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UrbanIXD Industry Report

Analysis of the Industry landscape around creating digital urban interactions

FP7 FET Open URBANIXD
Project # 323687



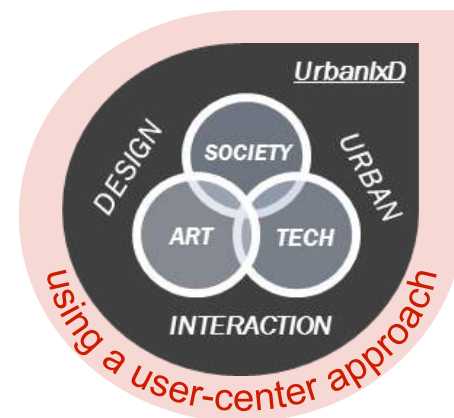
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Background

The [UrbanIxD Project](#) is a FP7 coordination action project, running from 2013 to 2014, for the European Commission under the Future and Emerging Technologies programme, that aims to define a coherent multidisciplinary research community working in a new research and/or application field called Urban Interaction Design.

[Urban Interaction Design](#) is an emergent field composed of three main elements: technology, society and art. It addresses the question of how we, as physical beings, will interact with the technologically augmented, data-rich urban environments that increasingly characterize cities. Urban Interaction Design (UrbanIxD) draws upon knowledge and approaches from a range of disciplines involved in the design of urban spaces, connecting them and establishing their interactions as a principle. It is also rooted in the wider field of interaction design (IxD), from which it takes much of its [emphasis on behaviors at the human scale, putting the user and the citizen at the center of the process of creating services, products and solutions in networked urban spaces.](#)



The present work is framed in the [Industry Landscape & Liaison work package](#) of the UrbanIxD project in charge of Telecom Italia and with the main propose of assess the current state of commercial activity and players, discussing the value for the industry to invest in this field, describing the biggest challenges, and identifying the most promising outcomes. [This document represents the results and analysis of an analysis of the Industry landscape around creating digital urban interactions in the Smart City context and an online survey.](#)

The [online survey](#) was the instrument used to answer some of the questions arising during the Industry landscape study. It was deployed in two phases; the first one was conceptualized as an exploration phase whose main target was to assess the general opinions of the extended community involved and related to the project in the subjects of interests; the second one, which was based on the information obtained in the first stage, was aimed to add an important non-probabilistic but quantitative sense to the consultation, increasing the survey samples and converging the wider ideas gathered in the early phase.

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Can Urban Interaction Design mediate between people, places and technology?

Question

“Technology is the answer.
But what is the question?”



[Cedric Price, Architect]

Technology

“The most profound technologies are those that disappear. They weave themselves in the fabric of everyday life until they are indistinguishable from it.”



[Mark Weiser, Computer Scientist]

People

“We don't make cities in order to make buildings and infrastructure but to come together, create wealth, culture, more people.”



[Dan Hill, CEO]

Design

“Design is the difference between having a digital project in a lab or out in the real world.”

