

# Applied Data Science Project

L12 – Human Centred Design. Introduction: principles and tools



**Politecnico  
di Torino**

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I'm interested in the human dimension of technology.  
I've been working on **research and innovation** projects,  
leading activities related to the psychological and social aspects  
that **influence the adoption and interaction with new technologies**.

I design and assess innovative and people-centred services,  
applying the Human-Centred Design approach.

# Why design is interesting for data science and viceversa?

We know that we daily produce tons of data, even unintentionally.

Data science aims to **learn from data and extract value** from them, not only or not necessarily economic value.

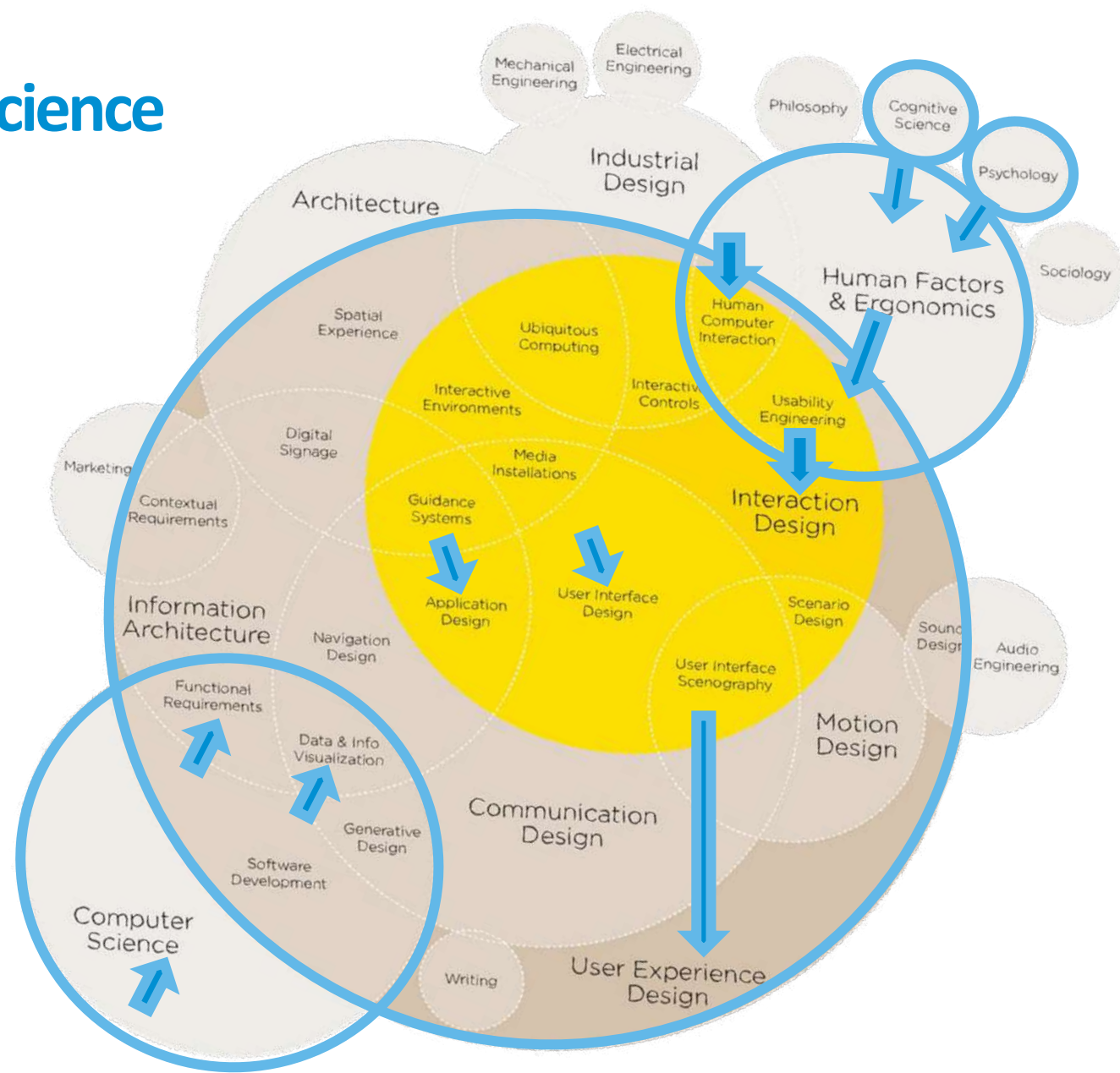


Data scientists have the **responsibility and power to**

- decide which data to collect and use
- provide data and analysis to understand user needs
- collect and analyse data to test and improve services.
- monitor services over time to improve it



Psychologists and Designers provide the **mindset to work putting people first** and concretise **positive experiences**.



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# Why this module?

To **overcome and complete «the impersonality of a purely technical approach to data»** and to start designing ways to **connect data to what it really represents: knowledge, behaviours, people.»**

«**Dealing with data and technology means dealing with the lives of the people** who use them, produce them, suffer the effects, the advantages but sometimes also discrimination».

Big Data is a commodity and an intrinsic and iconic **feature of our present.**

Data Humanisms offers **a new way to think to data**, their usage, value and limitations informed by the real world, aware of the human diversity, needs and rights.

## DATA HUMANISM

~~SMALL~~ ~~big~~ data  
data ~~bandwidth~~ **QUALITY**  
~~IMPERFECT~~ ~~infallible~~ data  
~~SUBJECTIVE~~ ~~impartial~~ data  
~~INSPIRING~~ ~~descriptive~~ data  
~~SERENDIPITOUS~~ ~~predictive~~ data  
data ~~conventions~~ **POSSIBILITIES**  
data to ~~simplify~~ complexity / **DEPICT**  
data ~~processing~~ **DRAWING**  
**data** **driven** **design**  
~~SPEND~~ ~~save~~ time with data  
data ~~is numbers~~ **PEOPLE**  
data will make us more ~~efficient~~ **HUMAN.**

@giorgialupi

# Content and activities of this module (9h)

9<sup>th</sup> of October 2024  
10,00-11,30

**A humanistic approach to data**

30<sup>th</sup> of October  
10,00-13,00

**The stakeholders analysis  
and mapping**

31<sup>st</sup> of October  
13,00-14,30

**The users' Personas**

5<sup>th</sup> of November  
10,00-13,00

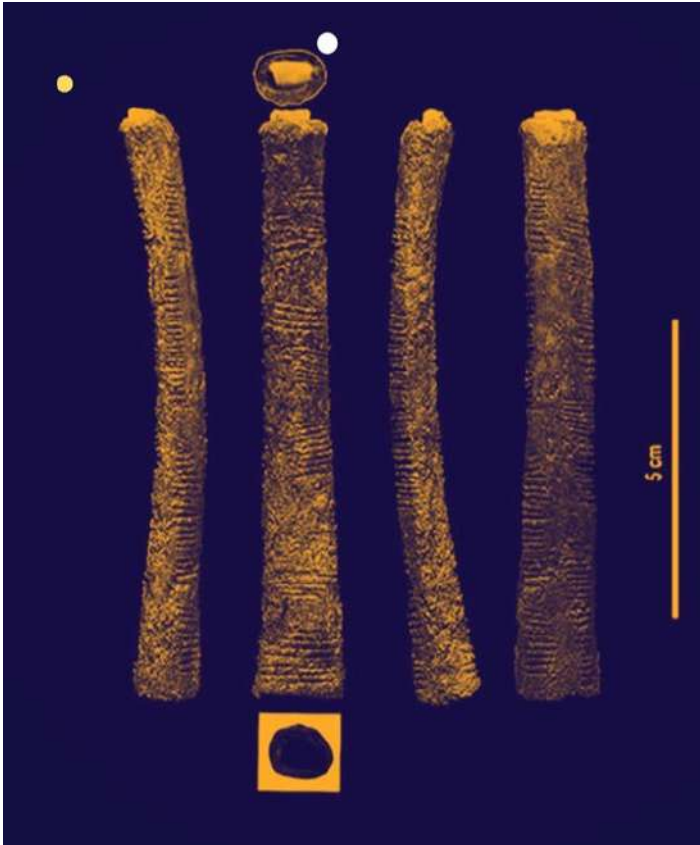
**The user journey**

- Discover the principles and tools of the human-centred design approach
- Exploit the potential of data to reply to real needs and offer services
- Be driven by the problem and not by available data



# 20.000 A.C

## Data is always collected!

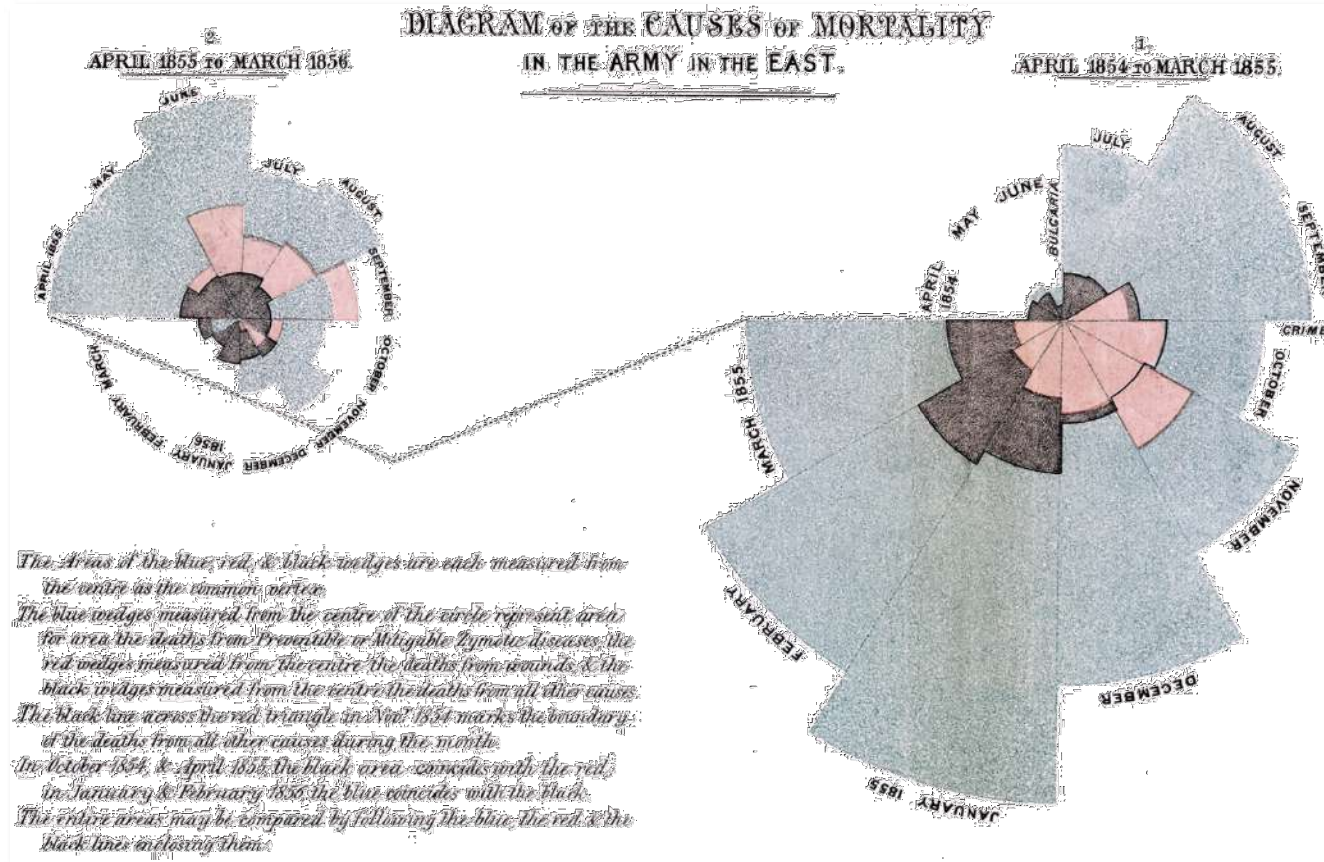


The first traces of data collection and calculation go back to the Paleolithic (2.5 million – 12.000 years ago).

Baboon bones, covered with signs grouped in 3 columns that occupy the entire length.

The ethno-mathematician Claudia Zaslavsky suggests that this instrument descends from the creative work of a human female; it would represent **the tracking of the lunar phases** in correlation with the menstrual cycle.

# 1859



The first visualization of complex data.

➤ The nurse Florence Nightingale began to track the causes of death of British soldiers in military hospitals during the Crimean war and **invented** the **polar chart** to display the pieces of evidence and communicate them.

# 2014

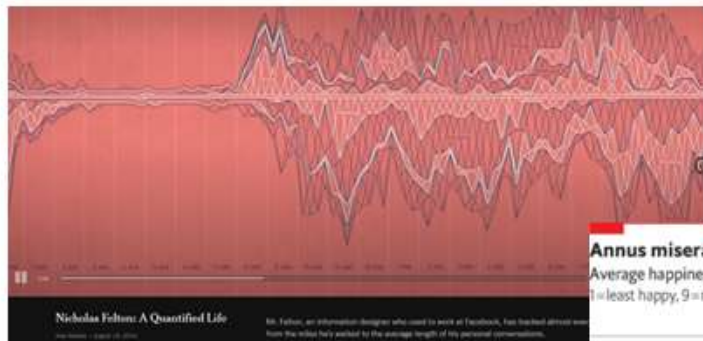


➤ The so-called **quantified-self** rises, thanks to the mobile and wearable self-tracking apps allow the measurement and analysis of any kind of activity.

- Diet
- Sport
- Books read
- Finance
- Dreams
- ...



Data change the way we perceive and get informed about the world and perceive complex phenomena.



