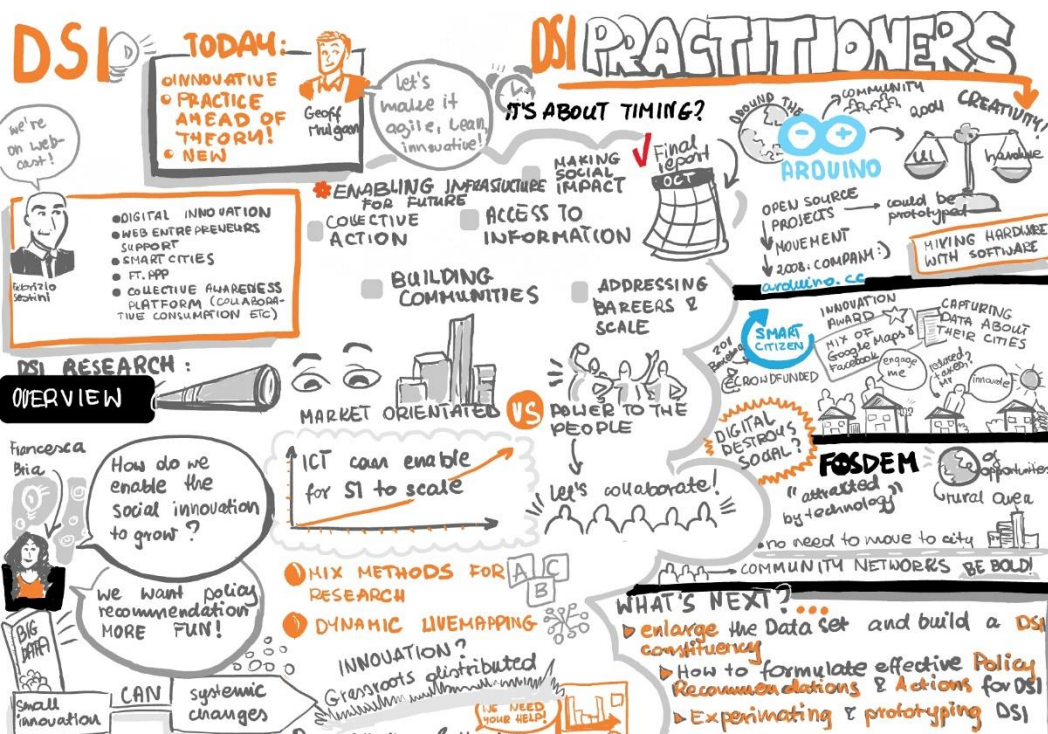
ICT as levers of Smarter Cities (III): Open Collaboration

- **Smarter environments cannot only be reached through technological solutions**
 - We have to take advantage of the **huge potential of collective intelligence** – citizenship capacity to generate knowledge through crowdsourcing techniques and **co-creation** – where ideation and production are socialized
 - **Citizens are increasibly becoming prosumers & makers!**



Social Open Innovation

- **Novel solution to a social problem** that is more effective, efficient, sustainable, or just than current solutions (**CAPS**).
 - **New ideas (products, services and models)** that simultaneously **meet social needs** and create new social relationships



ICT as levers of Smarter Cities (V): Ethical Implications

- **Personal data are the “new petrol” of XXI century**, being exploited by big corporations such as Google, Apple (publicity + marketing) **BUT ...**
 - There are **multiple distributed personal data silos** among different Internet providers and institutions which **have to be interoperable**
 - There is a need for individuals to have a **greater control of their own personal data**
- Governments must:
 - **Regulate, protect, legislate to guarantee the rights and opportunities of such data providers (we)**
 - Legislate and manage **non-functional aspects** (***accessibility*** – technological inclusion, ***privacy, data protection*** and ***ethics*** to achieve responsible technological solutions



**“Personal data is the new oil of the internet
& the new currency of the digital world.”**

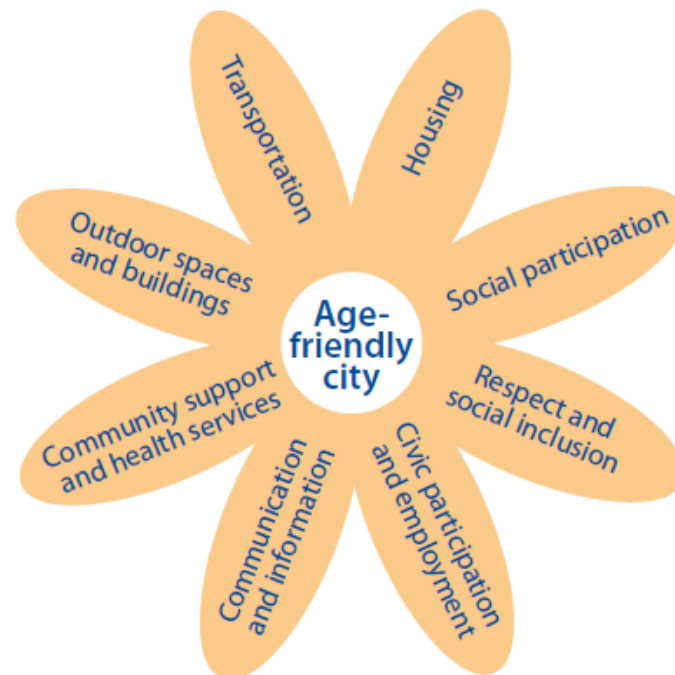
MEGLENA KUNEVA, European Consumer Commissioner

-
- A collage of various personal data points from a data broker, with a central tag that reads "YOUR DATA FOR SALE" and "Everything about you is being tracked—get over it" by Joel Stein. The data points are presented in colorful, overlapping rectangular blocks, some of which are partially obscured by the central tag. The data includes demographic information (age, gender, income), lifestyle details (hobbies, likes/dislikes), and personal identifiers (ZIP code, address, phone number). The central tag is a white, torn-edge paper tag with a hole at the top, featuring the text "YOUR DATA" in large, bold, black letters, "FOR SALE" in white letters on a red background, and a quote in black and red text. The background is a dense, chaotic arrangement of these data blocks in various colors like blue, orange, green, and pink.



Ambient Assisted Cities: Age-friendly Smart Cities

- The main attribute of a **Smart City** is **efficiency**
- An **Age-friendly city** is an inclusive and accessible urban environment that promotes active ageing
- The **main attributes of an Ambient Assisted (Smarter) City** are:
 - Livable
 - Accessible
 - Healthy
 - Inclusive
 - Participative



[WHO Global Network of Age-friendly Cities]



The need for Participative Cities

- **Not enough with the traditional resource efficiency approach** of Smart City initiatives
 - **“City appeal and dynamicity”** will be key to attract and retain citizens, companies and tourists
 - Only possible by **user-driven and centric innovation**:
 - **The citizen should be heard, EMPOWERED!**
 - » Urban apps to enhance the experience and interactions of the citizen, by taking advantage of the city infrastructure
 - The **information generated by cities and citizens must be linked** and processed
 - » How do we correlate, link and exploit such humongous data for all stakeholders’ benefit?
 - Demand for **Big (Linked) Data for enabling Urban Analytics!!!**