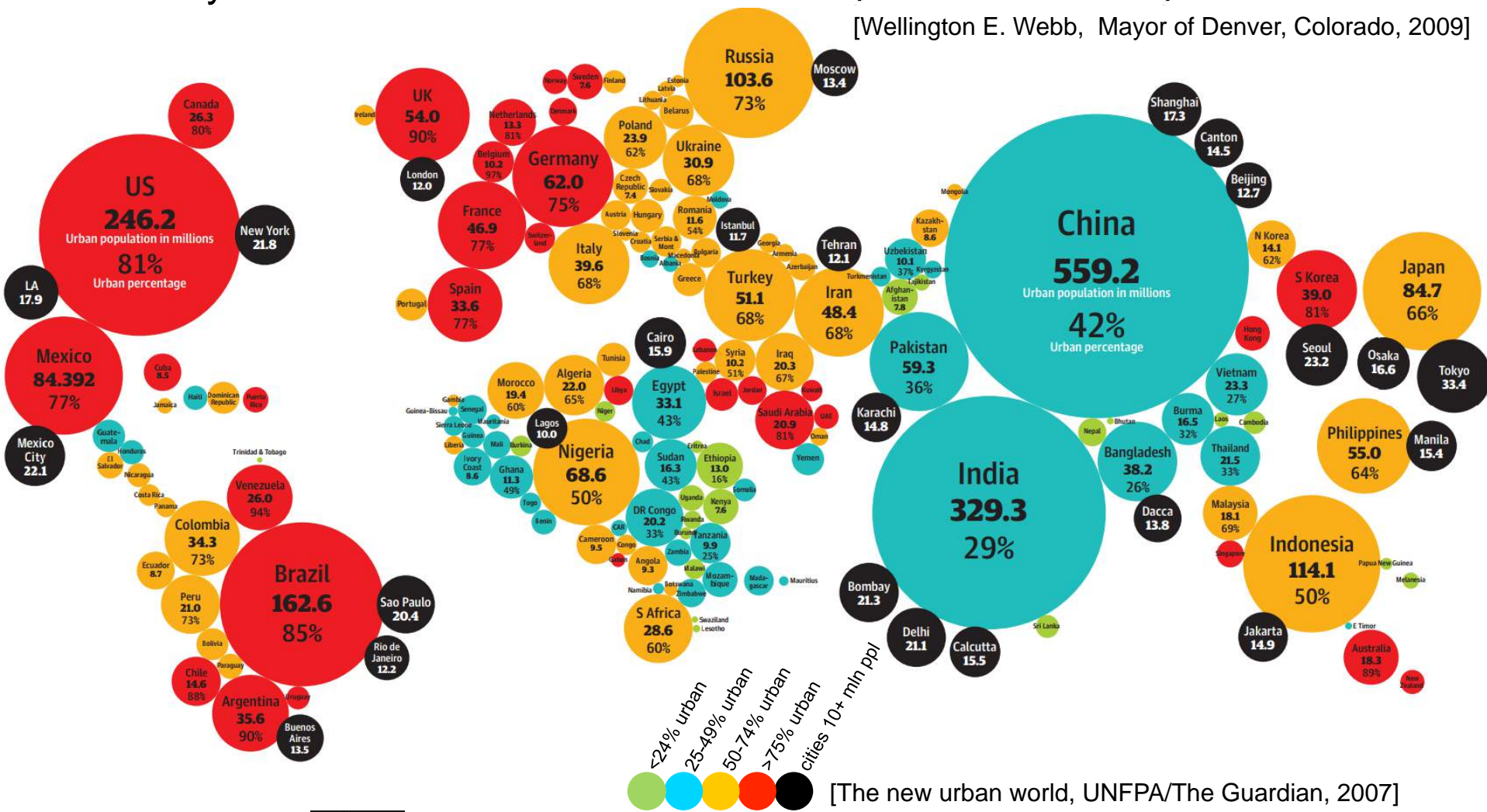


[Lord Inglewood, House of Lords, UK]

The new urban world

The 19th century was a century of **empires**, the 20th century was a century of **nation states**. The 21th century will be a century of **cities**.

[Wellington E. Webb, Mayor of Denver, Colorado, 2009]



[The new urban world, UNFPA/The Guardian, 2007]