### Annus miserabilis

Average happiness score of English-language tweets

1=least happy, 9=most happy

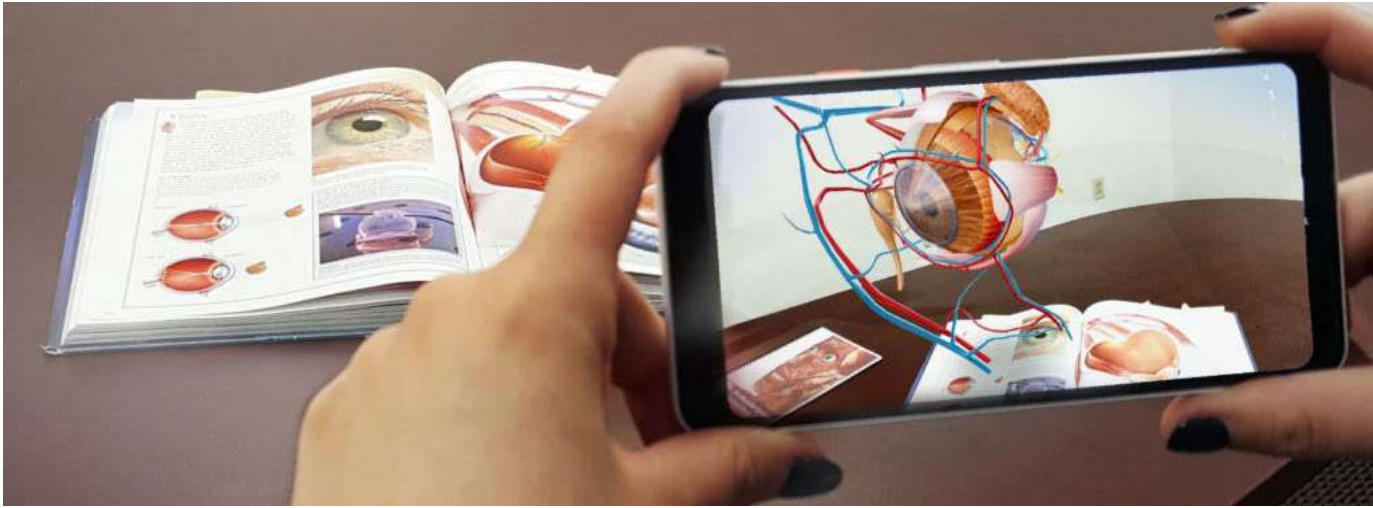


Source: Hedonometer.org

The Economist

Source: Feltron, 2014. The quantified self. The New York Times video, 2014.





Data shape work practices and tools we use to accomplish several tasks.



# Human – data interaction

## DATIFICATION

The act of transforming objects and processes into data, that is the **quantitative description of an observed and coded phenomenon**.



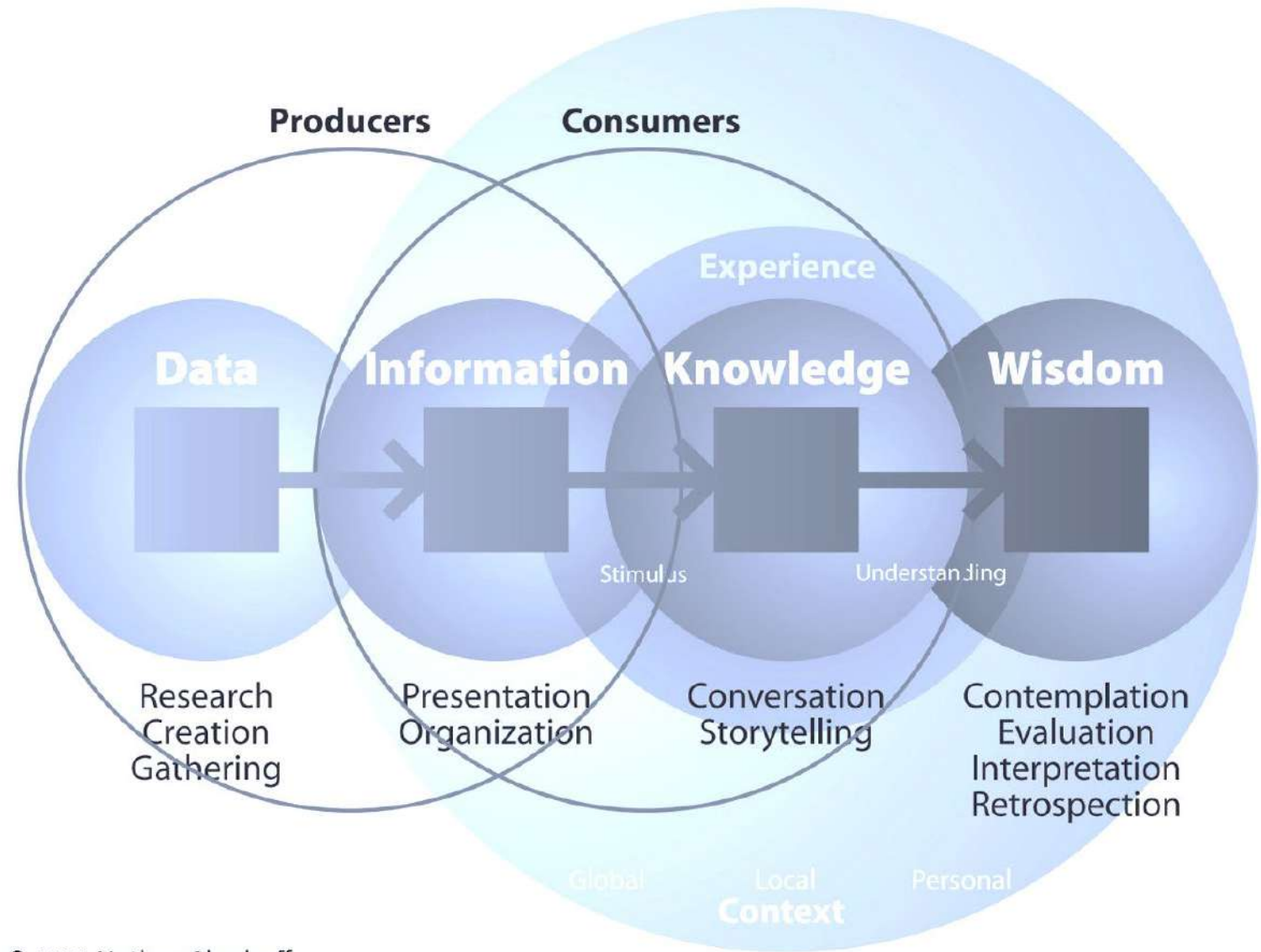
## DATA/INFO-VISUALIZATION (UX/UI)

**Enrichment** of data with narrative, visual elements, interaction modalities.



## DATA-DRIVEN SERVICES (SD)

Design of services leveraging data analysis and insights to **guide decision-making**, optimize operations, and enhance user experiences.



© 1994 Nathan Shedroff

# Real-world data

- **Administrative** data (insurance claims, working documents)
- **Demographic** data (age, education, environmental factors, income, geographical location)
- **Behavioural** data (diet, lifestyle, physical activity)
- **Social** data (employment, family, family and social networks)
- **Clinical** data (electronic medical records, laboratories, imaging, genomics, metabolism, tissue, patient-reported results)
- **Attitude** data (patient experience and feelings)
- **Financial** data (expenses, income, credit card purchases)

## Official sources

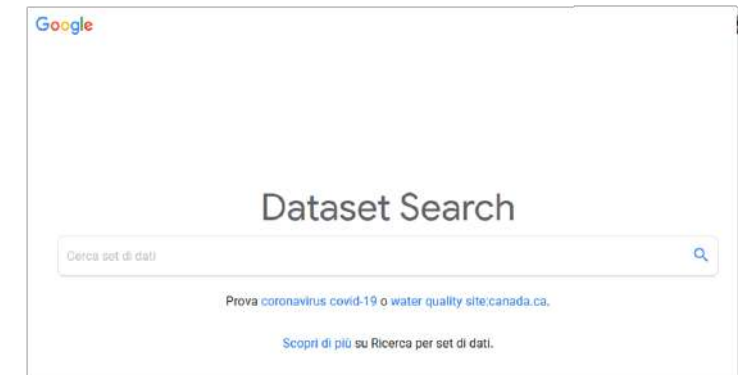
[Istat](#)  
[Eurostat](#)  
[Istituto superiore di sanità](#)  
[World bank](#)  
[Public administrations](#)

## Private sources

[Google Trends](#)  
[Spotify](#)  
[IDC](#)  
[Gartner](#)  
[Caritas](#)  
[Save the Children](#)  
[Legambiente](#)  
[WWF](#)  
[Fondazione Agnelli](#)

## Aggregators

[Statista](#)  
[WikiData](#)  
[OurWorldInData](#)  
[Data.world](#)  
[Google public data](#)  
[datasetsearch.research.google.com](#)





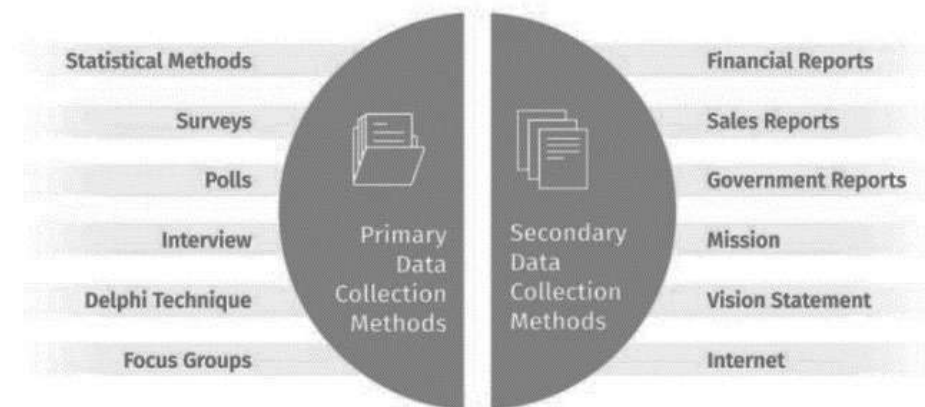
# Ad hoc data

Aggregation of existing data

- Documentary sources (open data and private datasets, reports, ...)
- Automatic data (logs)
- Ethnographic research (observation, diary, netnography)
- Ad-hoc (surveys, interviews, polls, ...)
- **Crowdsourcing**: collaborative data collection practice from user communities (e.g. Tripadvisor)
- **Citizens science/counterdata\***: bottom up initiatives collecting data on social phenomena not still counted (e.g. <https://www.themigrantsfiles.com/>)

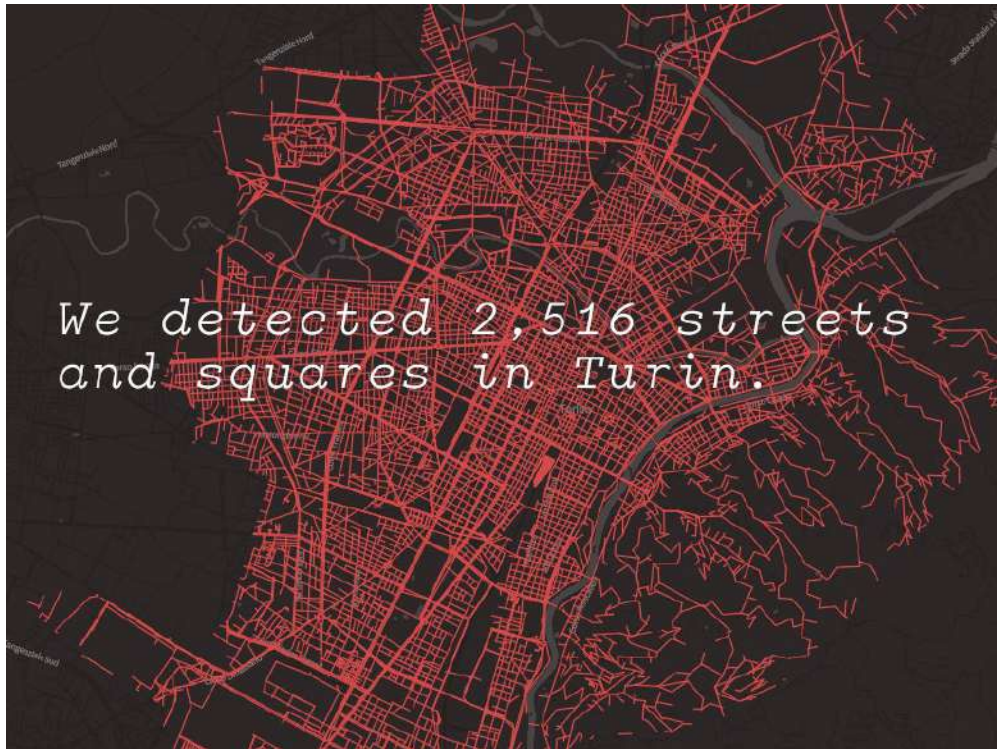


## Data Collection Methods





## Example > Mapping diversity

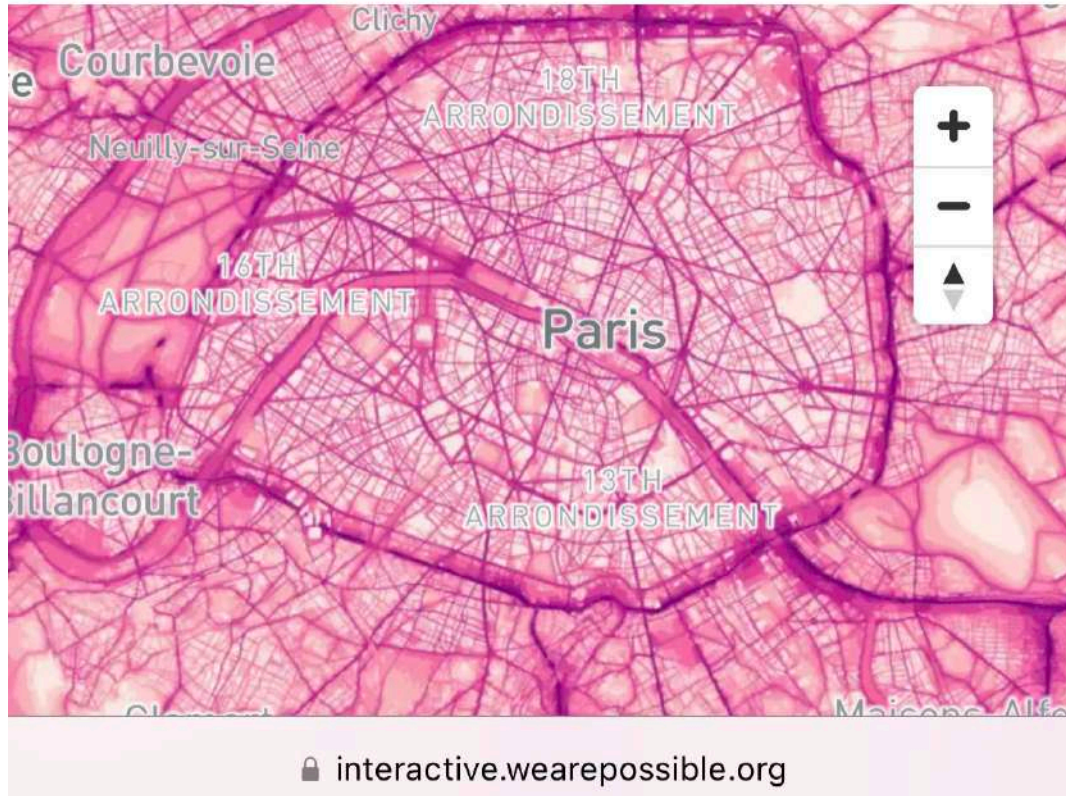


This project is based on open, crowdsourced data sources. What we did, in essence, was to match the list of streets built by [OpenStreetMap](#) (and made available by [Geofabrik](#)) with the [Wikidata](#) identifier of the entities they are dedicated to. Matching was first done automatically and then manually verified street by street using a dedicated interface.