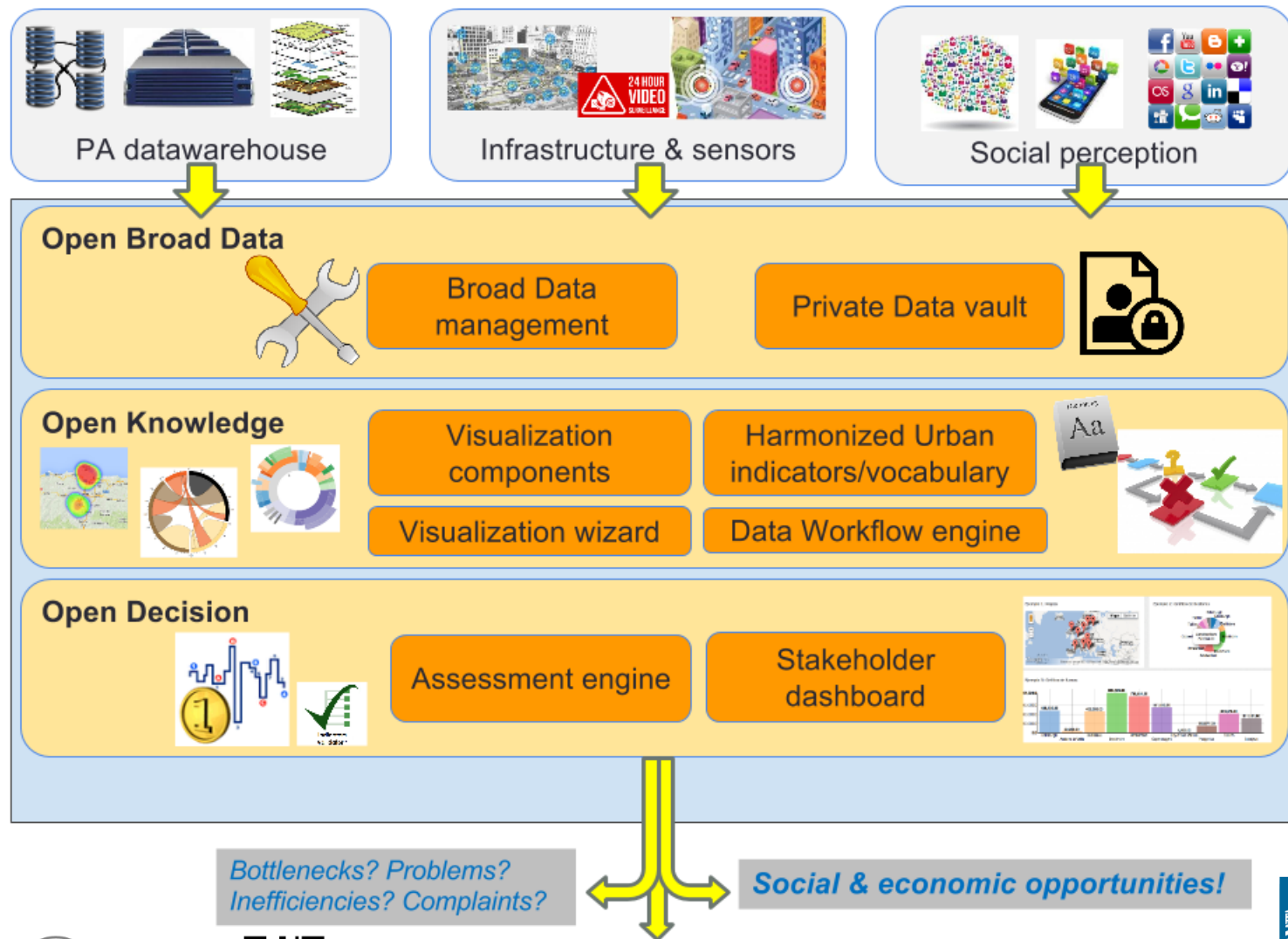


Broad Data Analytics

- **Broad Data aggregates data from heterogeneous sources:**
 - Open Government Data repositories
 - User-supplied data w/social networks or apps (**OSM, Wikipedia**)
 - Public private sector data or
 - End-user private data
- **Huge potential on correlating and analysing Broad Data:**
 - Leverage **digital traces left by citizens** in their daily interactions with the city **to gain insights** about why, how and when they do things
 - We can progress **from Open City Data to Open Data Knowledge**
 - Energy saving, improve health monitoring, optimized transport system, filtering and recommendation of contents and services



From Open Data to Open Knowledge



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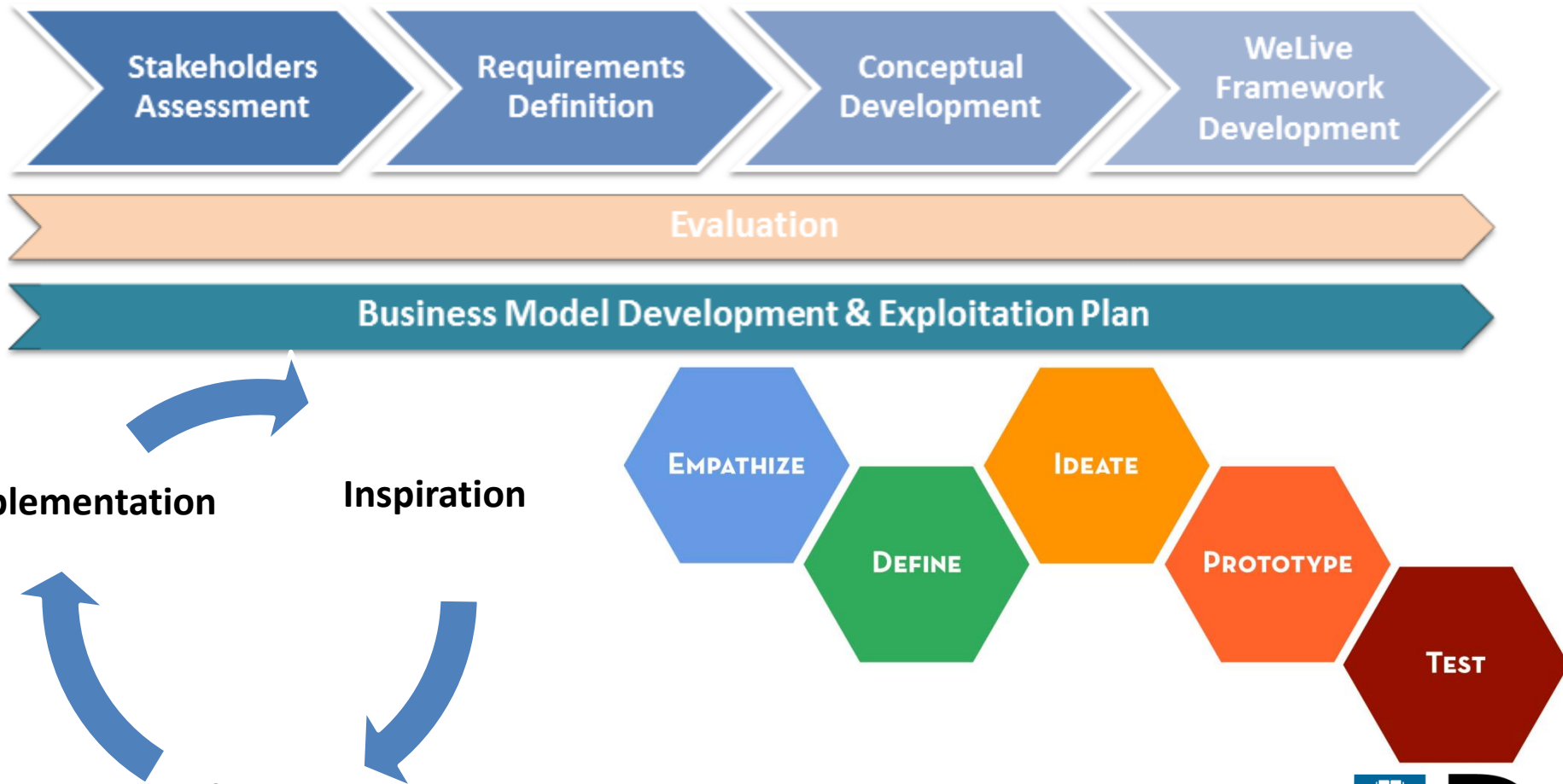
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Co-Creation of public services: service design approach through Design Thinking



Ideation



THE INTERNET OF THINGS *Explained*

10 THINGS YOU NEED TO NOW

WHAT IS IT?

A global network of connected people and devices

WHAT IS IT ENABLED BY?

Decreasing technology costs, sensors, connectivity, APIs, and more...



Artificial limbs
Parking spaces Pacemakers
Toothbrushes Kitchen appliances
Wearable devices Jet engines
Thermostats CARS Lights
Medical devices Personal appliances
Curling irons Home security systems
Anything that has an 'on and off' switch

WHAT ARE WAYS TO CONNECT?



Human to
Human



Human to
Device



Device to
Device

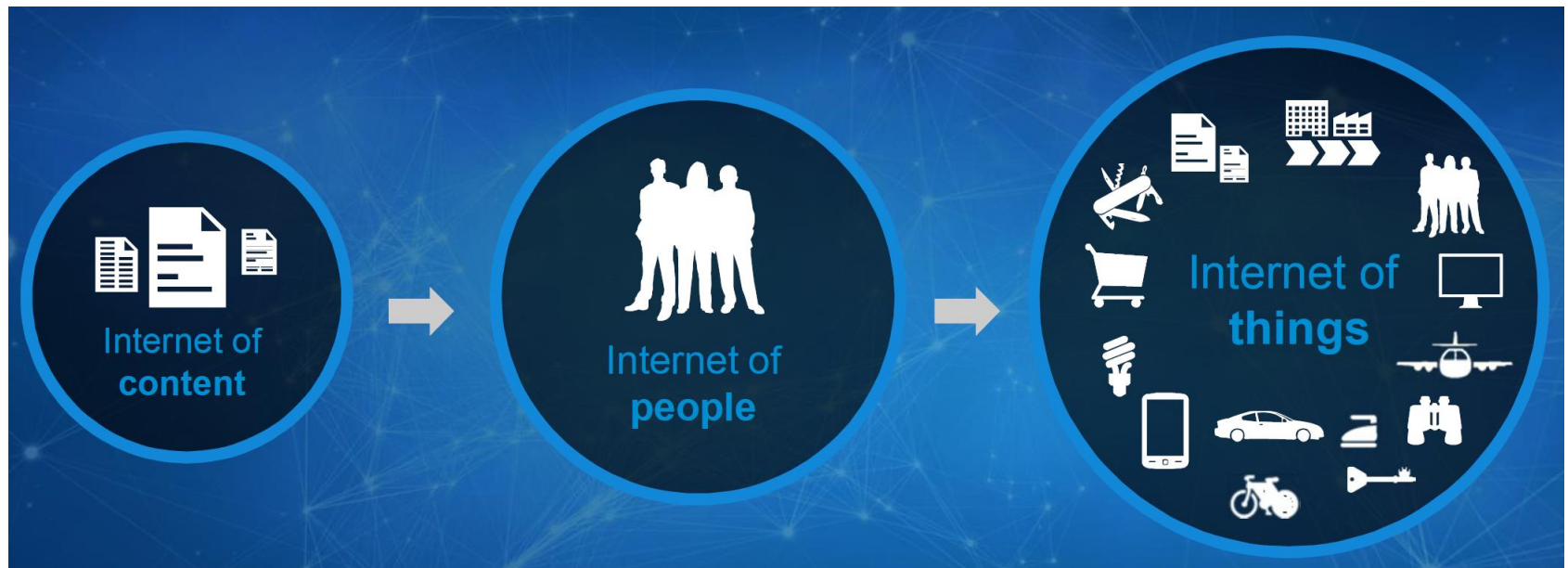
WHAT INDUSTRIES WILL BE IMPACTED?



Virtually all including manufacturing, retail, transportation and logistics, healthcare, energy, agriculture, financial.