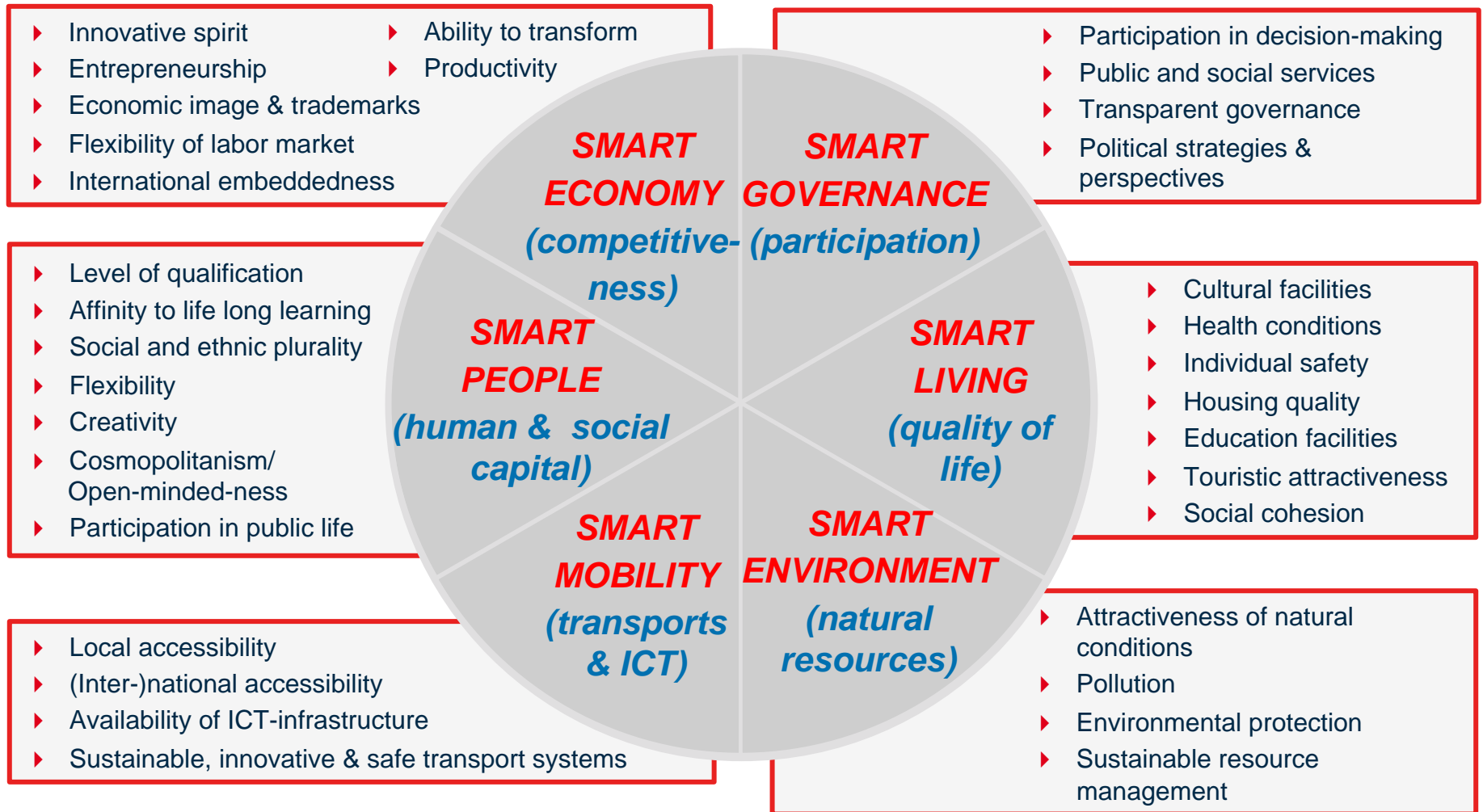
Smart Cities impact on several human activities

Defining a Smart City

We believe a **city** to be **smart** when investments in **human and social capital** and traditional (transport) and modern (ICT) **communication infrastructure** fuel **sustainable economic growth** and a **high quality of life**, with a wise management of **natural resources**, through **participatory governance**

[Andrea Caragliu et al., 2009]