[Methodological note available online.](#)



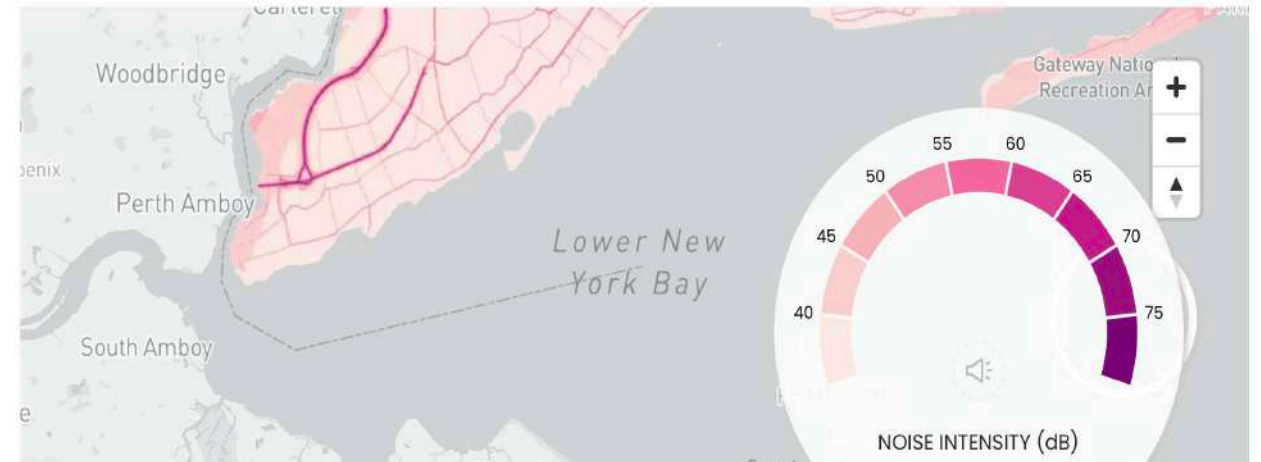
## Example > Noisy cities



Like what you see? Share it on:



Want more like this? Sign up to our [mailing list](#).



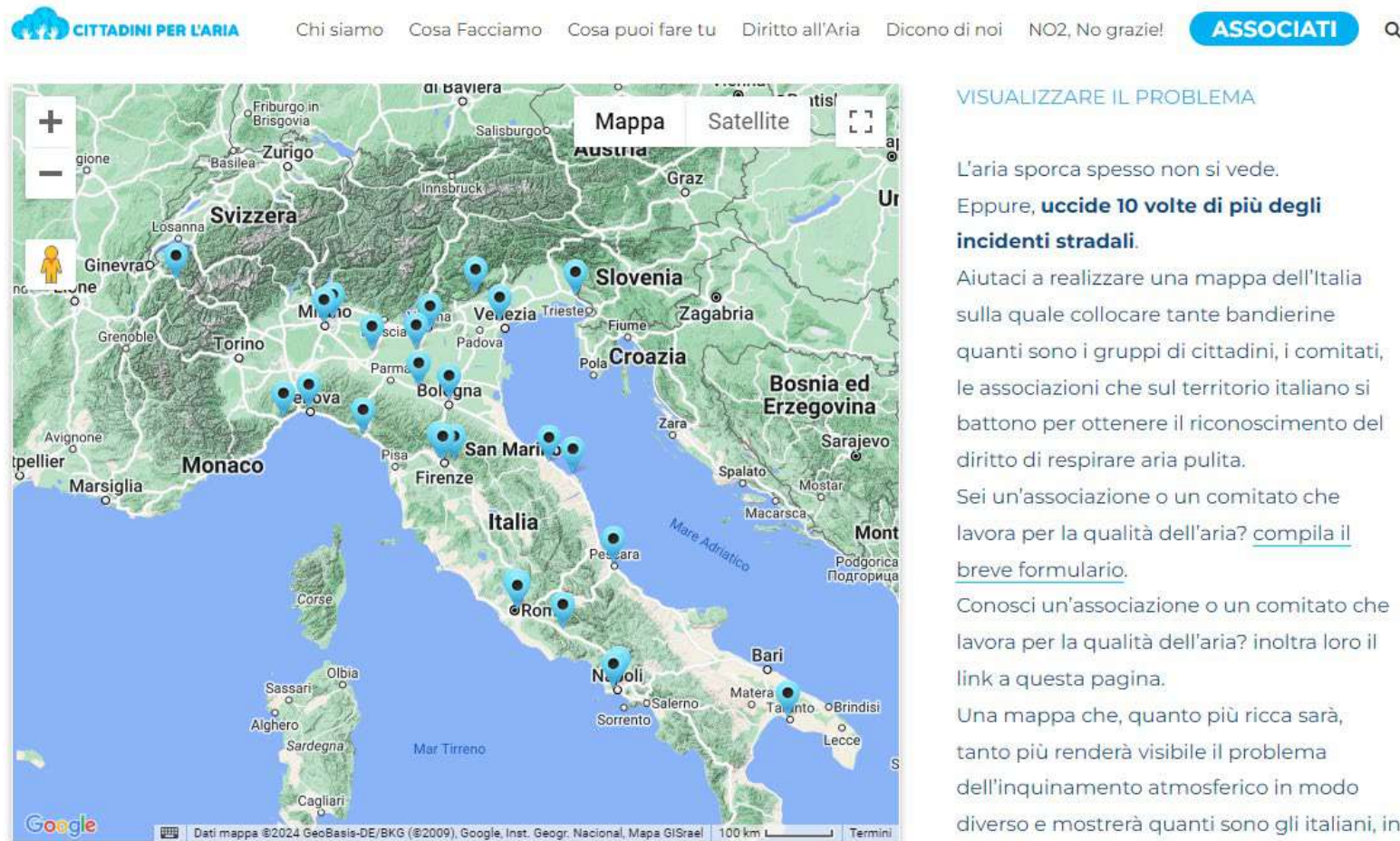
Data is taken from monitoring stations on the [Rumeur network](#) and intermediate points are modelled and validated against the collected data, including the effects of average weather conditions on noise levels. Methodological information available.

Without sound

With sound



# Example > Cittadini per l'aria



Una RETE PER L'ARIA è una piattaforma che si propone di:

- attivare relazioni,

## VISUALIZZARE IL PROBLEMA

L'aria sporca spesso non si vede.

Eppure, **uccide 10 volte di più degli incidenti stradali.**

Aiutaci a realizzare una mappa dell'Italia sulla quale collocare tante bandierine quanti sono i gruppi di cittadini, i comitati, le associazioni che sul territorio italiano si battono per ottenere il riconoscimento del diritto di respirare aria pulita.

Sei un'associazione o un comitato che lavora per la qualità dell'aria? [compila il breve formulario.](#)

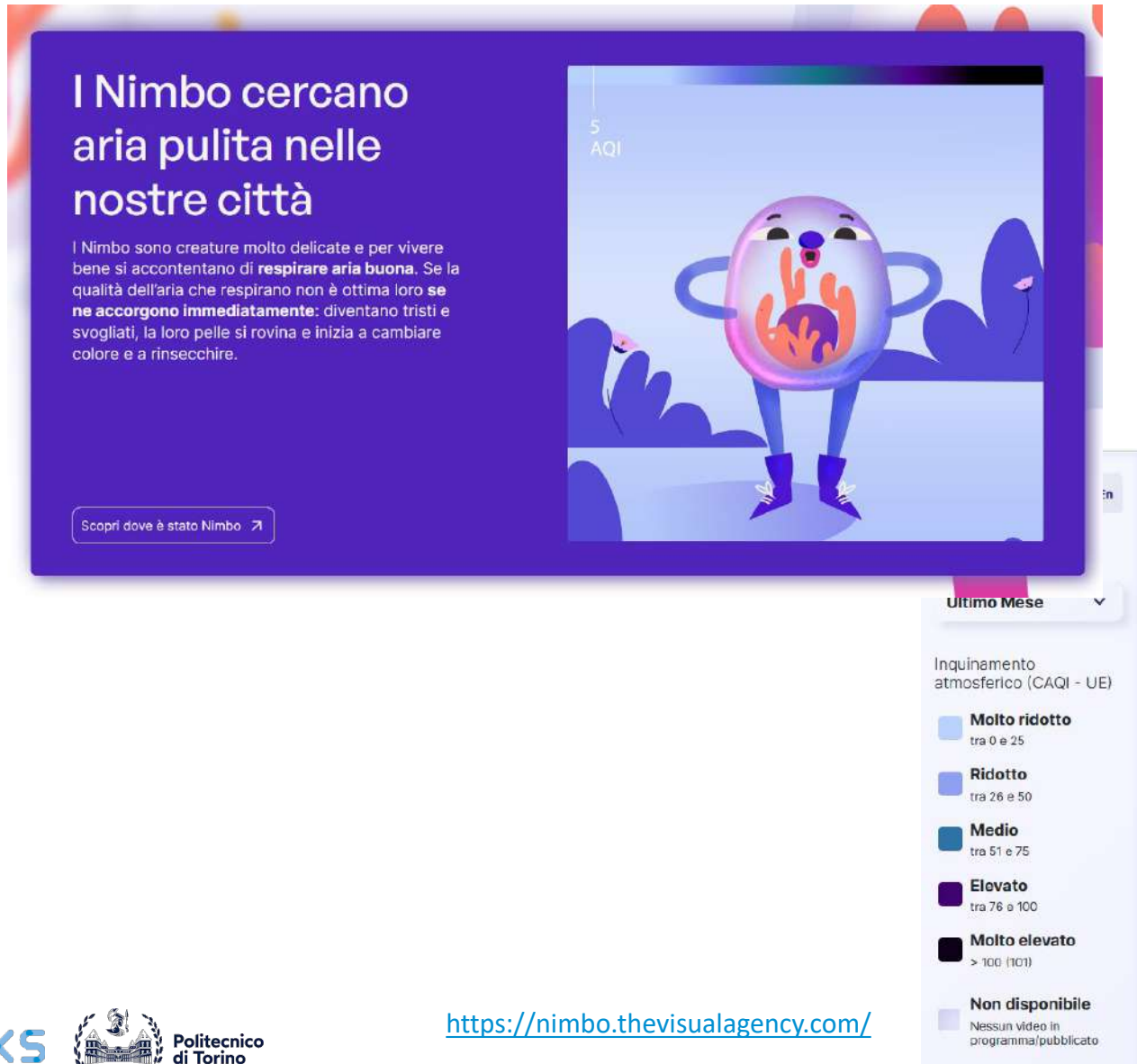
Conosci un'associazione o un comitato che lavora per la qualità dell'aria? inoltra loro il link a questa pagina.

Una mappa che, quanto più ricca sarà, tanto più renderà visibile il problema dell'inquinamento atmosferico in modo diverso e mostrerà quanti sono gli italiani, in ogni parte del paese, che considerano questo tema una priorità.

Grazie!

Citizen-science projects, based on crowdsensed data on levels of nitrogen produced by e crowdsourcing. Studio Calibro designed and developed the map where citizens can read the nitrogen levels generate from diesel-powered cars and other sources.

# Example > Nimbo



The visual layer of a wider system and process is relevant to address targets that might be very different.

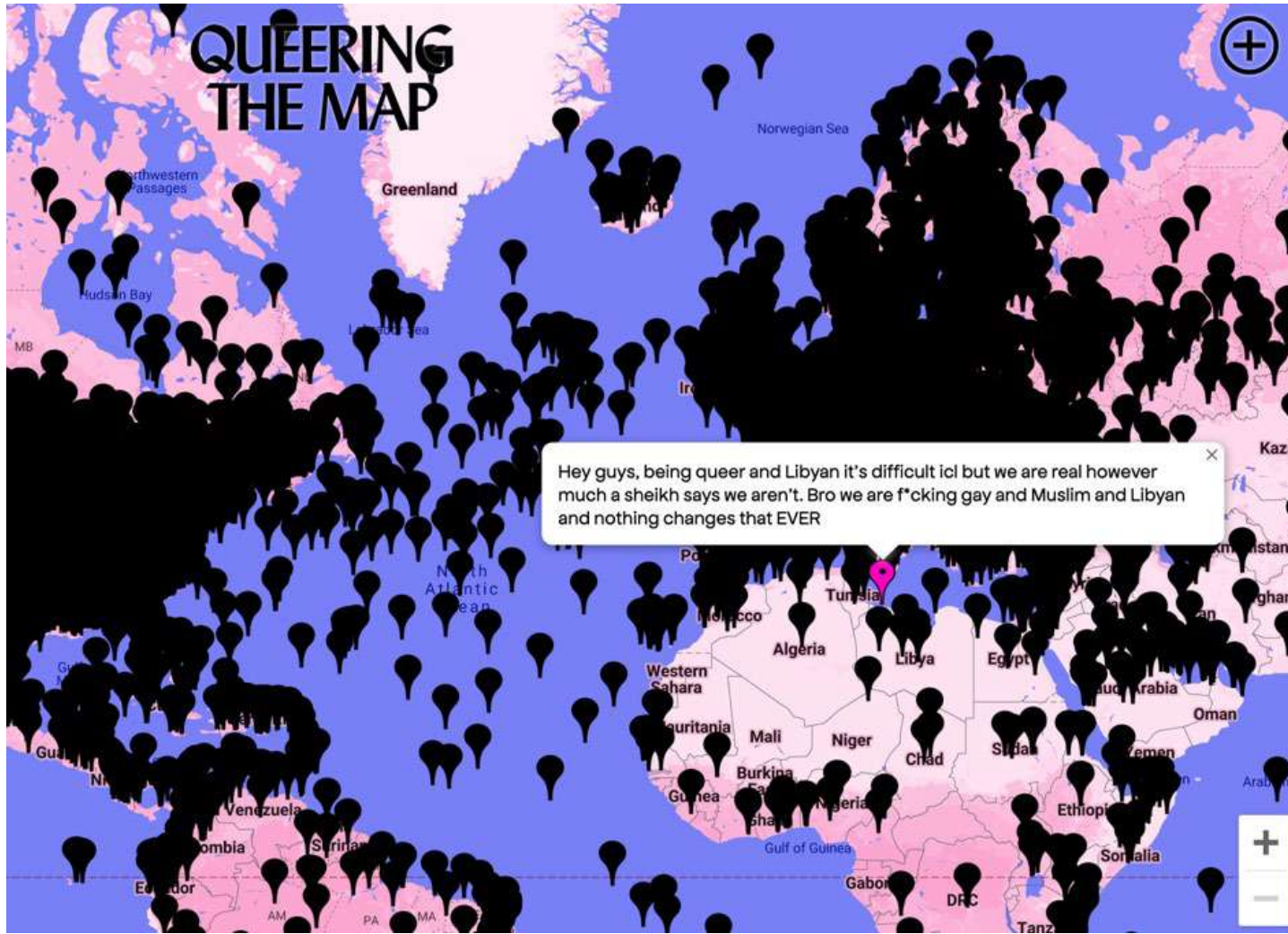
The general audience, lacking in «numeracy» or children to be introduced to ecology and climate matters might benefit from Data-storytelling.