Internet of Things ... connecting information, people and things



6 facts about IoT

1. IoT is the term used to describe **any kind of application that connected and made “things” interact through the Internet**
2. IoT is a communication network connecting **things which have naming, sensing and processing abilities**
3. IoT is the **next stage of the information revolution**, i.e. the inter-connectivity of everything from urban transport to medical devices to household appliances
4. Intelligent **interactivity between human and things to exchange information & knowledge** for new value creation
5. IoT is **not just about gathering of data but also about the analysis** and use of data
6. IoT is not just about “smart devices”; it is **also about devices and services that help people become smarter**

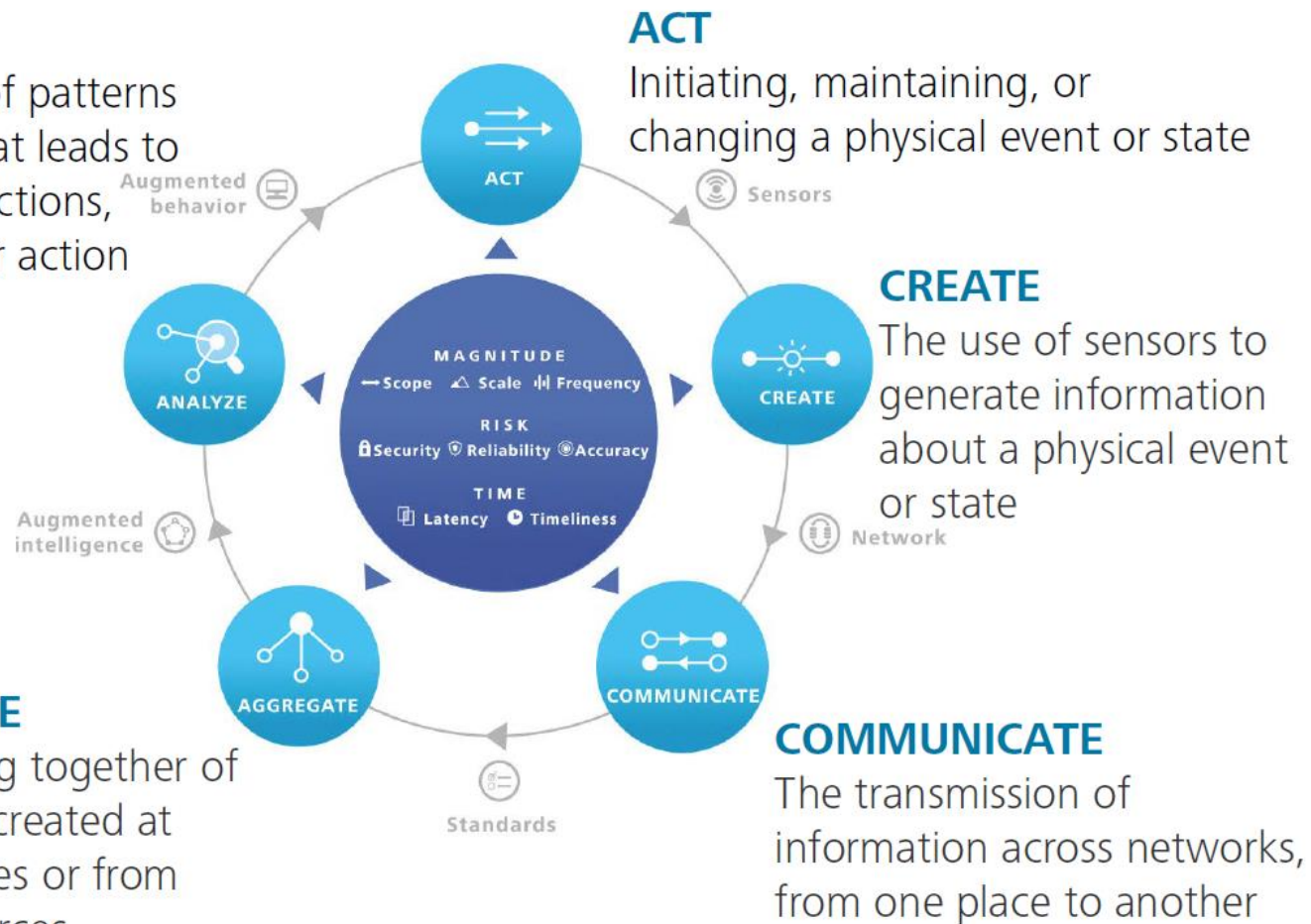


Value of IoT

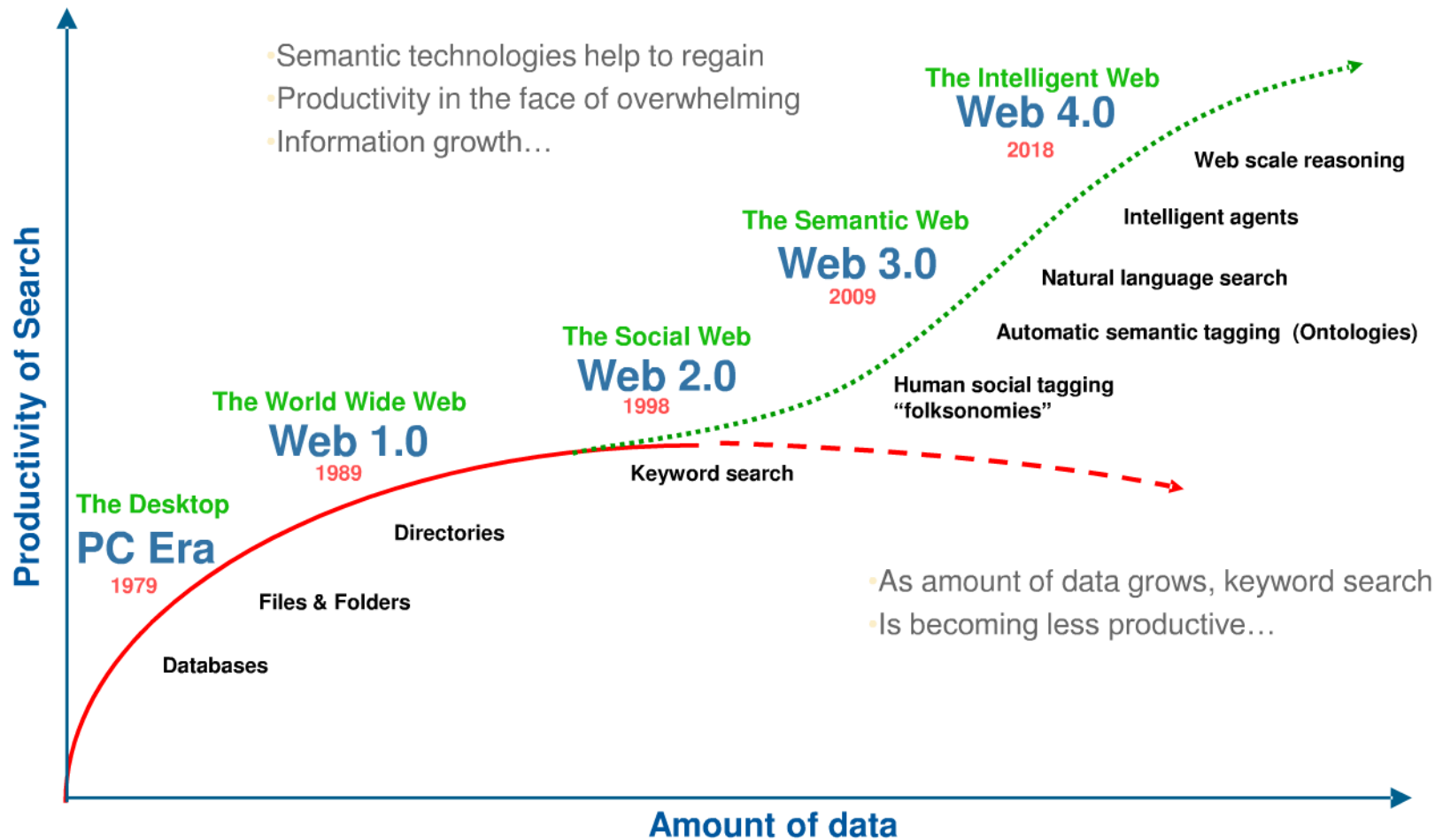
- Information within the Internet of Things creates value in a never-ending value loop consisting of 5 stages (CREATE ... to ACT):

ANALYZE

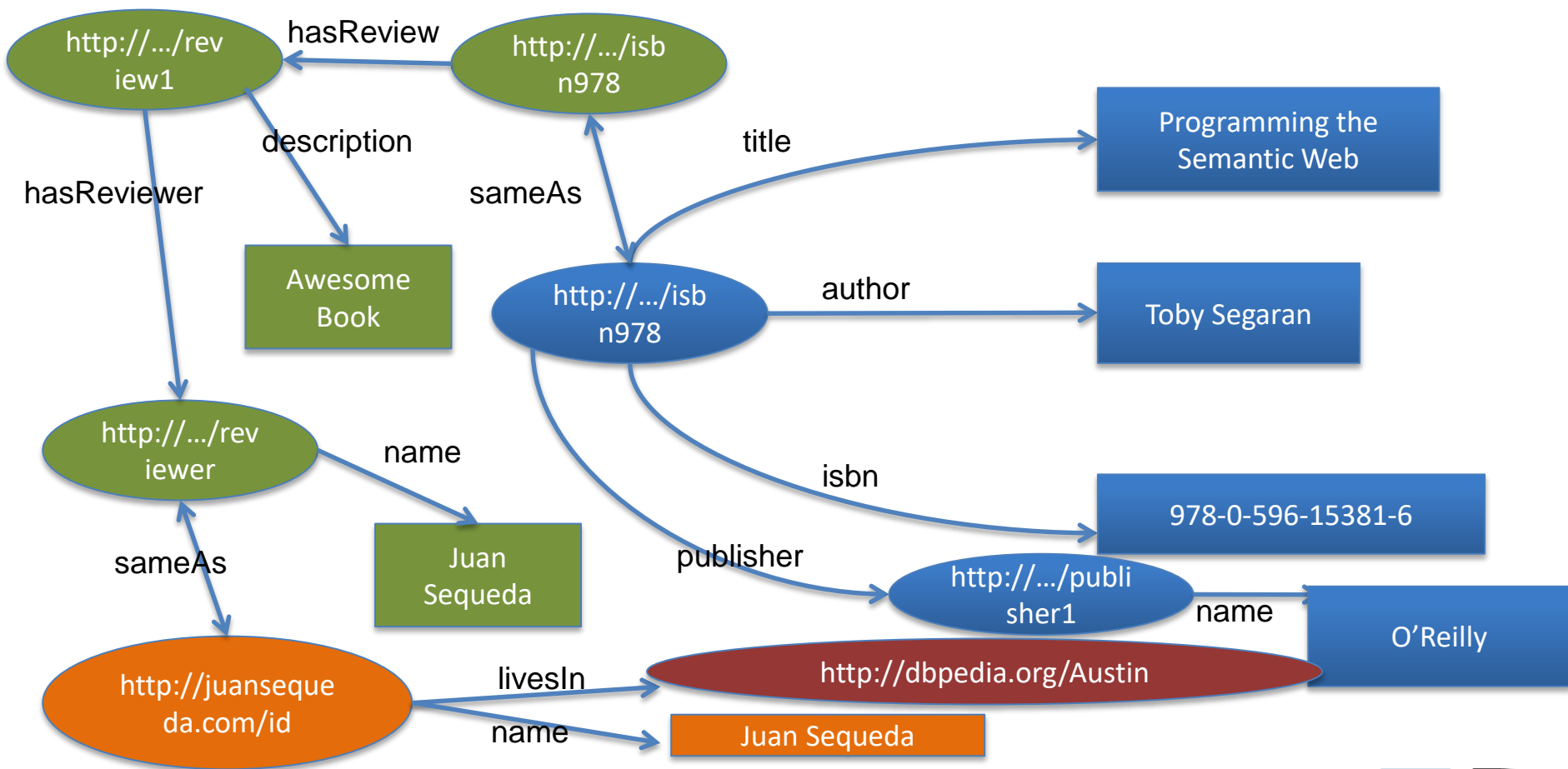
The discernment of patterns or relationships that leads to descriptions, predictions, or prescriptions for action