Smart City functional areas and characteristics

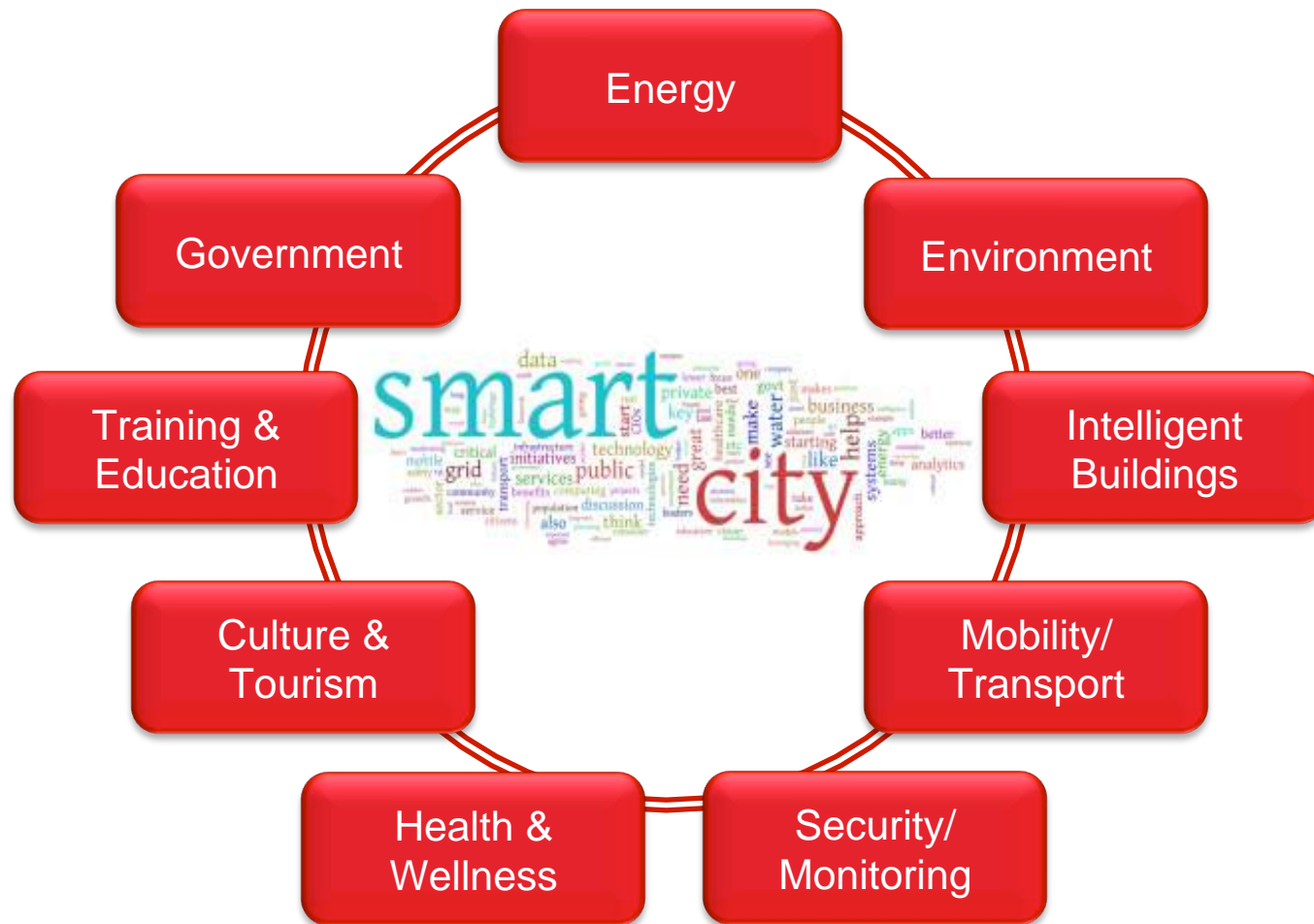


[Smart cities. Ranking of European medium-sized cities. TU Wien, Lubian University, TU Delft,

2007]