- Enrich the language with metaphors and descriptions
- Simplify the visual layer





## Example > Queering the map



Queering the Map is a **community-generated counter-mapping** platform for digitally archiving LGBTQ2IA+ experience in relation to physical space.

The platform provides an interface to **collaboratively record** the cartography of queer life—from park benches to the middle of the ocean—in order to preserve our histories and unfolding realities, which continue to be invalidated, contested, and erased.



# Crowdsourcing

**More than 7 billions** of humans are able to acquire, produce and share data.

2005


























*Pope announcements in Vatican*

2013



# Crowdsourcing platforms

Da fonti sul Web

	Amazon Mechanical Turk	▼		99designs	▼		Upwork Inc.	▼
	Crowdspring	▼		OpenIDEO	▼		Designhill.com	▼
	Microworkers	▼		Cad Crowd	▼		DesignCrowd	▼
	Google Crowdsourcing	▼		InnoCentive	▼		Twine	▼
	uTest	▼		Wazoku reviews	▼		Chaordix	▼
	Idea pipeline	▼		IdeaScale	▼		Kaggle	▼
	Namethis	▼		Ponoko	▼		Quri	▼
	Topcoder	▼		UserVoice reviews	▼			

Mostra menu ^

Feedback



# People + connected devices + events = Crowdsourcing

In critical conditions, regardless of the type of crisis and emergency, people need to exchange information, both receiving and providing it.

They use all the known channels (Social media, Maps-based services, IM)

**#ChennaiRains/The W...**

Mark off areas, streets and small roads that are water logged and impossible to cross by any means of private

220,944 views

SHARE

**Water-Logged Roads**

- Velachery Bypass Road
- Srinivasa Road - T Nagar
- Chettnad Health City Bus Stop
- Keeakattalai Junction
- ... 36 more

**Road Blocks- Slow Traffic**

- Sidco Nagar
- Buzulah Road - T Nagar
- Madhyo Kalish Temple
- Avvai Shanmugam Salai

**Chennai Flooding**  
FACEBOOK SAFETY CHECK

Quickly find and connect with friends in the area. Mark them safe if you know that they're OK.

Are you in the affected area?  
Yes, let my friends know.

ABOUT THE CRISIS

Heavy rain has caused severe flooding in the Indian city of Chennai and surrounding areas. This is an ongoing situation. The rain is expected to continue for several more days.

**FOR HELP IN #CHENNAIRAINS: HERE ARE THE HASHTAGS YOU NEED TO KNOW**

**#CHENNAIRAINSHelp**  
If you know of someone, or you yourself require help or want to offer help, please use this hashtag, tagging @TwitterIndia so we can help RT

**#CHENNAIVOLUNTEER**  
If you have supplies or can provide volunteer support, please use this hashtag

**#CHENNAIRESCUE**  
If you are stranded and in desperate need of rescue, please use this hashtag & tag @TwitterIndia so we can RT

**Crowdsourced list of places and people offering shelter**

Search: Eg. Adyar

Area in Chennai where shelter is available	Accommodation available for (No. of people)	Twitter Handle/Facebook Profile	Mobile Number	Original Source Link for information
Tambaram, Porumbataram, Vandalur and Uthupatti		@sugamini		Look help at Tambaram, Porumbataram
100 Feet Road	100	@sugamini	8190742958	SELF
Adyar	5	@praveenachari	8000561122	SELF
Adyar	5	praveenachari	8000561122	SELF

**Shelter and Food**

Offering shelter for 4 people  
Mumbai

Message

Like Comment Share

**Pushparaj**  
@pushparaj15

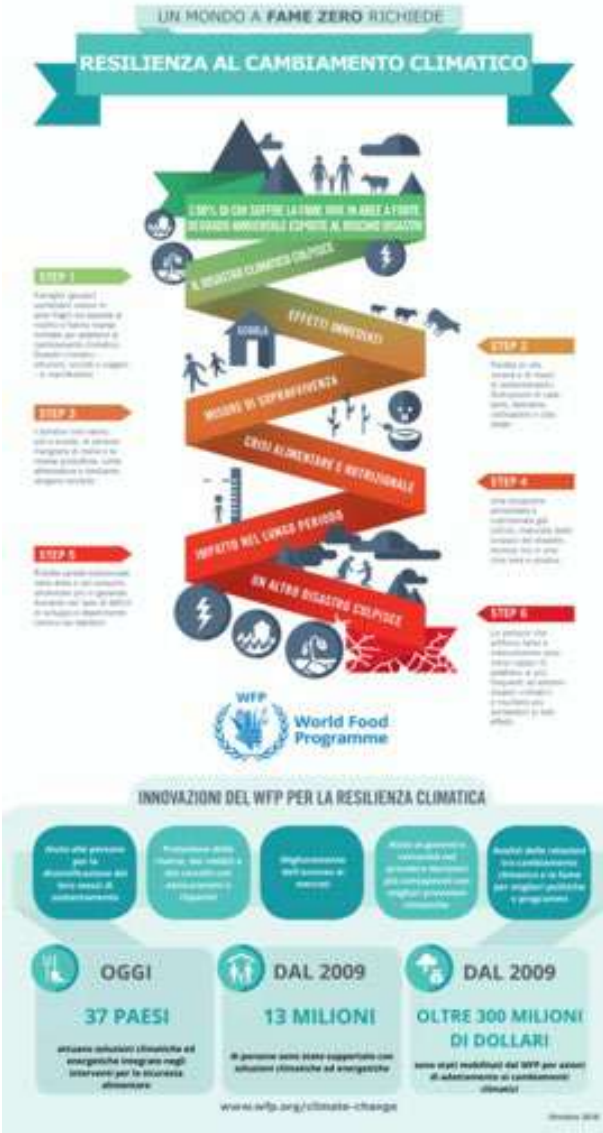
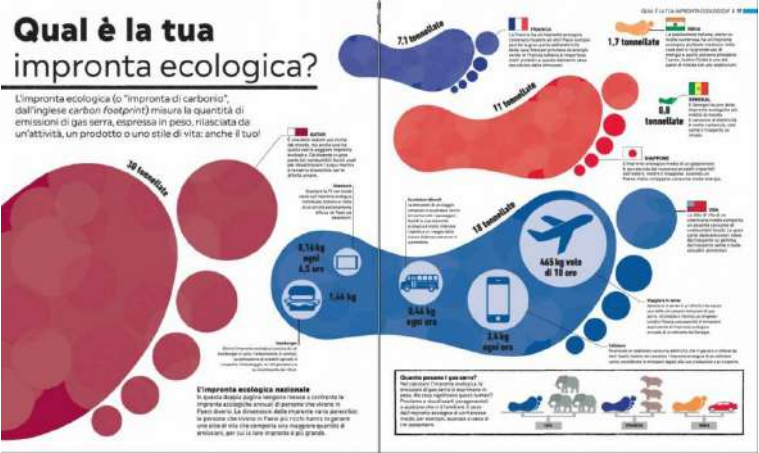
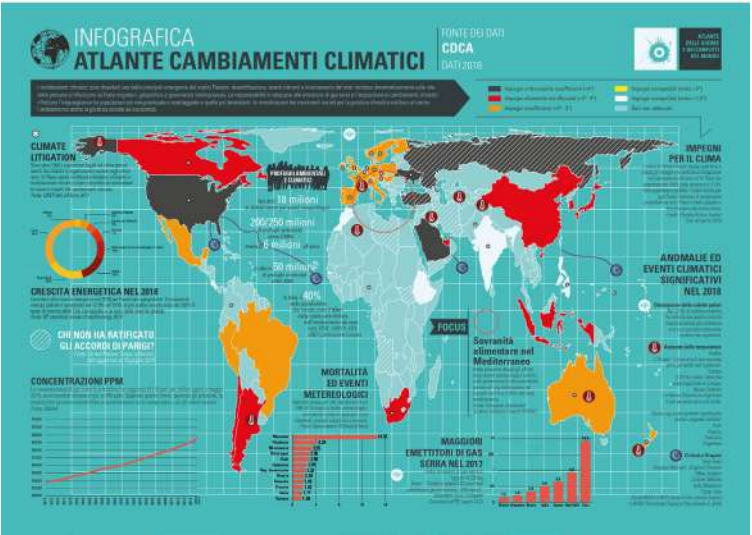
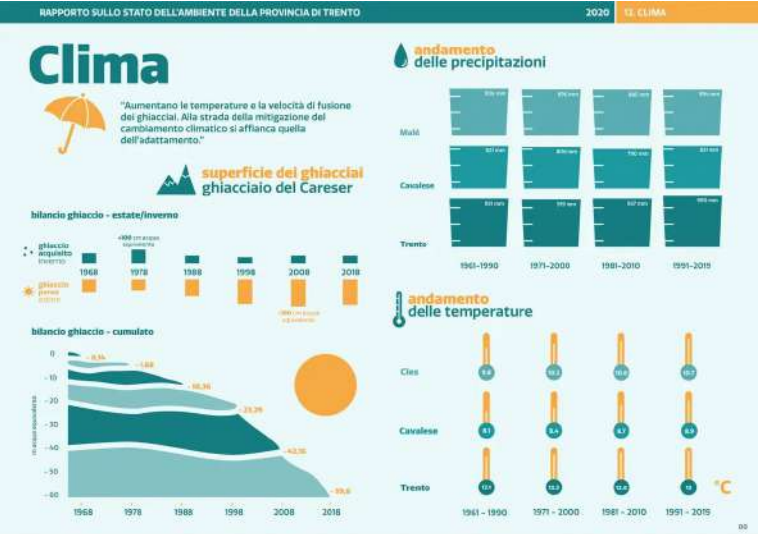
I live near Thiruvannamiyur RTO. I can accomodate two ppl in my home. Contact : 9994476633 **#ChennaiRainsHelp**  
**#ChennaiFloods**

RETWEETS 210 LIKES 35

11:04 PM - 1 Dec 2015

# Infovisualization

In 1896 the first work on global warming was published.



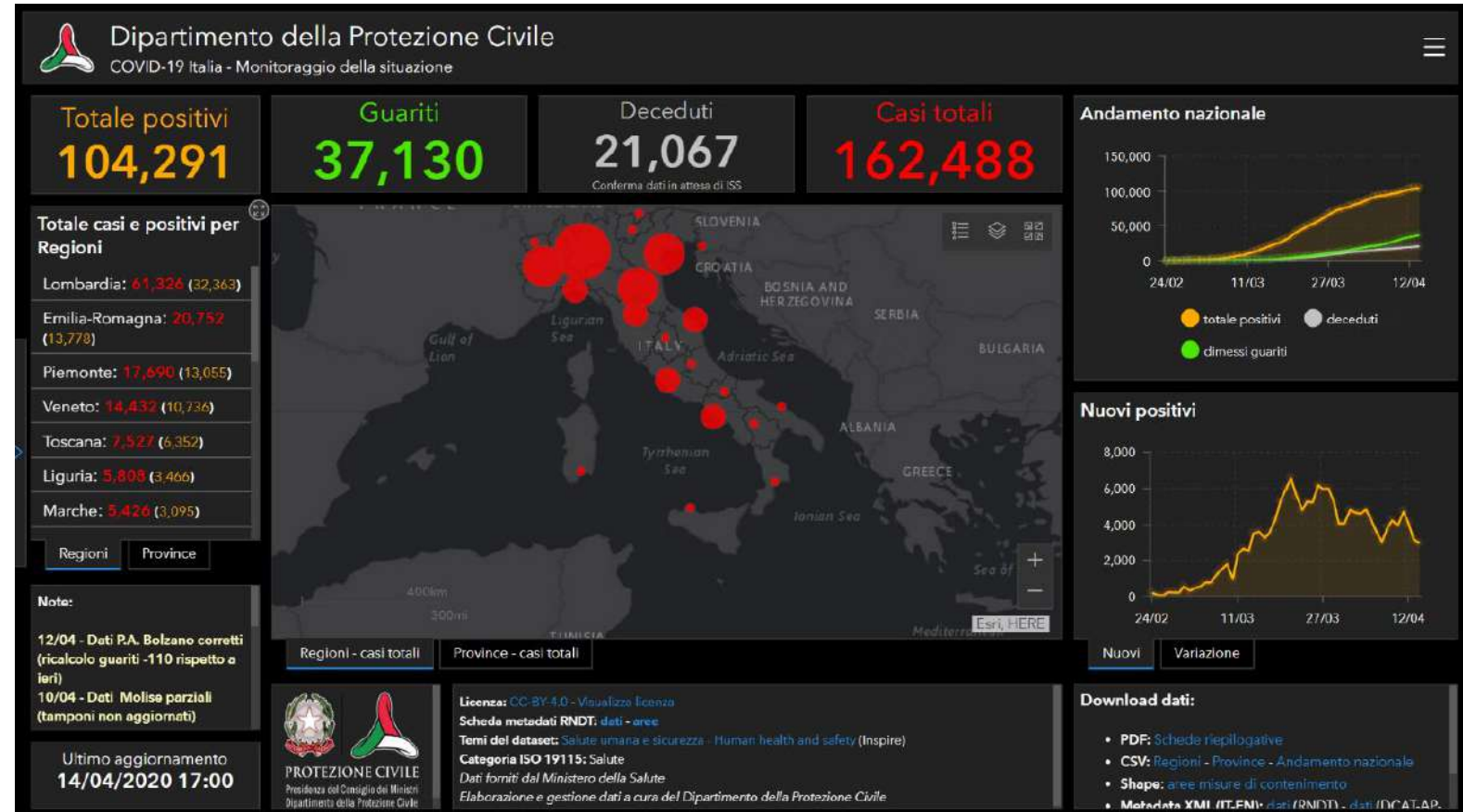
Warming stripes



# Dashboard for professionals

Web-accessible dashboards that allow different types of actors to **view data and monitor complex phenomena**.

- Monitoring complex events/systems (total visibility)
- Trend identification
- Measure of efficiency
- Decision support
- Automated reports
- Fast identification of abnormal data and correlations
- Alert



Source: [data.europa.eu](https://data.europa.eu)



# Dashboard for professionals (into the wild)



# Dashboard for professionals (into the wild)



Perception (event  
detection, search)

Processing (analysis,  
comparison)

Reasoning  
(possible evolving  
scenarios)

Projection  
(possible  
interventions)

Decision and  
coordination  
(intervention  
execution and  
monitoring)

Situation awareness

# Dashboards for professionals and not only



Plane control room



Airspace explorer (separation data)

# Dashboard for the public

Source: <https://www.ilsole24ore.com/sez/sostenibilita/osservatorio>

24



## Osservatorio ESG

Indagine sulla situazione della Sostenibilità (Ambiente, Sociale e Governance) nelle piccole e medie società italiane quotate a Piazza Affari e sul mercato Aim.