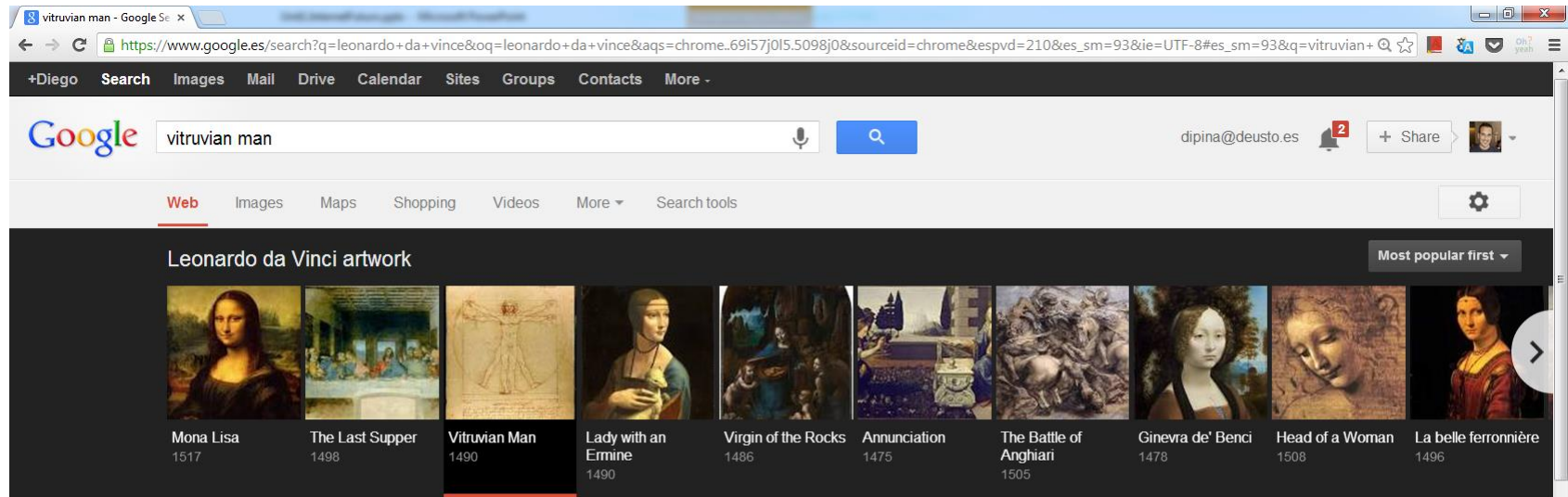
Evolution of the Web



Linked Data Example



Google Knowledge Graph



[Vitruvian Man - Wikipedia, the free encyclopedia](https://en.wikipedia.org/wiki/Vitruvian_Man)

en.wikipedia.org/wiki/Vitruvian_Man

The **Vitruvian Man** is a drawing created by Leonardo da Vinci circa 1490. It is accompanied by notes based on the work of the architect Vitruvius. The drawing ...

[Vitruvius](#) - [Leonardo's robot](#) - [Mirror writing](#) - [Modulor](#)

[The Vitruvian Man - Worlds of Leonardo da Vinci](http://leonardodavinci.stanford.edu/submissions/clabaugh/.../leonardo.html)

leonardodavinci.stanford.edu/submissions/clabaugh/.../leonardo.html

leonardo's **vitruvian man**. "We know very little about Leonardo's apprenticeship in Verrocchio's workshop, but the short account provided by Vasari confirms that it ...

[Da Vinci's Vitruvian Man of math - James Earle - YouTube](https://www.youtube.com/watch?v=aMsaFP3kggQ)



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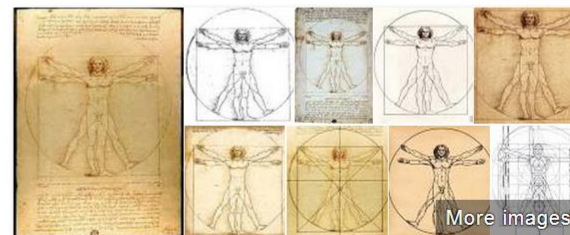
Jul 11, 2013 - Uploaded by TED-Ed

View full lesson: <http://ed.ted.com/lessons/da-vinci-s-vitruvian-man-of-math-james-earle> What's so special ...

[BBC - Science & Nature - Leonardo - Vitruvian man](http://www.bbc.co.uk/science/leonardo/gallery/vitruvian.shtml)

www.bbc.co.uk/science/leonardo/gallery/vitruvian.shtml

An introduction to Leonardo da Vinci's 'Vitruvian Man' sketch with bbc.co.uk's guide to



Vitruvian Man

Art work

The Vitruvian Man is a drawing created by Leonardo da Vinci circa 1490. It is accompanied by notes based on the work of the architect Vitruvius. [Wikipedia](#)

Artist: [Leonardo da Vinci](#)

Dimensions: 34 cm x 26 cm

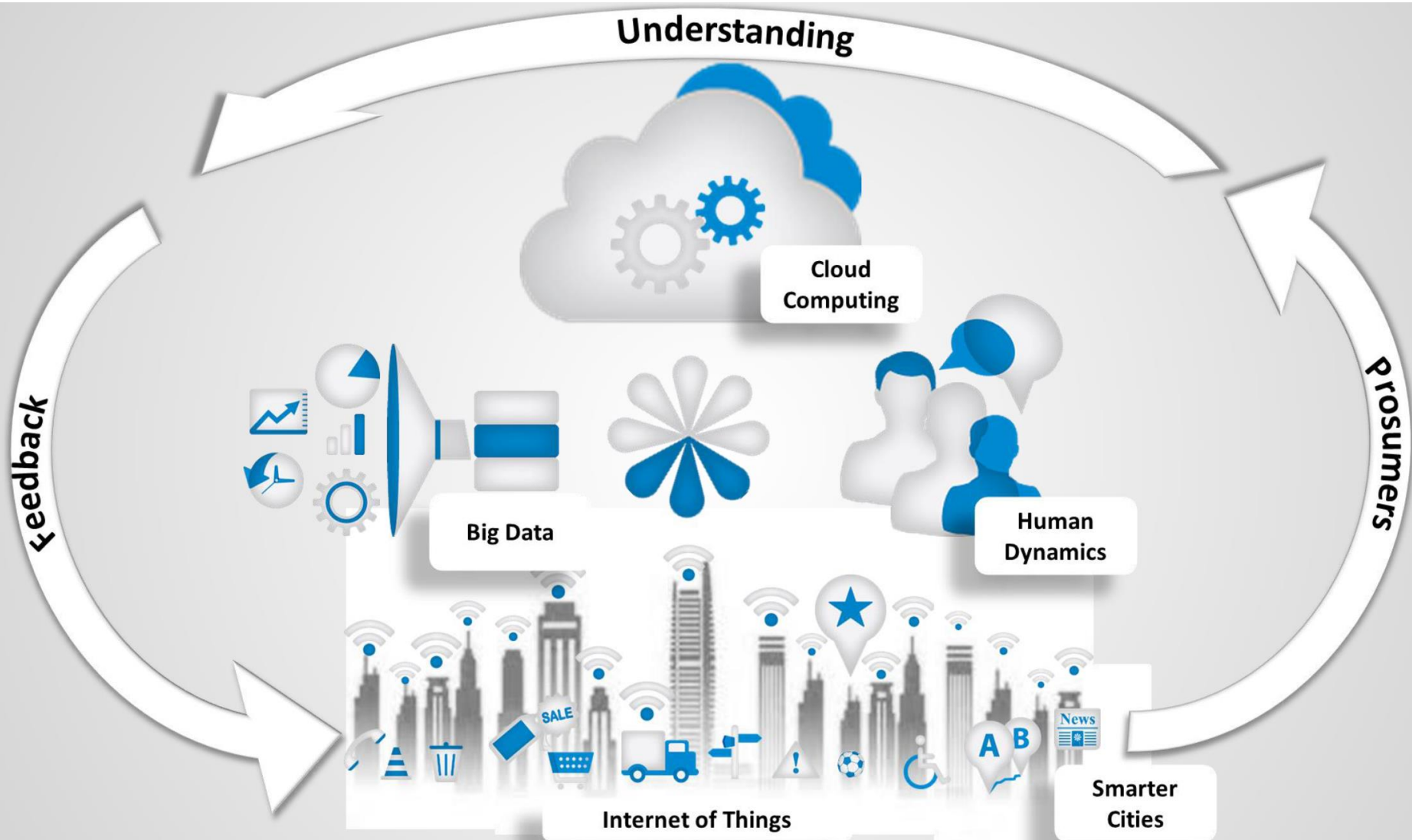


Data has changed

- 90% of the world's data was created in the last two years
- 80% of enterprise data is unstructured
- Unstructured data growing 2x faster than structured