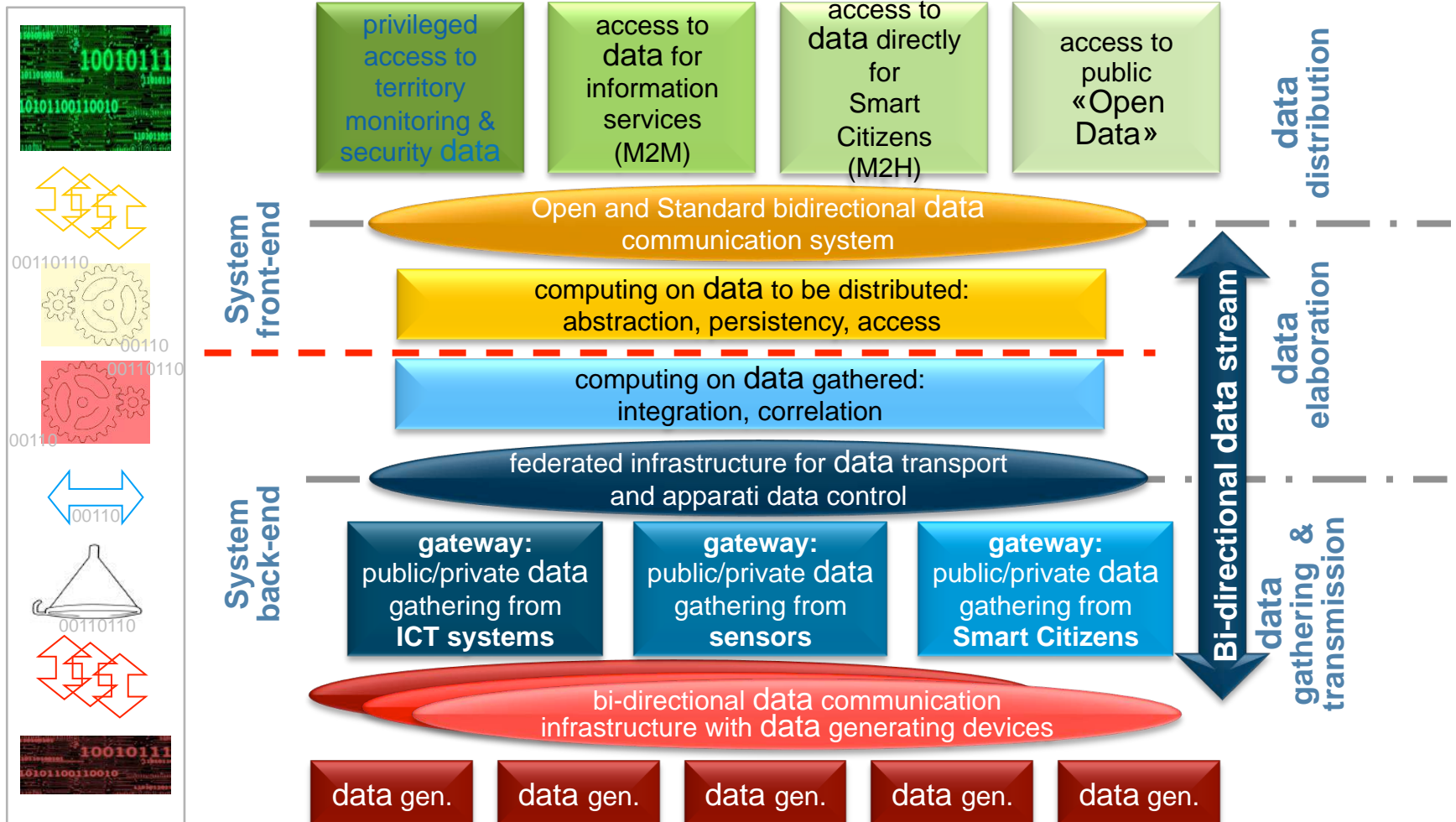
Application areas addressed in a Smart City

According to the Programme for Digital Services set by the Italian Government [Agenzia per l'Italia Digitale] there are 9 main application areas:



A Smart City architectural model: all(most) about data

This revised model was published by the Agenzia per l'Italia Digitale in 2012 as a recommendation to the public administration



Global trends for Smart Cities

- ▶ More than two-thirds of the global population is expected to live in urban contexts by 2050
- ▶ There will be at least 88 Smart Cities all over the world by 2025, up from 21 in 2013, narrowing the definition of **Smart Cities** to cities that **have deployed** - or are currently piloting - the integration of **ICT solutions across three or more different functional areas** of a city. That means the number of smart cities worldwide will quadruple within a 12-year period that started last year.