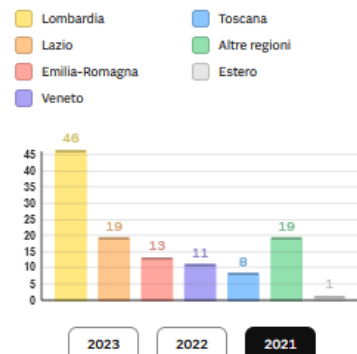
### Informazioni generali

n° ESG/Aziende **2023**  
136/358

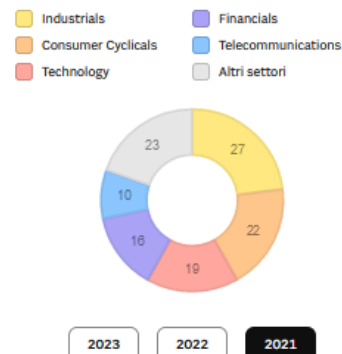
n° ESG/Aziende **2022**  
146/351

n° ESG/Aziende **2021**  
117/332

#### Regione sede legale (top 5)



#### Settore economico (top 5)



### Questionari

Cerca azienda per nome o codice ISIN...

AZIENDA	REGIONE	SETTORE	QUESTIONARI
ABC Company IT0005445294	Lombardia	Financials	2023 2022 2021
Abitare In IT0005445280	Lombardia	Consumer Cyclical	2023 2022 2021
Acea IT0001207098	Lazio	Utilities	2023 2022 2021
Aeffe IT0001384590	Emilia-Romagna	Consumer Cyclical	2023 2022 2021
ALA IT0005446700	Campania	Industrials	2023 2022 2021
Alfonsino IT0005456039	Campania	Technology	2023 2022 2021
Alkemy IT0005314635	Lombardia	Consumer Cyclical	2023 2022 2021
Alcore IT0005451303	Lombardia	Industrials	2023 2022 2021
Almawave IT0005434615	Lazio	Technology	2023 2022 2021
Altea Green Power IT0005472730	Piemonte	Energy	2023 2022 2021



# Dashboard for the public





# From data to the service

One team of data-journalists involved in project Uma-por-Uma, in the state of Pernambuco - Brazil, has combined the collection of data with a proximity service for families of the victims.

### The Anatomy of a FEMINICIDE COUNTERDATA SCIENCE PROJECT

#### RESOLVING

Starting a monitoring effort

Background and motivation for why activists start a database of cases. Their theory of power and conceptual influences; their framing of the problem; how they encountered missing data; why they believe counting feminicides or gender-related killings may help to challenge the problem.

#### RESEARCHING

Finding + verifying information

Activists seek relevant information to add to their database. This can include sourcing existing datasets, mining media and other sources of information, and triangulating across sources to verify details. Such research either discovers new cases or adds information to existing cases in the database.

#### RECORDING

Information extraction + classification

Activists transform unstructured data from various sources into structured datasets located in databases, spreadsheets and/or text documents. They classify cases according to diverse typologies. They manage data, including ethics, access and governance of the database.

#### REFUSING + USING

Where data go, who uses them

**Reform** / Working with state to formulate new laws, policies and practices

**Remember** / Memorializing killed people; Grieving in public

**Revolt** / Protesting, mobilizing; Performing resistance in public space

**Reframe** / Storytelling that challenges stigma; Reframing violence as structural

**Repair** / Supporting families and communities who have lost beloved members

## #UMAPORUMA

Onde encontrar ajuda

**0800 281-8187**  
Ouvidoria da Mulher do Estado de Pernambuco

**180**  
Central de Atendimento à Mulher do governo federal

**100**  
Central de Denúncia de Exploração Sexual e Tráfico de Mulheres do governo federal

**190 - MULHER**  
Polícia Militar de Pernambuco

### Centros de referências especializados

**Centro Especializado de Atendimento à Mulher Clarice Lispector**  
Rua Bernardo Guimarães, nº 410 - Santo Amaro Recife/PE - CEP: 50.050-440  
Fone: (81) 3355-3009 / 0800-281-0107  
Email: ordalicespector@gmail.com

**Centro Especializado de Atendimento à Mulher Márcia Dangremom**  
Rua Maria Ramos nº 131 - Bairro Novo - Olinda/PE - CEP: 53.920-010  
Fone: (81) 3429-2707 / 0800-281-2008  
Email: cmclinda@yahoo.com.br

**Centro Especializado de Atendimento à Mulher Maristela Just**  
Rua Teixeira São João, nº 64 - Prazeres - Massaranduba  
Jardim dos Guararapes/PE - CEP: 54.310-091  
Fone: (81) 3468-2485  
Email: cmumaristelajust@gmail.com

**Centro Especializado de Atendimento à Mulher Aqualtune**  
Rua Santa Tereza, nº 384, 1º andar - Centro - Paulista/PE - CEP: 53.000-000  
Fone: (81) 3433-4447 / (81) 3437-0891  
Email: bpinhalves@hotmail.com

**Centro Especializado de Atendimento à Mulher Maria Percina Souto**  
Rua José Bezerra da Silva, nº 146  
Centro - Cabo de Santo Agostinho/PE - CEP: 54.510-520  
Fone: (81) 3518-1937  
Email: cmmap10@hotmail.com

**Centro Especializado de Atendimento à Mulher**  
Avenida Dr Pedro Correia de Araújo, s/n  
Centro - São Lourenço da Mata/PE - CEP: 54.735-210  
Fone: (81) 98891-1488 / (81) 3535-3984  
Email: tacitaniho@hotmail.com

**Centro Especializado de Atendimento à Mulher**  
Rua Hilda da Costa Monteiro, nº 94 - Centro - Ipojuca/PE - CEP: 55.590-000  
Fone: (81) 3551-2505  
Email: cmulheredonaumaipjuca@gmail.com

**Centro Especializado de Atendimento à Mulher em Situação de Violência Doméstica e Sexista De Gravatá**  
Rua João Pessoa, nº 170 - Centro - Gravatá/PE - CEP: 55.642-000  
Fone: (81) 3563-9003 Prefeitura  
Email: secmulher@prefeitura.degravata-pe.gov.br

**Centro Especializado de Atendimento à Mulher em Situação de Violência Doméstica e Sexista de Vertente do Lério**  
Rua Olímpia Batista de Santana, nº 22  
Centro - Vertente do Lério/PE - CEP: 55.760-000  
Fone: (81) 3634-7220 Prefeitura  
Email: sec.mulhervertencederio@outlook.com

**Centro Especializado de Atendimento à Mulher Maria Bonita**  
Rua: Barão de Porto Seguro nº 117  
Maurício de Nassau - Caruaru/PE - CEP: 55.004-350  
Fone: (81) 3721-0499  
Email: karinyoliveira@caruaru.pe.gov.br

**Centro Especializado de Atendimento à Mulher Josefa Mendes de Barros**  
Rua José Bezerra da Silva, nº 230  
Centro - Santa Cruz do Capibaribe/PE - CEP: 55.890-000  
Fone: (81) 3731-1826 Prefeitura  
Email: coordenadora.camulheresc@gmail.com

**Centro Especializado de Atendimento à Mulher em Situação de Violência Doméstica e Sexista Joana Beatriz Lima e Silva**  
Rua Frei Carneiro, nº 344 - Heliópolis - Garanhuns/PE  
Fone: (81) 3762-9115  
Email: cornegianhuns@gmail.com

**Centro Especializado de Atendimento à Mulher em Situação de Violência Doméstica e Sexista Dona Agrestina**  
Rua Coronel Manoel Alves, nº 110  
Centro - Agrestina/PE - CEP: 55.495-000  
Fone: (81) 3744-1103 Prefeitura  
Email: secretaria.mulheragrestina@gmail.com

# Examples of Data-Driven Services

## Dynamic Content Delivery

- **Netflix's Content Personalization**  
(it analyses **viewing history, preferences, and ratings** to suggest shows and movies)



## User Behavior Analytics

- **Google Analytics**
- **Adobe Analytics**  
(these tools analyse website and app user behaviour, providing insights into how users interact with a digital product)



## Personalized Design Recommendations

- **Canva's Design Suggestions**  
(by analyzing what users commonly choose it tailors the design options presented to individual users)



## Personalized Travel Recommendations

- **Tripadvisor**  
(data from user reviews, preferences, and past travel behavior are used to provide personalized travel recommendations, such as hotels, restaurants, and activities that align with individual tastes and previous experiences)



## Personalized Learning Experiences

- **Coursera**  
(by analysing user progress, engagement, and interests, it suggest courses, learning paths, and resources that are most relevant to the learner's goals)



**Do you know other services data-driven services?**

# What is a service?



# What is a service?

## Services...

1. Are not tangible
2. Are not separable from consumption
3. Cannot be stored
4. Cannot be owned
5. Are complex experiences
6. Quality is difficult to measure

Source: Mager, Birgit: Service Design – a review. Hollins, Bill: Design and its management in the service sector.

**Intangible value** delivered to users through the **interaction of people, processes, technologies, and environments**.

It is not a physical product, but **the experience and outcomes** that meet specific needs of people (stakeholders, users). Services are often co-created, meaning they rely on both the provider and the user to produce the desired result.

Key elements of a service in service design are:

- **Touchpoints**  
(phygital points of interaction between the service provider and the user)
- **Back end and Front end**  
(infrastructures and system for managing the process)
- **User Journey**  
(sequence of events a user experiences, from discovery to post-service support).

**Human variability and context play a much bigger role** in influencing our experience, even of the same service.



# Service is a collection of experiences

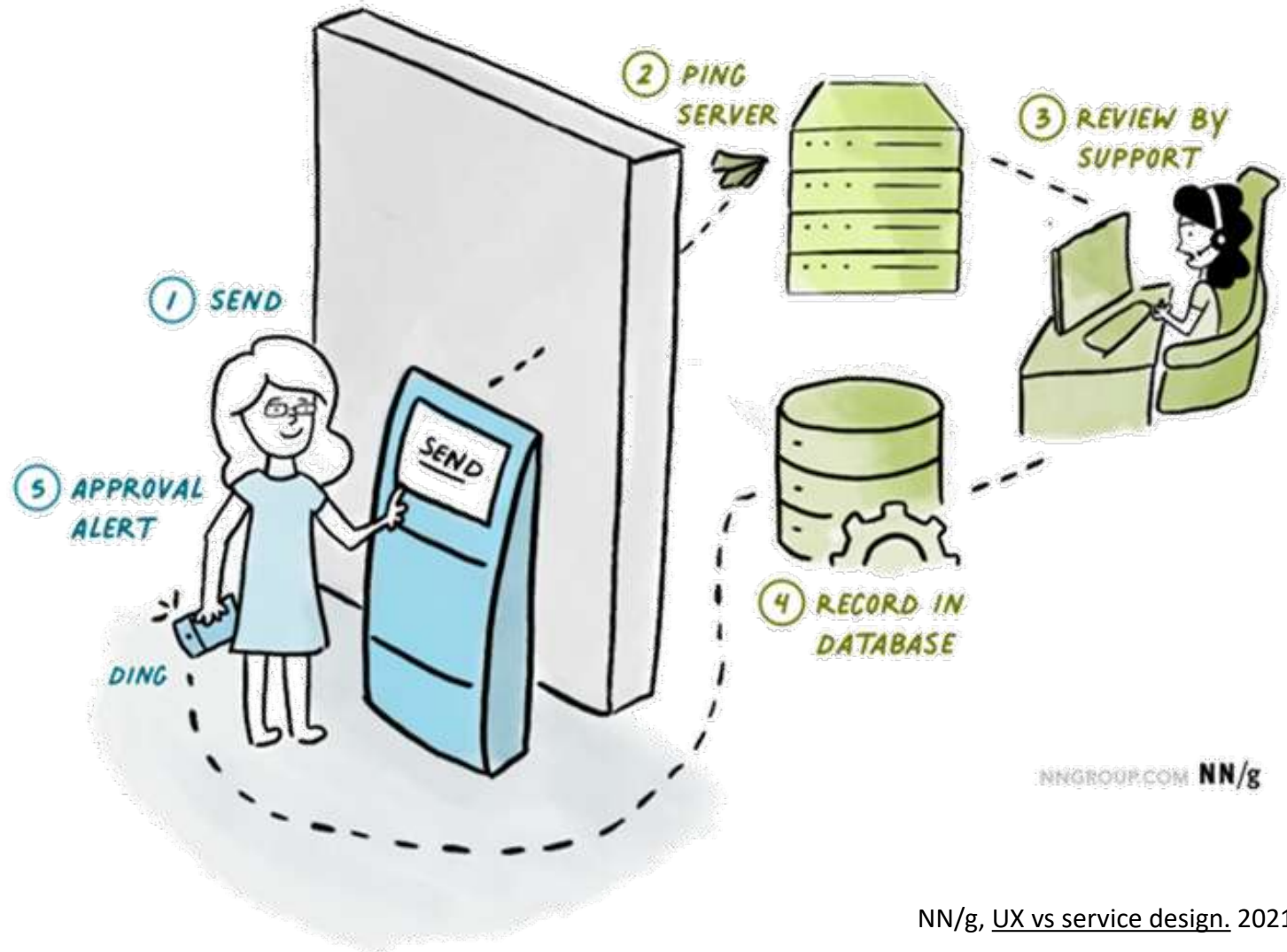
**Service design** is focused on **how** that user experience is internally created.

**User experience** is focused on **what** the end user encounters.

## User Experience

vs.

## Service Design

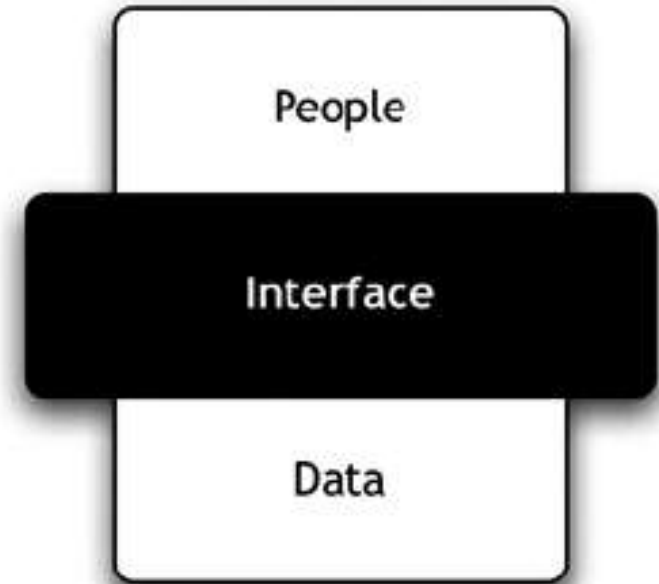




# We make experience through interfaces (over time, through touchpoints)

An interface is the representation making data and information available as sensorial phenomena, tailored for the human perception, cognition and action.