Analytics in the Smart City: Data-driven decision making




Big Data's 4 Vs



Ingest massive volumes of data – with parallelization




Bring analytics to data – and vice versa



Elastically execute on large-scale requirements



Innovative analytics models

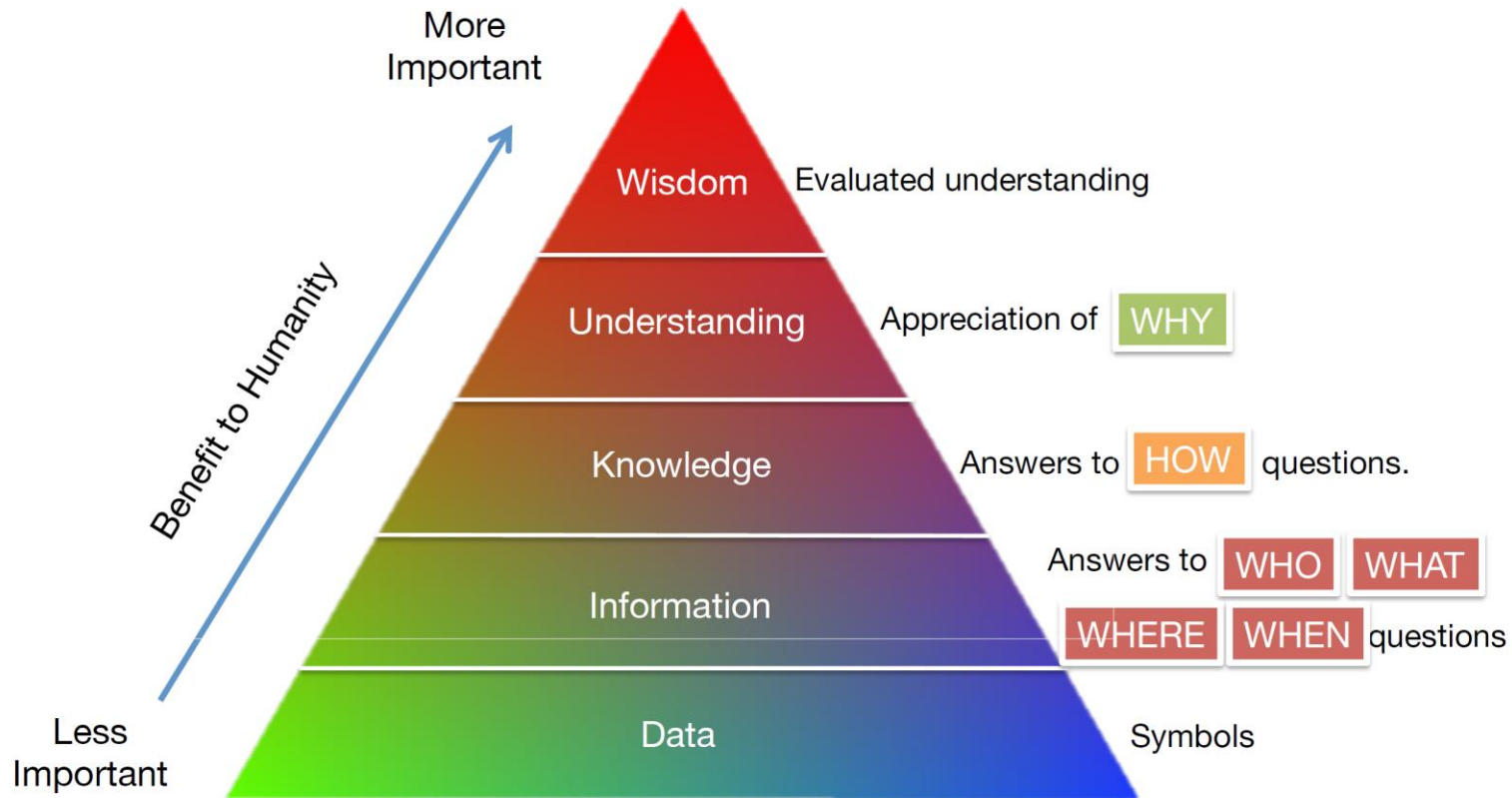


Various data sources
Enterprise (operational and business) Data,
Industrial Data & External Data

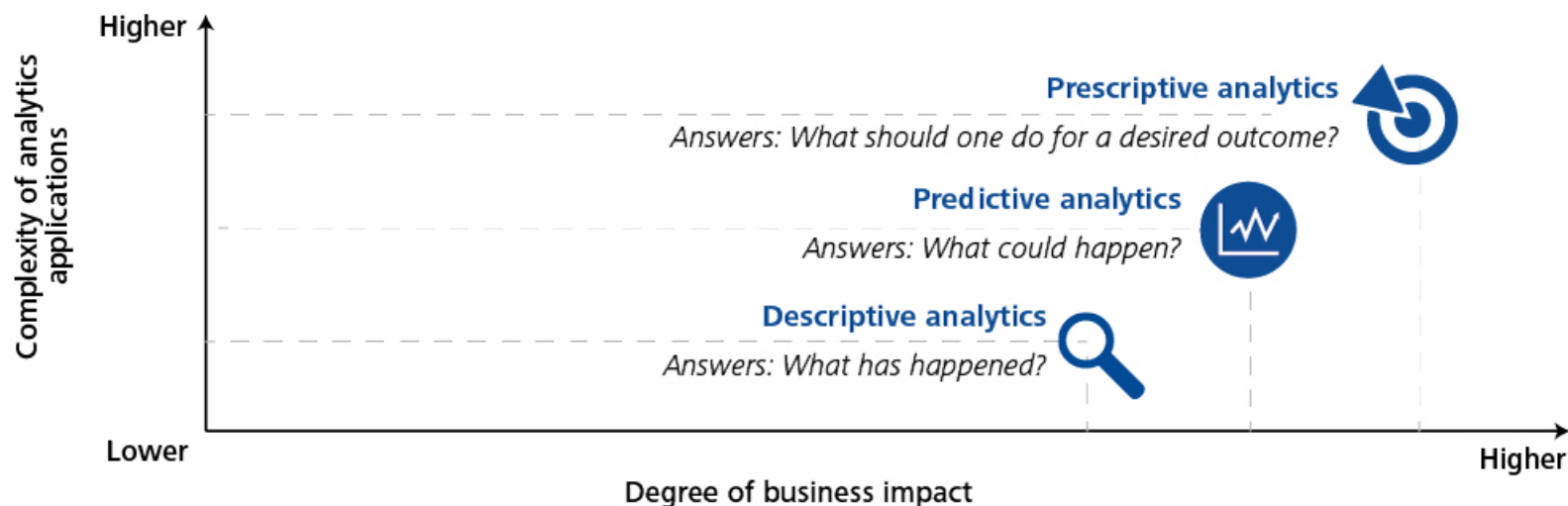


IoT & Big Data enabling Smart Spaces

- The more data that is created, the better understanding and wisdom people can obtain



Types of Analytics (I)



Degree of business impact represents the shift from post-mortem analysis to informed future planning based on past experiences. The shift in the basis of decision making from hindsight to insight and foresight could help companies move closer to a business objective.

Complexity of analytics applications refers to the algorithmic sophistication of analytics tools used and characteristics (for example, scale, scope, and frequency) of data sets used.

The shift from descriptive to predictive and prescriptive analytics requires increasingly complex analytics applications (data scientists, large and clean data sets, big data tools); however, the higher degree of business impact should prompt companies to ascend the analytics stack and leverage the copious amount of data to aid decision making and action.