North America

- ▶ Projects often **focus on a single functional area**, such as mobility and transport
- ▶ **Structured programmes** from big industrial players (IBM, Cisco & Siemens)
- ▶ Largest revenue generator in the smart solutions market

Europe

- ▶ Counted with the **largest number of smart cities last year**
- ▶ Focus on **energy** and **entrepreneurship & human capital** policies
- ▶ Market growth is expected after recession with slowly increasing investments in infrastructures to improve public facilities

Asia-Pacific Middle East- Africa

- ▶ Projects are sometimes based around creating **new infrastructure, rather than replacing legacy systems**
- ▶ Smart city **from scratch**, that will make them take over the lead in number of smart cities by 2025
- ▶ Most attractive market for the players operating in this market because of their high investments in the smart cities projects

Smart Cities are one of the biggest worldwide market

- ▶ There are more than 557,000 local governments around the world, and they spend about **\$4500 bln** each year to deliver important services to their citizens.
- ▶ Just in Europe there are more than 4,000 mayors with 164 mln inhabitants and more than 1,000 mayors with 88 mln inhabitants involved in USA

[CityMart.com blog, 24 Nov 2012]

- ▶ Cities have always been places of opportunity and even more so now. Recent estimates say that **80% of global GDP is generated in cities**

[Research Paper No. 136, ARUP, 2013]

- ▶ Market technologies and services needed to make Cities «smart» revenue will grow from **\$8.8 bln annually in 2014 to \$27.5 bln in 2023**

[Smart City, Navigant Research 2Q 2014]

- ▶ By the end of **2013** there were **170 smart city projects worldwide** of which more than 80% were addressing issues related to energy, transportation, or government.

[Smart City Tracker 3Q13, Navigant Research]

Smart Cities projects business models

Smart city projects are typically deployed via partnerships between the public and private sectors. The main business models include:

**Build-
operate-
transfer
(BOT)**

Most common model, where city planners work closely with an external private partner that, in turn, develops the services and deploys the necessary infrastructure. The third party is also responsible for the operation and continued management of the infrastructure, until such time when it is transferred back to the city

**Build-
operate-
comply
(BOC)**

BOC and MOD models, in comparison with the BOT, assign varying levels of responsibility in the building, operation or maintenance of smart city projects for the public and private sectors that are involved in those works.

**Municipal-
owned-
deployment
(MOD)**

[Smart Cities Report. HIS Technology, May 2014]

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Designing Interactions, for a system more easily usable

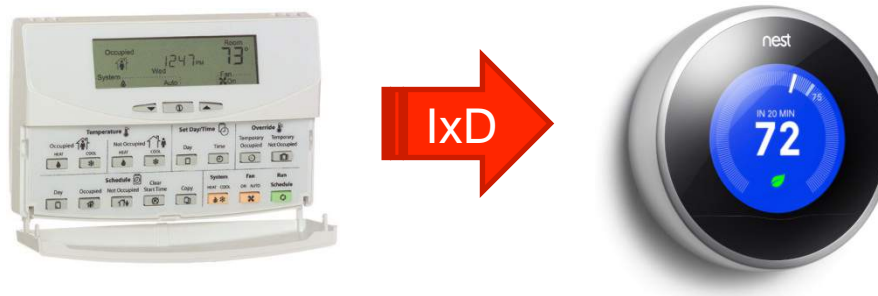
“I would have to learn to design the interactive technology instead of just the physical object“

[Bill Moggridge, 2006]



With "interaction design" products were created with **ease of use for the human** in mind, rather than simply a machine built by an engineer to perform a certain task