The interface is a communication tool, applying conventions and rules enabling the person to experience the system/service (through its representation).



Don't forget **people**.  
Always decide and define the **output**.



y.com/4023788

# Experiencing data

# From a human-centred perspective, data is...

Phenomena that occur and that begin to exist as data **if and when** someone decides to **observe, count and classify** them.

Data answer questions and **serve goals**.

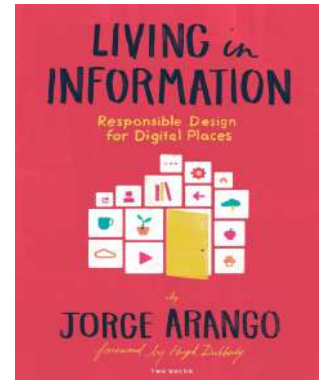
Data is something that we use to reduce uncertainty and make better predictions and decisions.

The data exists in relation to the subjects that **produces** it, **collects**, and then **uses** it, whether it is a single individual or a research community.

Data is a **construction** and reflects the relevance given to what it is decided to be measured.



To learn more: : Jorge Arango.  
[Living in Information. Responsible Design for Digital Places.](#) 2018



To learn more: Lucio Cassia et al., Un dato di fatto.



# Data interplay with the Human Activity

Human activity is described as a hierarchical system where **each activity includes a set of actions** which in turn includes a **set of operations**.

## ACTIVITY:

reasoned practices which **determine** a spectrum of possible actions

➤ Activities always respond to motivations

## ACTIONS:

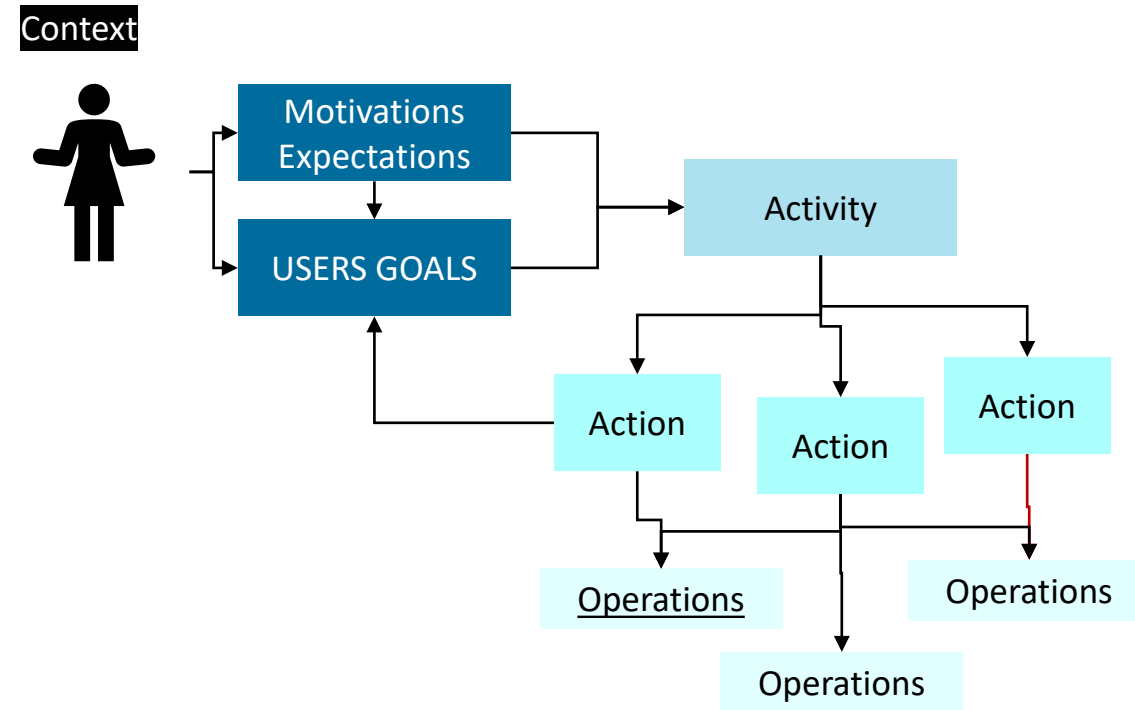
also described as Tasks, are purpose-oriented conscious and planned behaviors

➤ Actions refer to objectives

## OPERATIONS:

specific motor chains, determined at a lower level, often performed automatically (sign activity, signal discrimination, ...)

➤ Operations are influenced by conditions.



MOTIVATIONS

GOAL

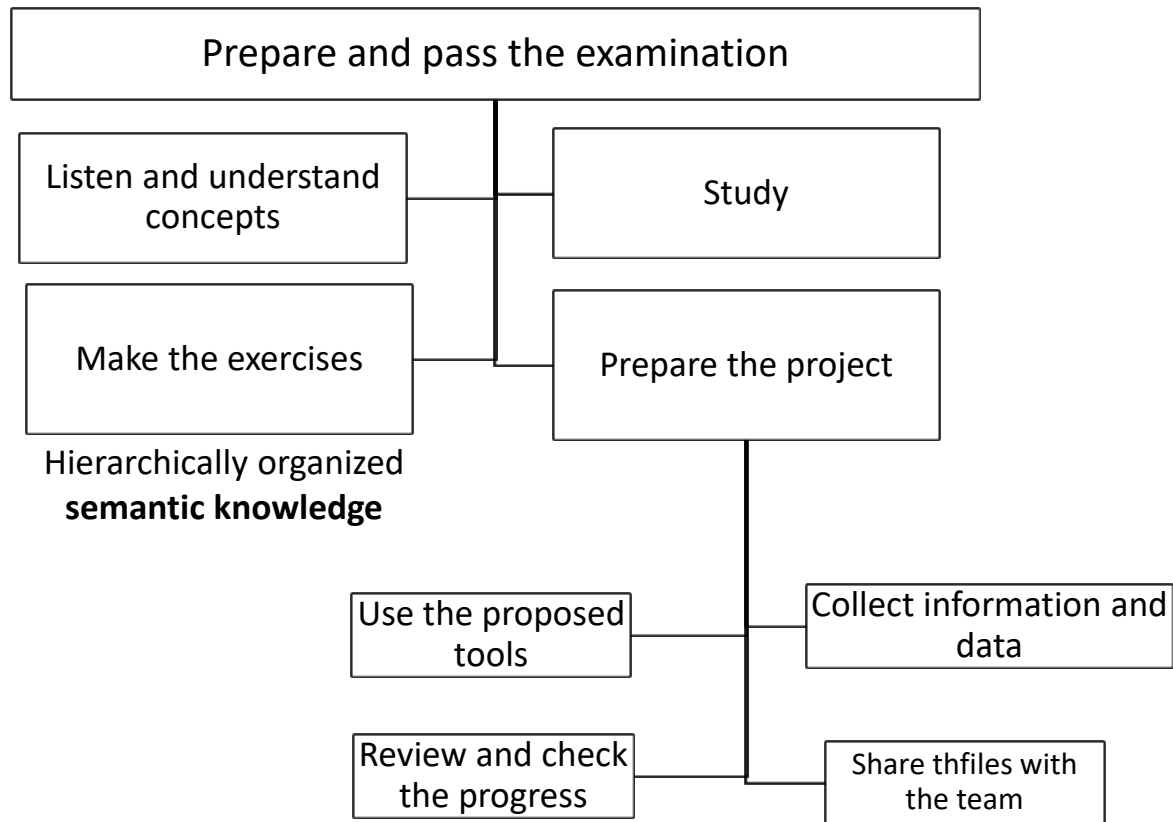
Activity

Actions

Sub-actions

Operations

- Start a career as a Data scientist
- Reach the Master's degree



Hierarchically organized  
**semantic knowledge**

**Procedural knowledge**

(different per tool and varying over time with the practice)



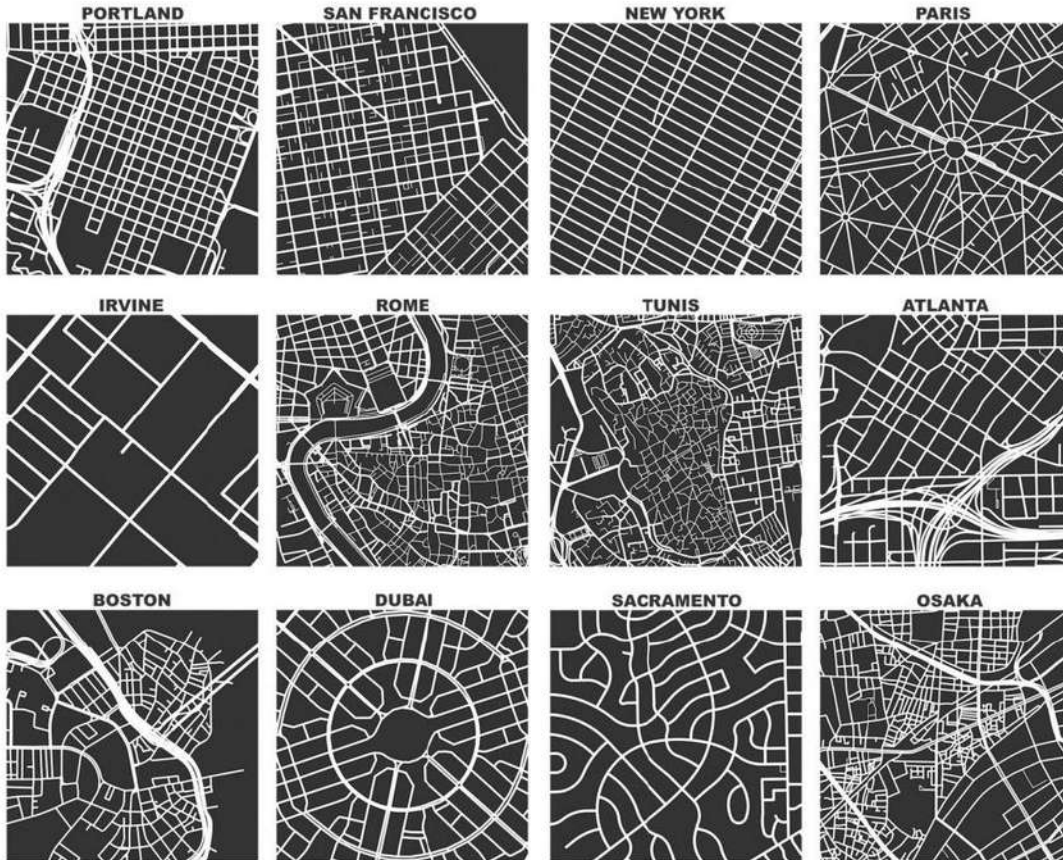
# Data fruition: from the motivation to the action

Hierarchical structure  
(from generic to specific level)





# Human-data interaction is task-specific



Processing and visualization of data must respond to a clear goal, even when it is exploratory.

In the EXAMPLE:

Quantify the **similarity between neighbourhoods** for supporting

- The urban planning
- The real estate market

## DRIVING QUESTIONS

«What features should be displayed to facilitate comparison of neighbourhoods? What characteristics make two neighbourhoods «similar»?

E.g. Layout of roads

# Interacting with data, we are fully engaged

The use of data and information involves several of our cognitive systems

- **REASONING AND LOGIC:**  
making assumptions and decisions, coordinating our movements in the various activities we carry out and verifying the consequences of our actions we use data continuously
- **EMOTIONS:**  
is the experience that is solicited by what we browse and that influences our ability to interact and our cognitive fluidity
- **ATTENTION:**  
the ability to understand context (peripheral attention) and select stimuli allow us to act appropriately
- **PERCEPTION:**  
the data we come into contact with are impulses that reach our nervous system, through the sensory organs, especially sight, but also hearing, touch, self-perception



## 2 cognitive functioning modalities



### FAST THINKING (system 1)

It's based on procedural memory.

It is reinforced by the repetition that fixes the motor behavioural patterns (habits, automatic operations).

In this situation,

**INTUITION** generates impressions on perceived or thought objects. Actions are quick, economical, not always conscious.



Micro-interactions

### SLOW THINKING (system 2)

Very expensive mode, that we activate it for solving complex problems and decisive choices.

It is influenced by previous experience, reflexive observation, and heuristics (empirical rules tested)

It generates judgements, is a slow, costly, intentional process.

In this situation,

**REASONING** generates judgments, which are: slow, expensive, intentional





# Decision making: Skill-Rule-Knowledge Framework

## Automatic



Skills

Less challenging behaviours in terms of **cognitive resources** and active control, these established routines are based on stable patterns called skill-driven behaviours.



Rules

More complex activities requiring the active involvement of the person that spends more cognitive resources to apply rules.



Knowledge

Finally, when the situation is new or critical (high severity of **consequences** in case the situation is not properly managed) or complex (that is, a very large number of **variables** or **alternatives** to consider), additional cognitive resources such as problem-solving and decision-making, support knowledge-based behaviors, are required to get to the solution.

## Aware

## Inner and external knowledge

Especially in the digital realm, every system is an **external knowledge device**, containing much of the information useful to experience and that the person does not need to store.

The interfaces are designed to enable the individual to access in a simple and explicit way the information needed during an activity.

A list of options in a menu is an external knowledge device:

- The menu allows the user to recognize the options and make a selection without having to memorise or remember anything.

Command line interfaces ask the user to recall commands, and recall them when needed

## RECOGNITION OVER RECALL



[Digital information wall](#)

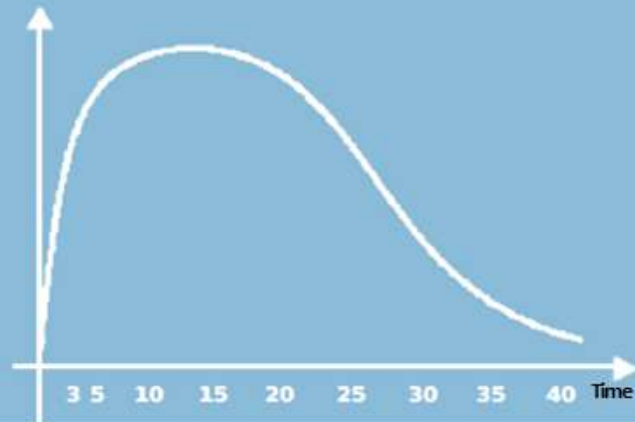
```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Versione 10.0.16299.309]
(c) 2017 Microsoft Corporation. Tutti i diritti sono riservati.

C:\Users\>help
```

# Attention, a precious resource



Attention focus



Our cognitive system has a fixed amount of attentional resources and the amount of resources allocated on multiple simultaneous tasks (typical of the mobile interaction) determines the quality and speed of processing of the respective tasks.