Graphic: Deloitte University Press | DUPress.com



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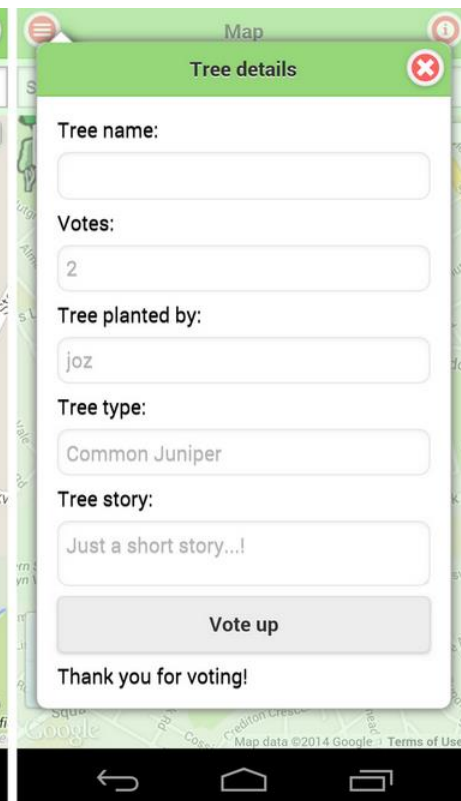
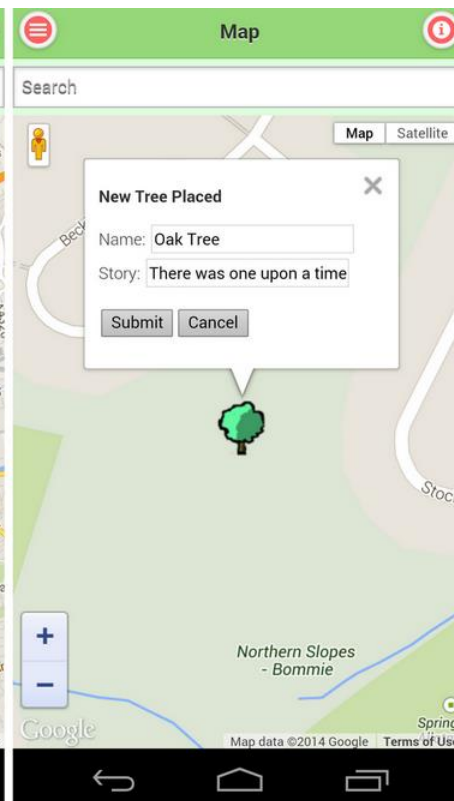
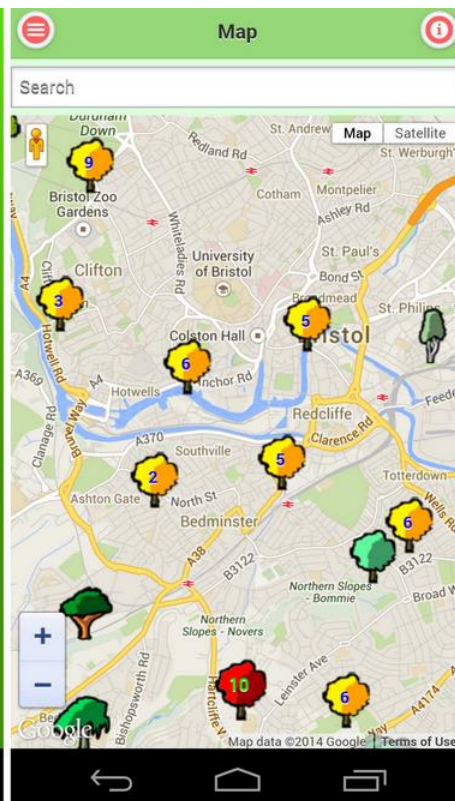
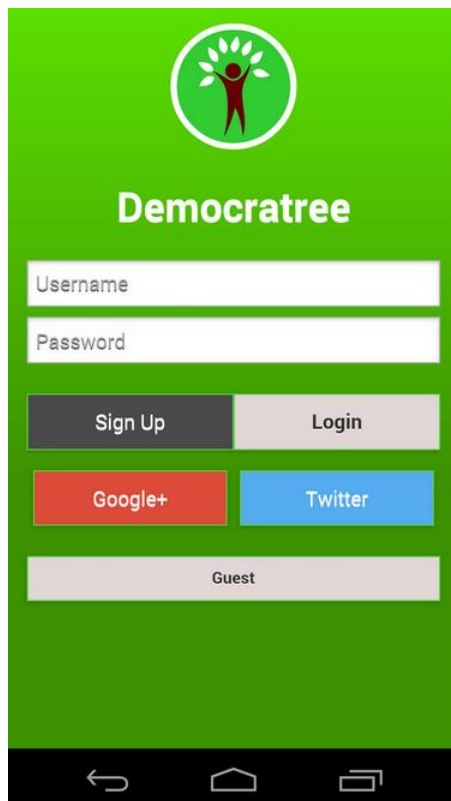
IES Cities Project

European CIP project
2013-2016, Bristol,
Majadahonda, Trento &
Zaragoza involved

- The **IES Cities** project **promotes user-centric mobile micro-services that exploit open data and generate user-supplied data**
 - **Hypothesis:** *Users may help on improving, extending and enriching the open data in which micro-services are based*
- Its **platform aims to:**
 - **Enable user supplied data to complement, enrich and enhance existing datasets** about a city
 - **Facilitate the generation of citizen-centric apps** that exploit urban data in different domains



Bristol's Democratree App



What's WeLive (I)

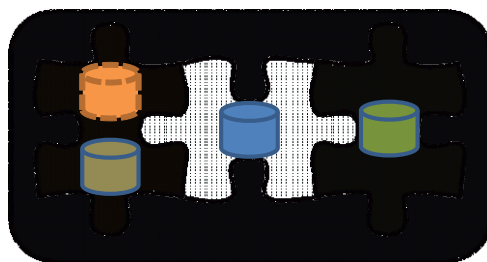
H2020 project
2015-2018,
Bilbao, Helsinki, Novi Sad and
Trneto councils involved



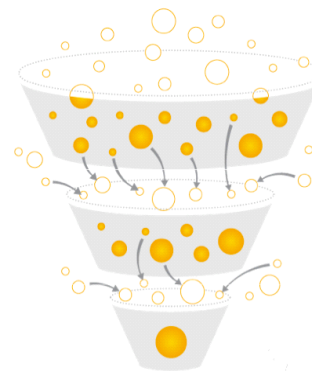
A novel **We-Government ecosystem** of tools (Live) that is easily deployable in different PA and which promotes **co-innovation** and **co-creation** of **personalised public services** through **public-private partnerships** and the **empowerment of all stakeholders** to actively take part in the value-chain of a municipality or a territory



Open Data



Open Services



Open Innovation



WeLive proposes...

Transform the current e-government approach into...



WeLive Open and Collaborative Government Solution = We-government + t-government + l-government + m-government



We-

All stakeholders
are treated as
peers and
prosumers



t-

Providing
Technology
tools to create
public value



l-

To do more
with less by
involving other
players and the
PA as
orchestrator



m-

Utilisation of
mobile tech. for
public services
delivery



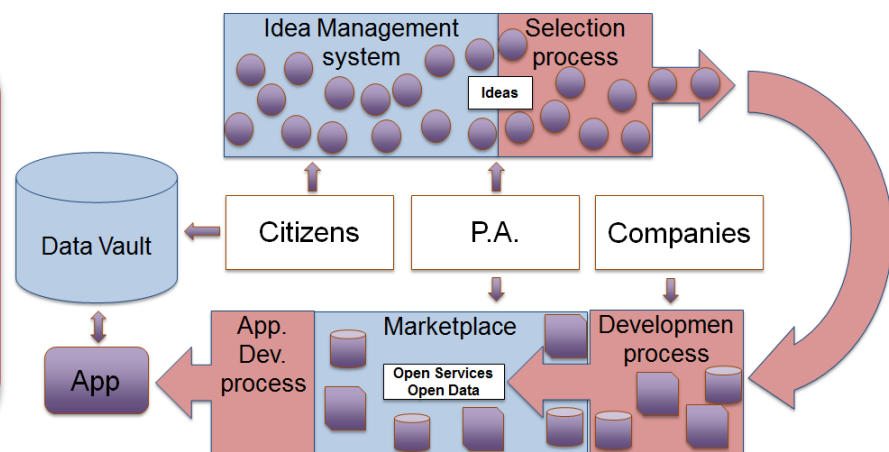
How? (I)

**Stakeholder Collaboration + Public-private Partnership →
IDEAS >> APPLICATIONS >> MARKETPLACE**

1 **WeLive offers tools to transform the needs into ideas**

2 **Tools to select the best Ideas and create the B. Blocks**

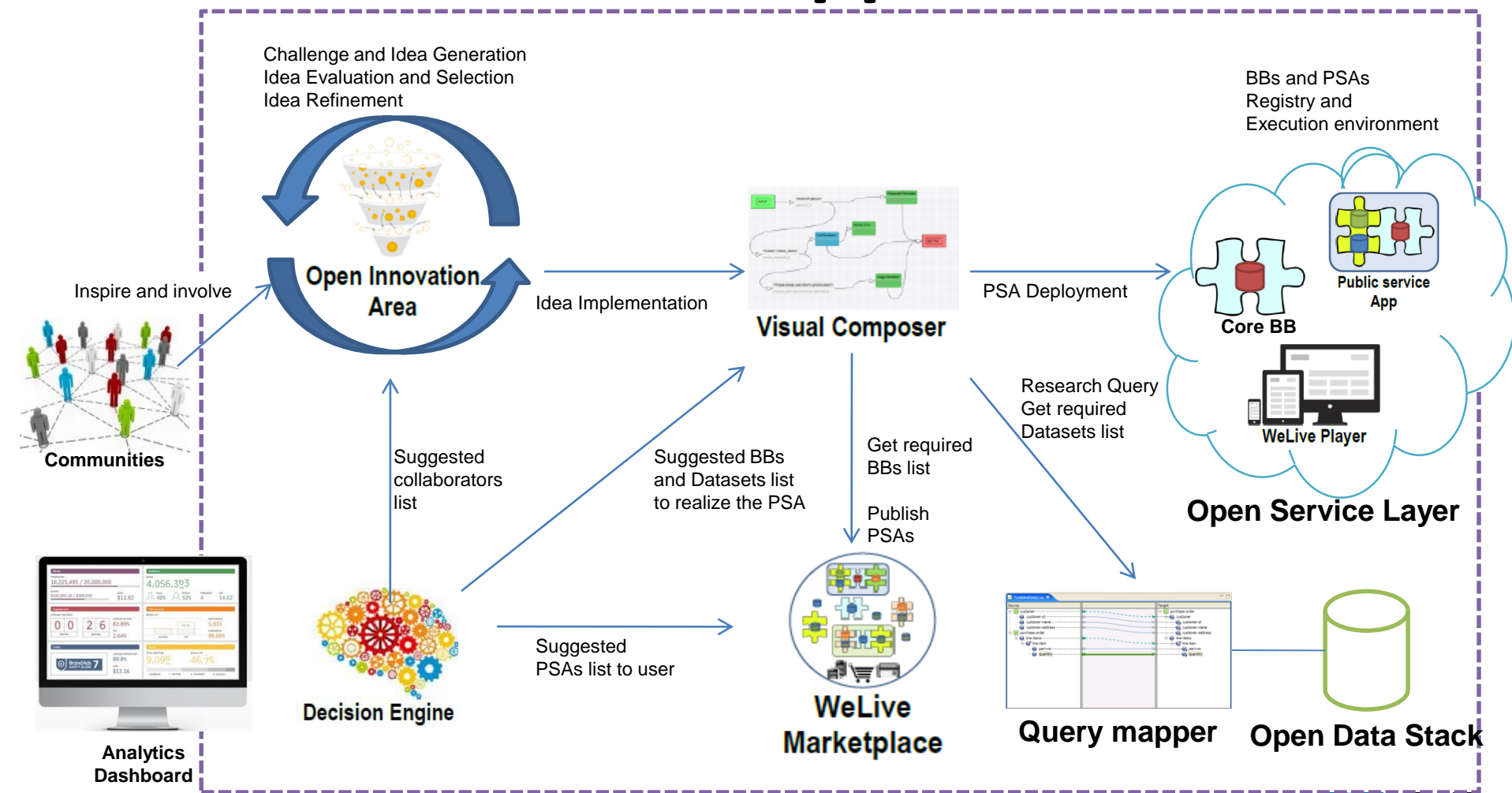
3 **A way to compose the Building Blocks into mass market Applications which can be exploited through the marketplace**