Interaction Design (IxD) makes smartness happen



NEST is a good example of how IxD turns a dumb product into a smart green one

- ▶ new technology and design is injected into the thermostat, to make it easier to use:
 - ▶ it simply looks like a knob or a dial because 99.9% of the time is about turn it up/down
 - ▶ more complex functions, such as setting a schedule, through a mobile app
 - ▶ infrared sensors allow the device to light-up/dim in human presence and turn down the heat
 - ▶ it has intelligence that learns from earlier temperature changes
- ▶ because thermostats typically control half the energy used in U.S. homes, a better-designed one could significantly reduce power consumption
 - ▶ the \$250 product has kept owners from using 225 million KWh of energy, saving around \$29 million at average U.S. prices
 - ▶ it also coaches people to use less energy with the green leaf icon

Design makes ROI-Return on Investment-higher

- ▶ According to a recent UK Design Council research, the most commonly reported rate of return from GB companies calculating a % return on design investment was 15%. (2008)
- ▶ In Great Britain an average design investment has been calculated to multiply the turnover by 2.25 when compared with the invested resources. (2007)
- ▶ In the USA companies who effectively invest in industrial design outperform their competitors by 75% on net sales and have increased profits (2005)
- ▶ In Denmark companies investing in design have gained a growth 22 % greater than companies that have not invested in design, and the difference will rise up to 40 % when talking about continuous investing. (2003)

“Urbane”: life style and culture implications in the cities

Attitudes of Urban consumers to be considered when innovating urban services:

- ▶ The average Manhattanite household spends 59% of their USD 13079 **food budget on dining out**, compared to the average American household that spends only 42% of their USD 6,514 food budget on dining out

[Bundle, May 2010]

- ▶ Even four years ago, Harris identified 'Urban Hustlers' (who comprise 21% of US consumers aged 12-34), spend close to USD 9 billion (10% of their annual spending), on **recreational activities**. Urban Hustlers are spending, on average, over USD 100 more than the non-urban population monthly, with their overall discretionary spending reaches USD 383 per month

[Harris Interactive, June 2007]

- ▶ The lifestyle of urban Chinese consumers has changed from a “survive” mentality to an “**enjoy life**” one, with 54% now pursuing a more **fun lifestyle**

[GfK Roper, 2010]

- ▶ Only 17% of Chinese urban dwellers say they are 'reluctant to spend money'

[Economist Intelligence Unit, August 2010]

Why Interaction Design is well applied to urban innovation

- ▶ The rise of human-centered design
 - ▶ human-centered design thinking and approaches are now gaining mainstream credence among private sector decision-makers focused on innovation.
 - ▶ human-centered design thinking is a methodology and toolkit popularized by its use at Apple and design firms such as IDEO
 - ▶ design thinking in government ICT is particularly applicable in changing workflow for shared services, in co-creation initiatives, and in efforts dealing with open data that involve citizens and multiple agencies
- ▶ New ingredients to create Smart Cities for the city developers coming from the IT industry
 - ▶ “Although [city] developers and the IT industry have always had common interests, the “smart” part of smart cities assumes an unprecedented level of IT technology. So, while developers embrace complexity through their master planning skills, they need to understand the new IT paradigms of cloud, Internet of Things, Big Data, and “bring your own device”, thus bringing this new model for strategic partnering for smart cities to the fore, led by developers.”

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Technological framework and challenges (1/2)

To innovate urban digital services and create urban digital interactions, we consider some technologies broadly available in a smart urban context:

- ▶ Personal smart mobile and wireless devices
- ▶ Pervasive mobile and wireless ultra-broadband connectivity
- ▶ Ubiquitous (Urban) computing
- ▶ Production of big, personal, open data (but not necessarily their reachability or availability)