*Information consumes cognitive resources. The abundance of information generates a poverty of attention and induces the need to allocate that attention efficiently among the many sources of information that can consume it».*





# Widen the perspective

## IDEO

Data science is a discipline of human-centered design.

“When data science, interaction design, and engineering experts come together, we’re able to introduce radically new experiences and systems.”

**DEAN MALMGREN**  
PARTNER, IDEO CHICAGO



## Google Design

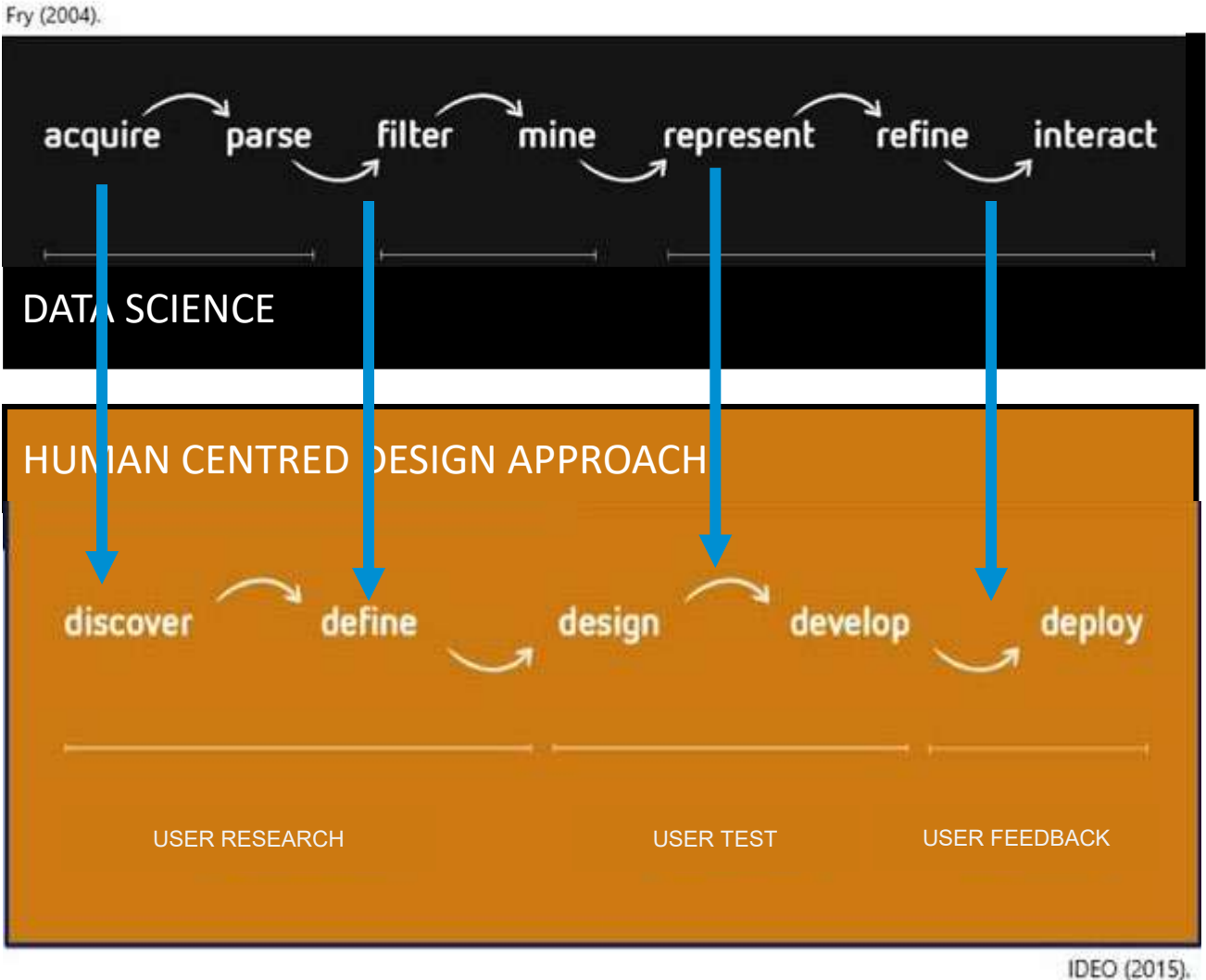
“Designers must be embedded in engineering and coding teams to keep the AI and machine learning efforts real—to keep them part of the world.”

Paola Antonelli  
MoMA's Senior Design Curator



“Not keeping into consideration the **relationship between the digital tools** we create/develop/manage **and human behaviours**. Keep on leaving those **relations misunderstood and uncontrolled**, might have **unintended consequences** and encourage the development of **very negative phenomena** for individuals, communities and populations.”

# The human centred design || data science





# The Human Centred Design approach

The **Human Centered Design** (HCD) is a design approach defined by the psychologist Donald Norman's seminal work.

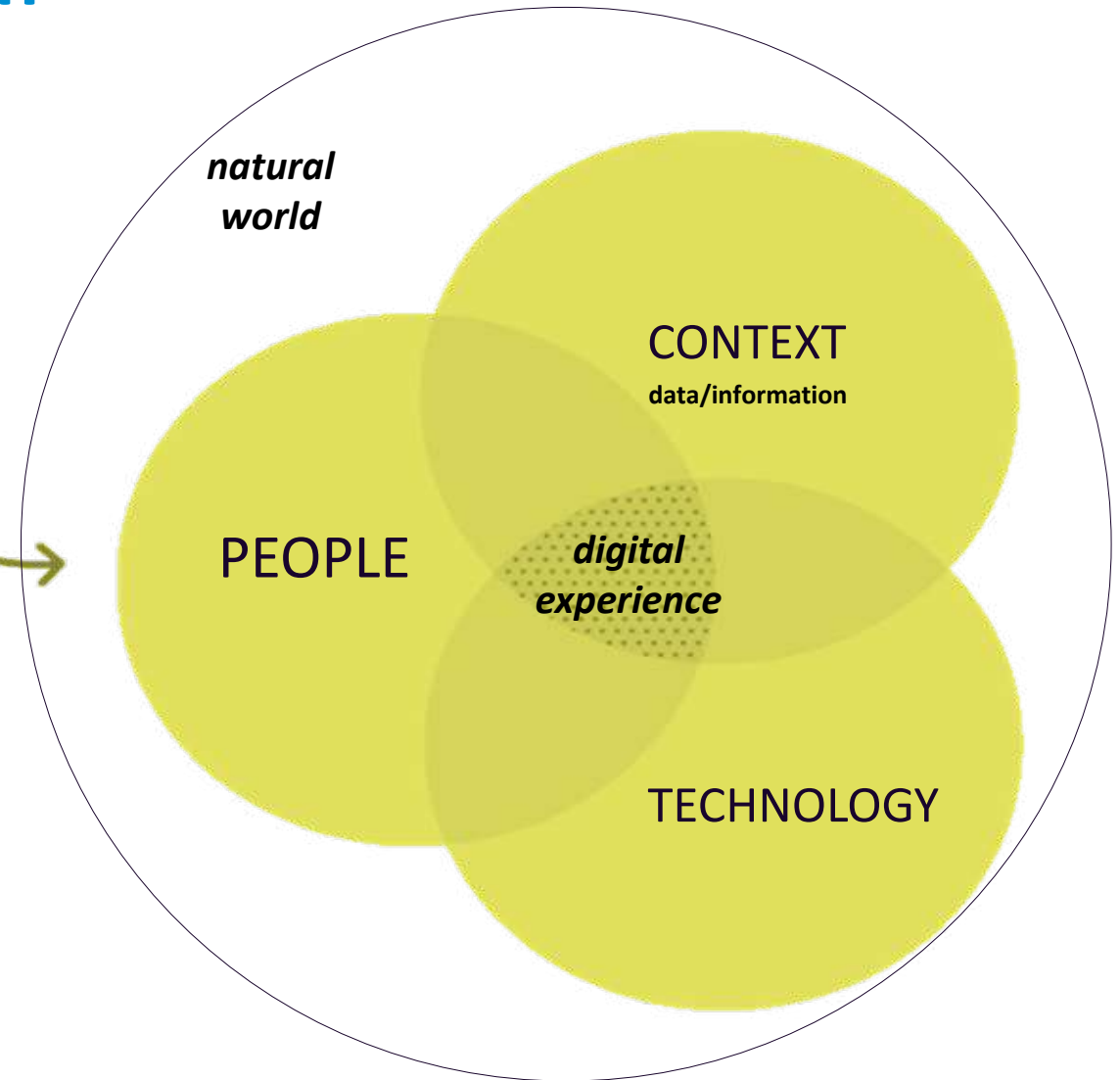
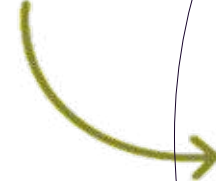
It reinterprets the human-computer interaction (HCI) in a psychological key, widening the **focus** from the product/system to the **people who use it**.

In this perspective, **EVERY SYSTEM INCLUDES PEOPLE** interacting with it a specific context. Here, data and information works as **SOCIAL CONSTRUCTS** that human beings generate, use, exchange, and enrich them.

The approach is the common background of many methodologies worldwide applied in the fields of software development (**Agile, Lean, Scrum**), design (**Design Thinking, UXD, Sprint ...**), education, social innovation, ...

It is also formalised in several ISO Standards.

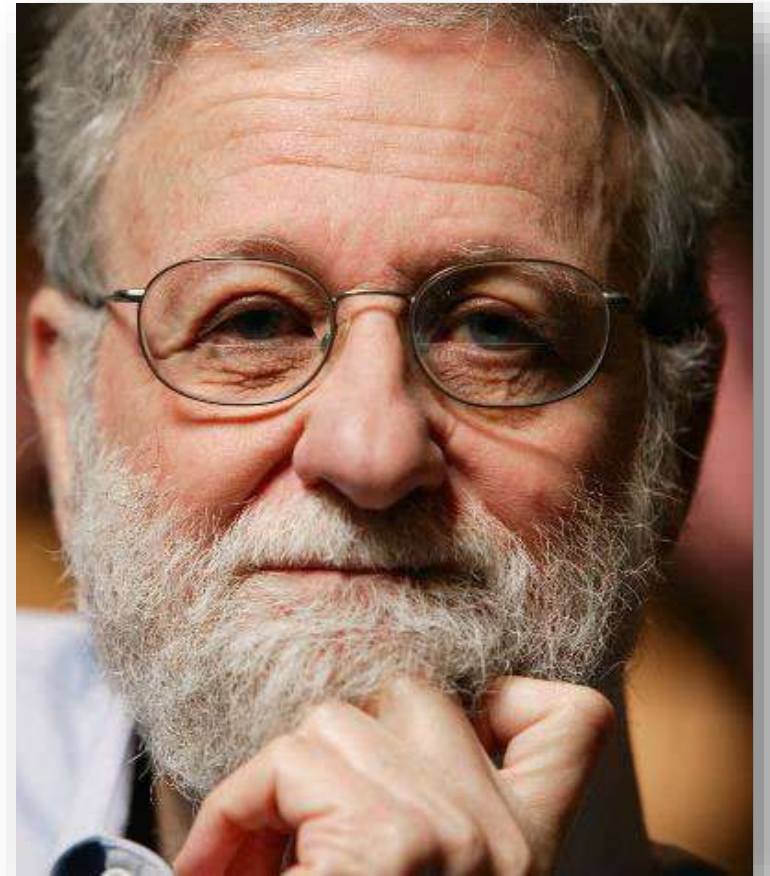
Start here



*“Artifacts pervade our lives, our every activity.  
Technology, potentially, makes our daily life more comfortable and pleasant...  
But at the same time, **it adds complexity and complication**”.*

## TECHNOLOGY PARADOX

*Complexity and difficulties are inevitable  
when increasing the number of features.  
A **good design can minimize it**”.*



# Human Centred Approach mindset

## HUMAN CENTRICITY

People are an integral part of the system. The design and development process must incorporate the needs and perspectives of **direct and indirect beneficiaries**.

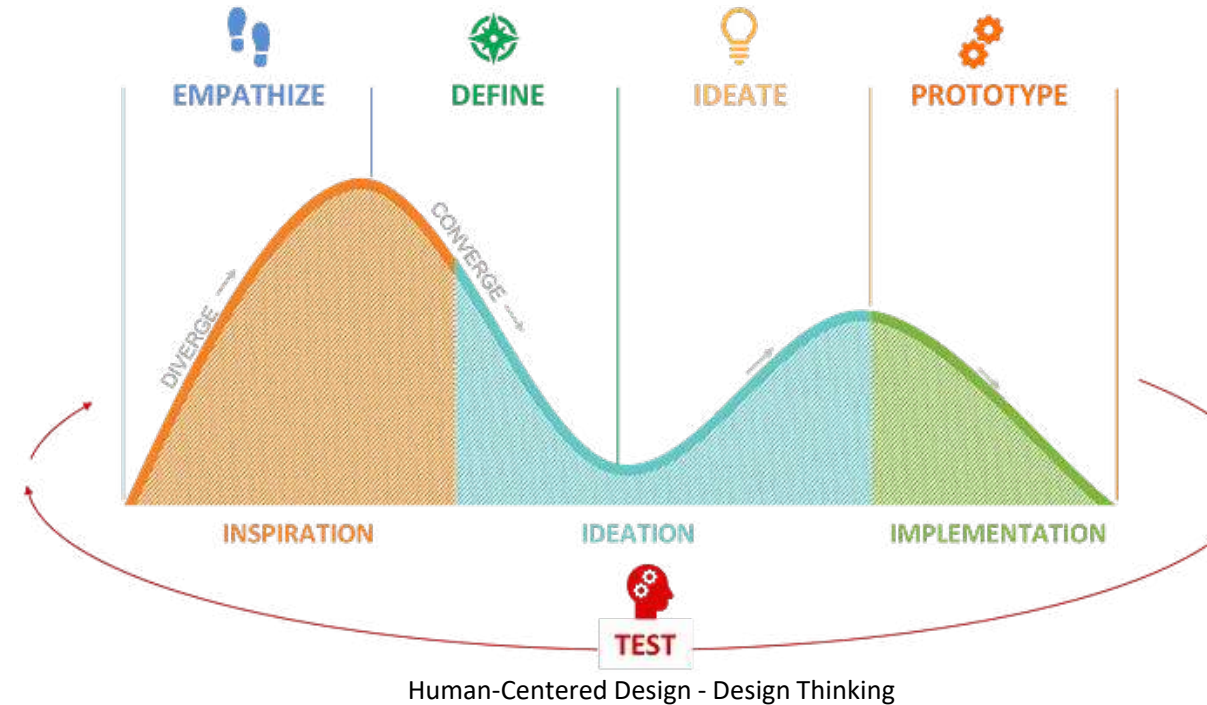
## ITERATION AND FEEDBACK

**Start by design, then develop. Test, fail early and often. Learn from errors and design again.**

Show, don't tell and test during the development, to create space to make **mistakes**, learn from different perspectives, progressively improve, and take better decisions.