WeLive

How? (II): WeLive Service co-creation approach



Scenario-driven Artefact Definition per City



1 – Agree a common methodology for stakeholders involvement and scenarios definition (benchmarking)



2a – Activities execution for insights gathering – stakeholder consultation process

2b – Deep analysis of city strategy and pilot focus, current IT and open data infrastructure

3a – Scenario #1 definition

3b – Scenario #2 definition

4a – New public service #1

4b – New public service #2



4g – New public service #7

4h – New public service #8



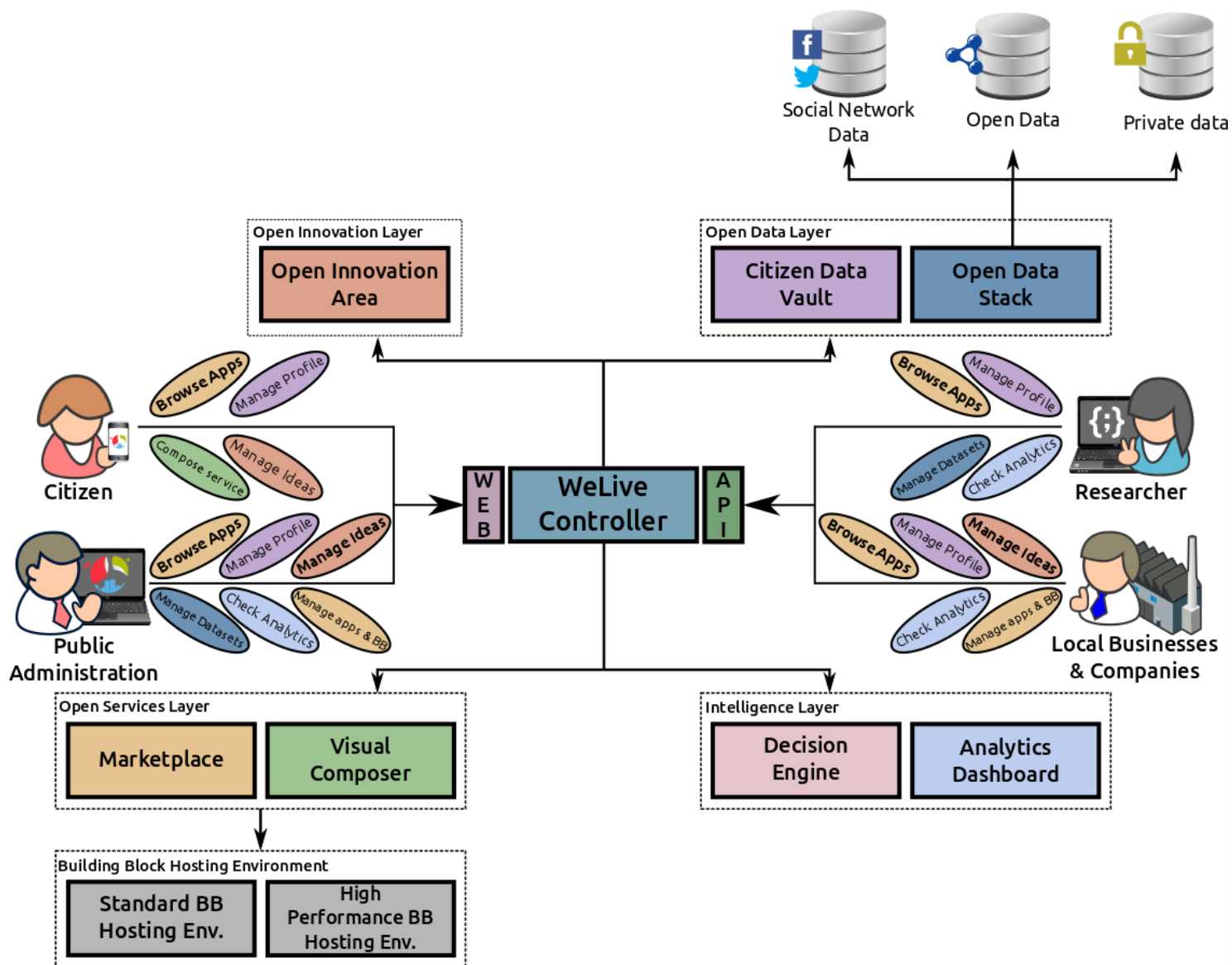
5 – Set of building blocks





WeLive

WeLive Vision/Architecture



WeLive Web UI Controller

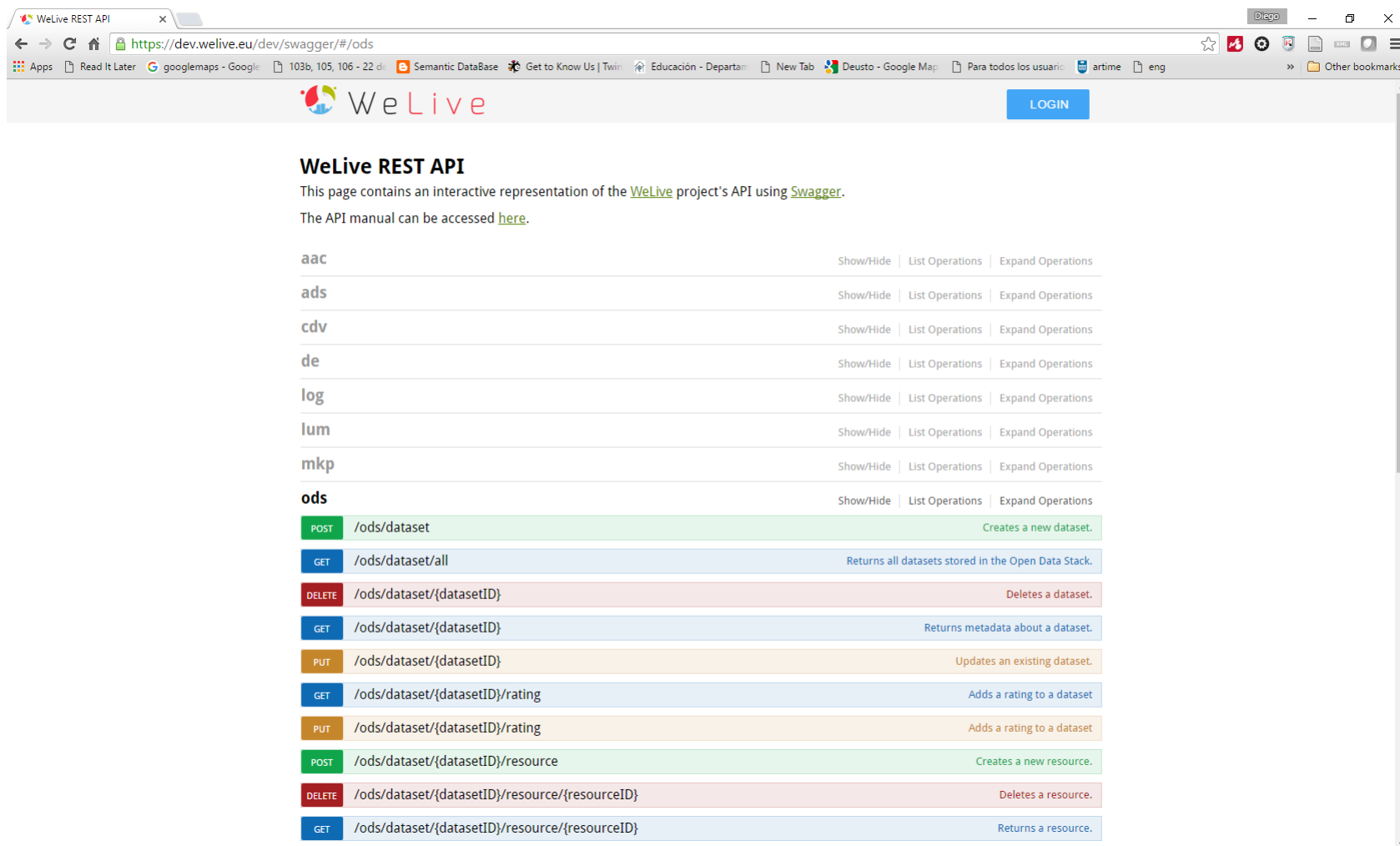


The screenshot shows a web browser window displaying the WeLive Web UI Controller interface. The browser's address bar shows the URL: https://dev.welive.eu/overlay?p_auth=czVq4isl&p_p_id=EssentialOverlay_WAR_EssentialOverlayportlet&p_p_lifecycle=1&p_p_state=normal&p_p_mode=view&p_p_col_id=colun. The page features the WeLive logo at the top center, followed by the text "Un concepto de administración pública basado en servicios móviles co-creados por el ciudadano." Below this is a section titled "Ecosistema de Herramientas WeLive" which includes three main components:

- Open Innovation Area**: Represented by a lightbulb icon. It describes a social co-creation environment where needs, ideas, and possible "solutions" can be reviewed and requested by public administrations for implementation. It offers tools for eliciting, analyzing, and improving ideas; tools for voting and selecting the "best" ideas for a specific need; and tools for allowing companies to offer technical solutions to selected ideas and be subsidized by interested citizens or the Public Administration.
- Marketplace**: Represented by a shopping cart icon. It is a repository where users can consult apps, building blocks, and datasets. In this environment, building blocks and apps of public services can be examined, selected, and acquired by different users of the WeLive solution.
- Open Data Stack**: Represented by a database icon. It is the WeLive tool responsible for the management of datasets from Bilbao, Novi Sad, Helsinki-Uusimaa, and Trento. In particular, this component is in charge of:
 - Combination of social data, public data of the government and even data generated by the user.
 - Access, integration, consultation and verification of heterogeneous datasets.
 - Management of related data entities: datasets, resources, data producers, data generators, etc.