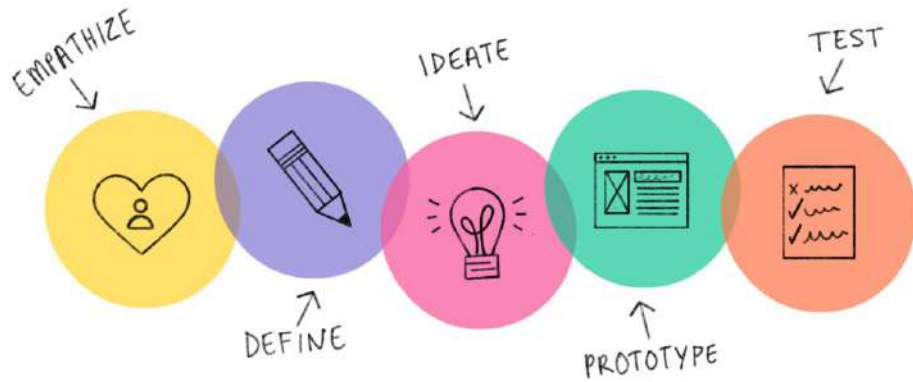
## DATA-DRIVEN APPROACH


Be consistent and stick to the real context, and collect data from the field. Combine big and small data (qualitative) to know the ecosystems in dept. Keep in consideration the **human variability** factors, to be inclusive and exhaustive.





# 1 approach, many methods



D.school, Human centred design 



## INSPIRATION

In this phase, you'll learn how to better understand people. You'll observe their lives, hear their hopes and desires, and get smart on your challenge.



## IDEATION

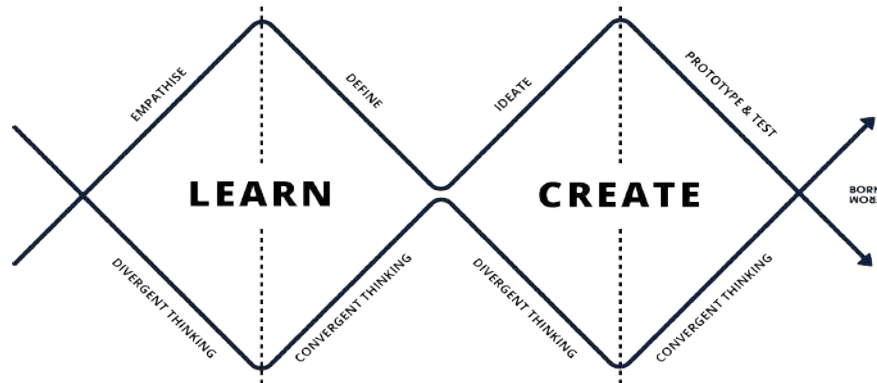
Here you'll make sense of everything that you've heard, generate tons of ideas, identify opportunities for design, and test and refine your solutions.



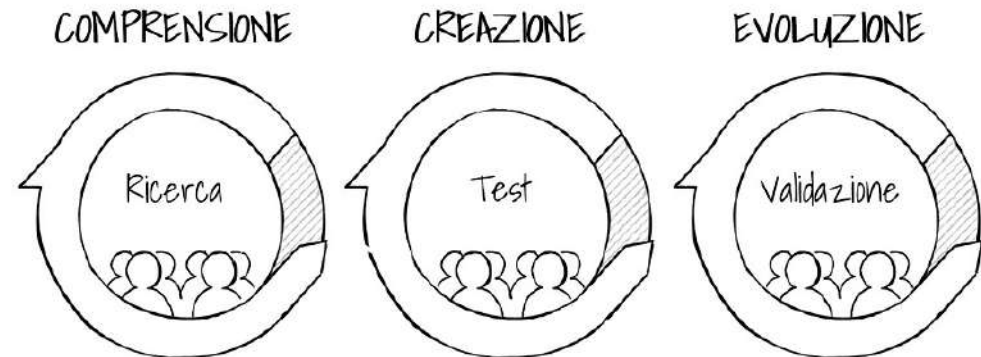
## IMPLEMENTATION

Now is your chance to bring your solution to life. You'll figure out how to get your idea to market and how to maximize its impact in the world.

Human Centered Design Field Guide, 2015. **IDEO**

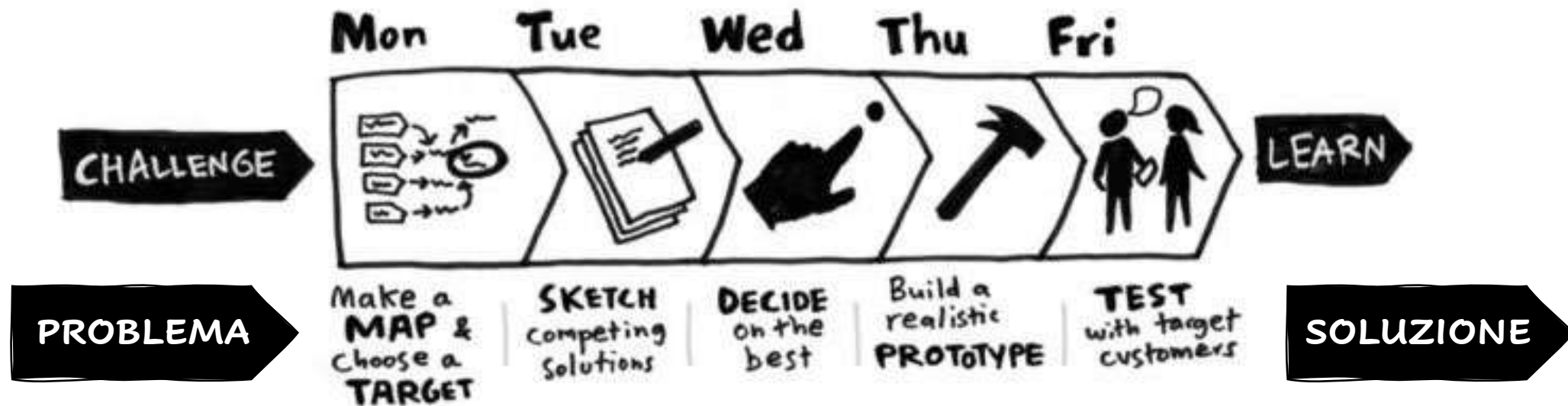
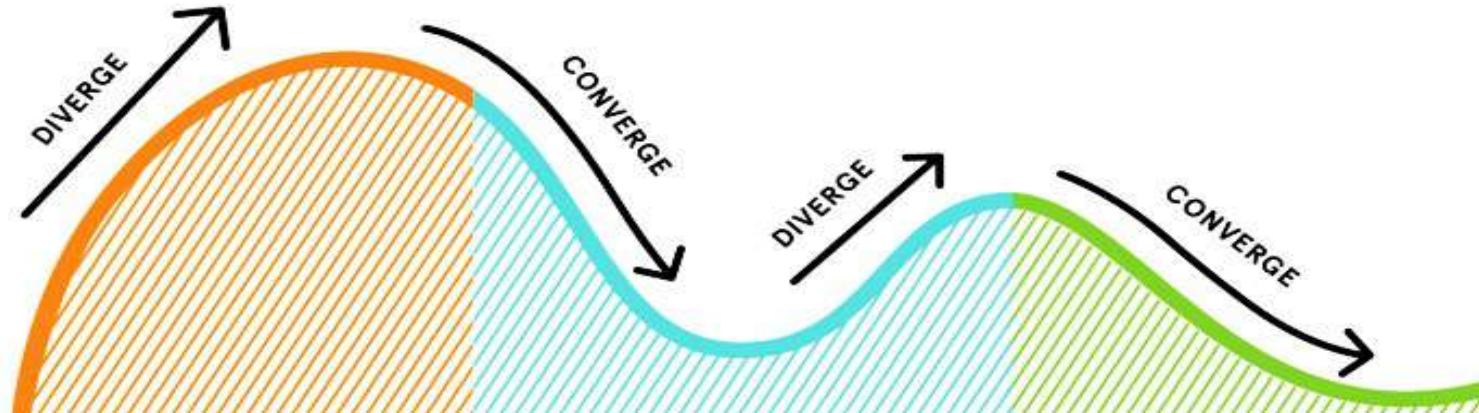


<https://www.designcouncil.org.uk/our-resources/the-double-diamond/>  
[designcouncil.org.uk](https://www.designcouncil.org.uk)



Bottà, D. UX Design design. Hoepli, 2019

# From Design Thinking to Design Sprint



# Experience (UX), a common field of action

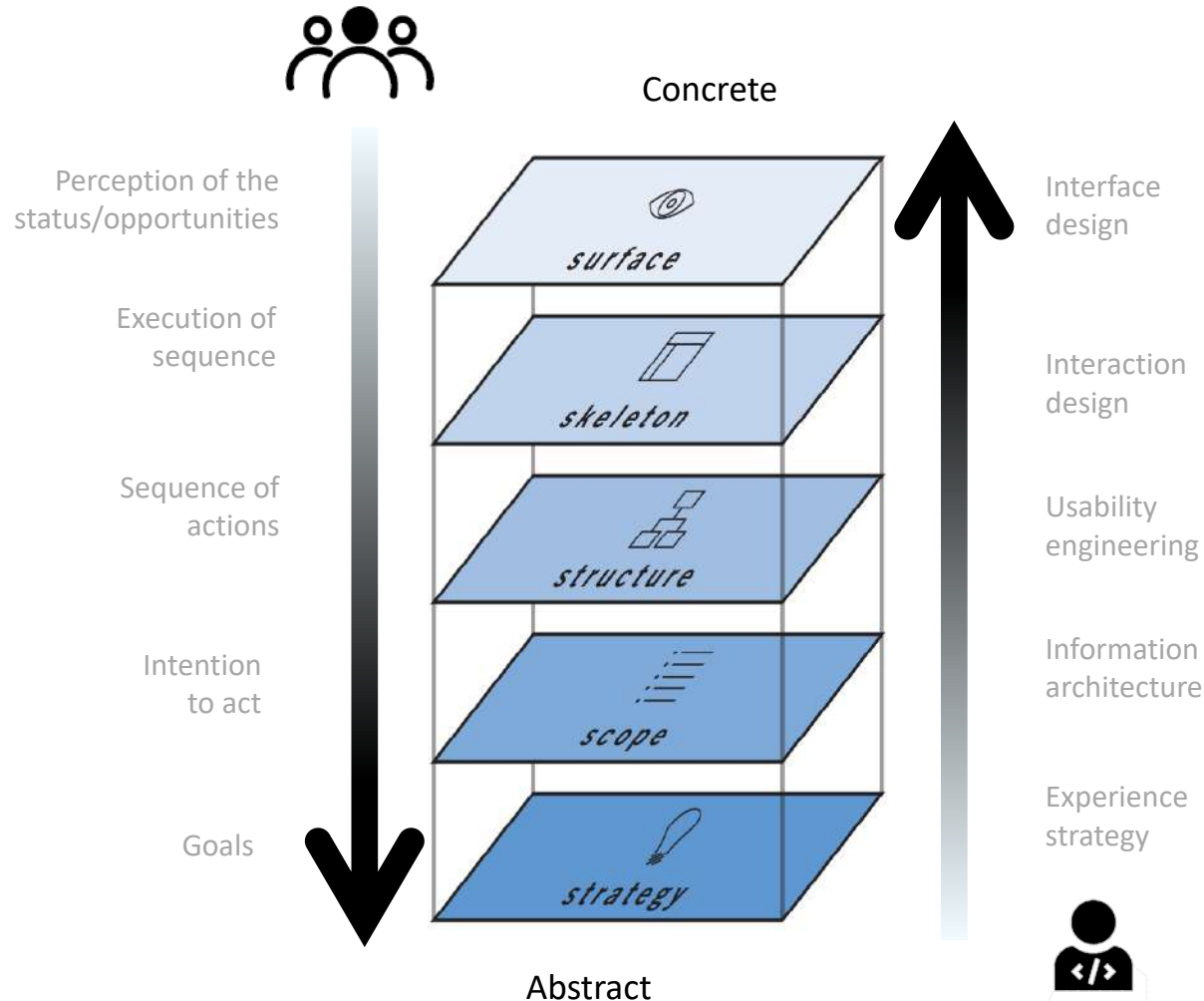
Users and designers share the same path,  
that run in the opposite direction.

ISO 9241:2019



**UX as Usage**  
*Who benefits proceeds  
FROM CONCRETE TO ABSTRACT*

It concerns the quality and fluidity  
of the whole experience over time:  
**expectation, use, memory,**  
that can be reached and  
maintained thanks to the  
compatibility with the individual,  
cognitive, emotional, contextual  
characteristics of the specific users.



## UX as Design

*Des/dev  
FROM ABSTRACT TO CONCRETE*

UX Design is the process for **ideating, designing and validating** aspects of the user experience.

# Human Centred AI Design principles and requirements

## #1 Put people first

The user's role, as well as the goal, have to be clear.  
To deliver positive experiences,

- Address user needs
- Consider human variability
- Prevent and manage possible errors

## #2 Design for trust and transparency

- Check the quality of the information
- Make visible sources and possible conflict of interest (Social Trust)
- Prevent biases

## #3 Make your solution Explainable

The user should always know how the system came to this conclusion or recommendation.

- Explain how the system works
- Review data (especially highly sensitive personal data) in use.
- Explain cause-effects relations right after the user action

## #3 Provide feedback and control

Let the user take informed decision. Provide alternative and support choices.

**Don't presume the desirability of AI**

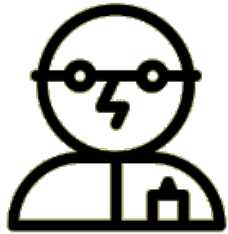
**Respect privacy and the collective good**

**Consider the unintended consequences of AI as design opportunities**





# Your projects



# Human Centred Design - Early Steps

1

## STAKEHOLDERS MAP

- Which is the **domain**?
- Who are the **key actors** involved in or impacted by this project/service?
- What are their primary **roles and interests**?
- What is the level of **influence and power** each actor has over the success or failure of this project/service?

2

## PERSONAS

- **Who are the primary users** of this product/service, and what are their key demographics, behaviours, and characteristics?
- What are the users' main goals, needs, and pain points, and how do they influence their interactions with the product/service?
- What are the **typical scenarios or contexts** in which users interact with the product/service?
- What **data they will provide/produce/receive**?

3

## USER JOURNEY

- What are the **key steps** users go through when interacting with our product/service, and what are their goals at each stage?
  - How do the users will reach the solution?
  - Which channels will be used?
- What are the **critical touchpoints and interactions** influencing the user's journey, and how can we optimise these to create a seamless and positive experience?
- We can now define the SMART goals of the service

Elements to  
define and  
communicate

- **THE VALUE PROPOSITION**
- **THE SMART GOALS**

of your project

# Contacts

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