The footer of the interface shows "Amigos conectados (0) - Grupos (0) Configuración".

WeLive RESTful API



The screenshot shows a web browser window displaying the WeLive REST API documentation. The page title is "WeLive REST API". Below the title, there is a description: "This page contains an interactive representation of the [WeLive](#) project's API using [Swagger](#). The API manual can be accessed [here](#)." Below this, there is a table listing the API endpoints and their operations.

Endpoint	Operation	Description
aac	Show/Hide List Operations Expand Operations	
ads	Show/Hide List Operations Expand Operations	
cdv	Show/Hide List Operations Expand Operations	
de	Show/Hide List Operations Expand Operations	
log	Show/Hide List Operations Expand Operations	
lum	Show/Hide List Operations Expand Operations	
mkp	Show/Hide List Operations Expand Operations	
ods	Show/Hide List Operations Expand Operations	
POST /ods/dataset	Creates a new dataset.	
GET /ods/dataset/all	Returns all datasets stored in the Open Data Stack.	
DELETE /ods/dataset/{datasetID}	Deletes a dataset.	
GET /ods/dataset/{datasetID}	Returns metadata about a dataset.	
PUT /ods/dataset/{datasetID}	Updates an existing dataset.	
GET /ods/dataset/{datasetID}/rating	Adds a rating to a dataset	
PUT /ods/dataset/{datasetID}/rating	Adds a rating to a dataset	
POST /ods/dataset/{datasetID}/resource	Creates a new resource.	
DELETE /ods/dataset/{datasetID}/resource/{resourceID}	Deletes a resource.	
GET /ods/dataset/{datasetID}/resource/{resourceID}	Returns a resource.	



WeLive Apps: Bilbozkatu



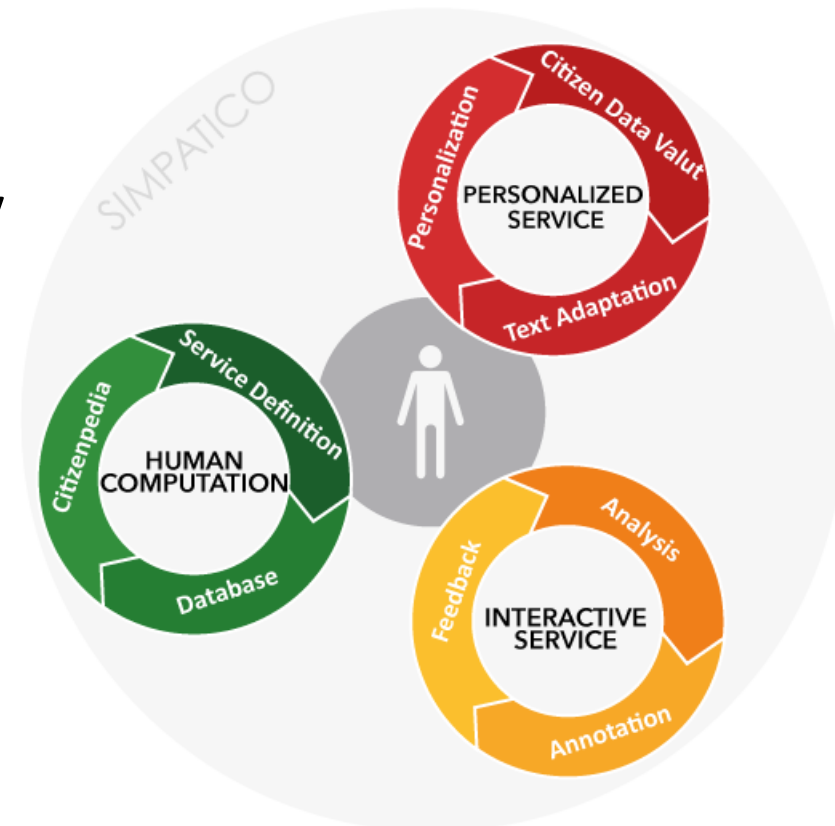
All WeLive apps available at:

https://play.google.com/store/search?q=welive_project

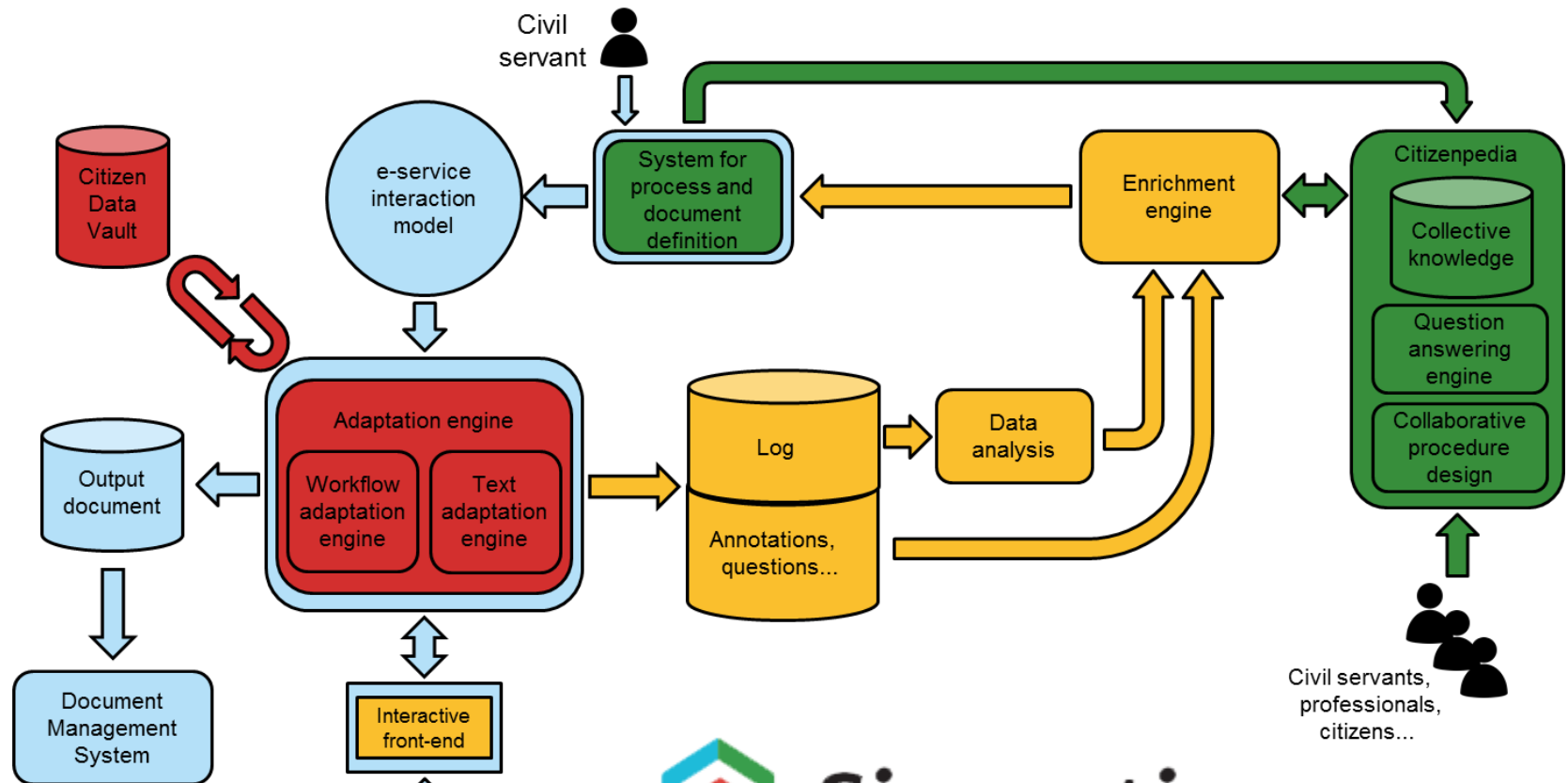
- Addresses the need to offer a more efficient and **more effective experience to companies and citizens in their daily interaction with Public Administration (PA)**
 - Providing a **personalized delivery of e- services** based on advanced **cognitive system technologies** and by **promoting an active engagement of people** for the continuous improvement of the interaction with these services.

<http://www.simpatico-project.eu/>

H2020 project
2016-2018, EURO6,
Sheffield, Trento &
Xunta Galicia involved



PA traditional e-services vs. SIMPATICO approach



Simpatico



Conclusion

- We need **cooperative cities and territories** which are **inclusive, participative, aware and responsive** to the needs of all societal sectors
 - **ICT intertwined with co-creation through multi-stakeholder involvement are key to achieve smarter environments**
 - To do more with what we have, without having to invest big amounts, but taking advantage of information that is already available, transforming knowledge, democratizing its access and usage, protecting and regulating its usage, and easing decision making among different actors



Learning Goals

1. Know about the key methodologies and technological enablers of Smarter Environments
2. Realize why the right technology is not enough to enable acceptable Smarter Environments
3. Understand how to democratize technology usage so that it serves to empower users in an inclusive manner to foster better more acceptable Smart Environments
4. Gain an understanding on how stakeholder engagement and participation approaches are being successfully combined with technology
5. Learn what technologies and user involvement methods are available and how to bring them together to pursue CyberParks goals

Technological pillars to enable Smarter (Collaborative + Inclusive) Environments: Internet of Things, Web of Data and Citizen Participation

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13-16 February, Lisbon, Portugal

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