Some technologies have to be addressed as challenges

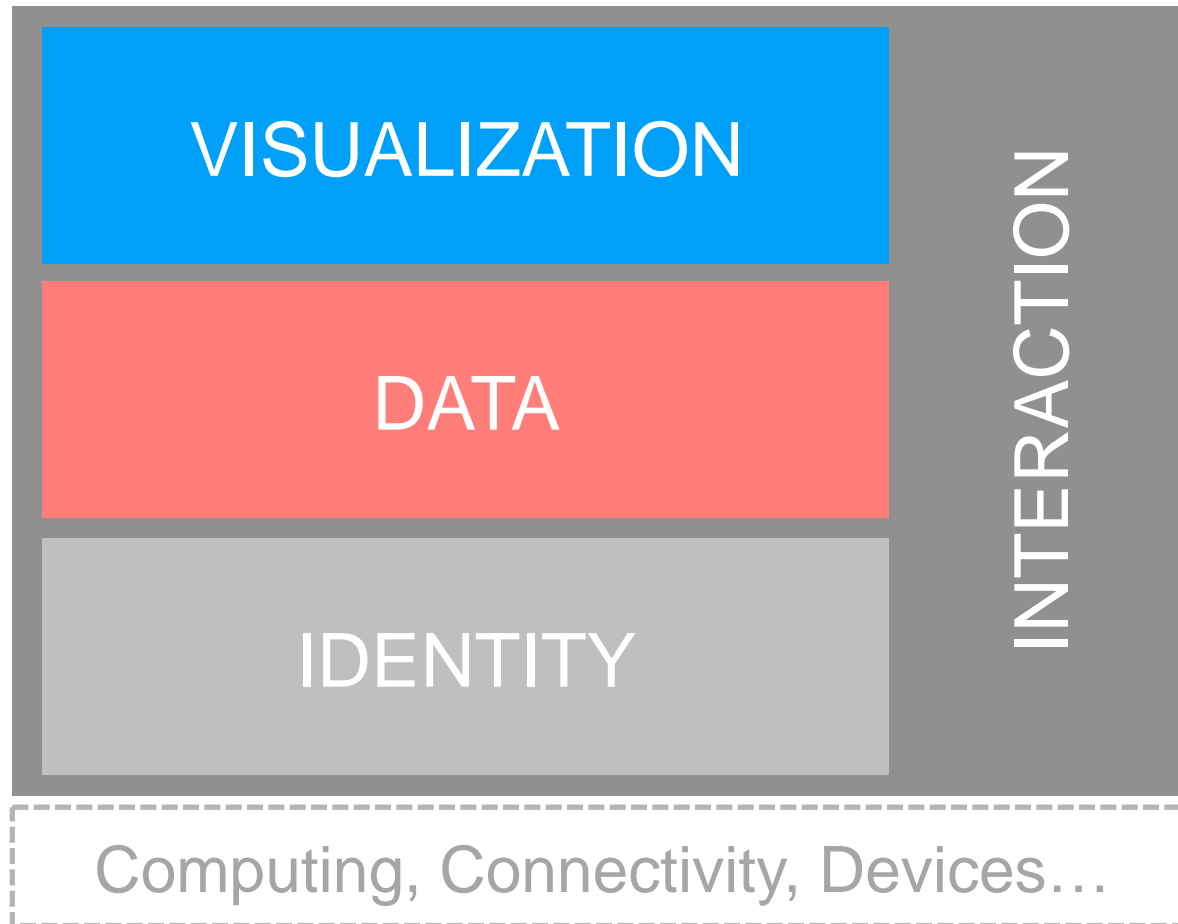
- ▶ A universal identity system that supports an individual, a community or a specific entity to be identified when accessing to the Smart Urban Space¹, disclosing only the quantity of information needed to perform the requested task
- ▶ A system able to extract relevant information from a big amount of uncorrelated data in real time
- ▶ An effective way to access, publicly visualize and interact with this relevant pieces of information, complementing the access via personal devices

Urban interactions² are actions taking place in smart urban spaces by the citizens, based on the mentioned technologies

¹ http://www.ubicc.org/files/pdf/3_379.pdf

² <http://www.nsf.gov/pubs/1998/sbe981/sbe981.htm>

Technological framework and challenges (2/2)



Digital Identity

Reason why

- ▶ Digital Identity is a way for a user to be identified and authorized to access a service (on a web site or so), as well as to transfer attributes
- ▶ Today such an Identity can be used to access government services and bank services. The Big OTT (Google, Facebook, Twitter, Microsoft...) use it to give access to their Social Networks and services
- ▶ In such a way any service available in the Urban Space can be used by the citizen in an automatic way under his control and in respect of her privacy

Challenge

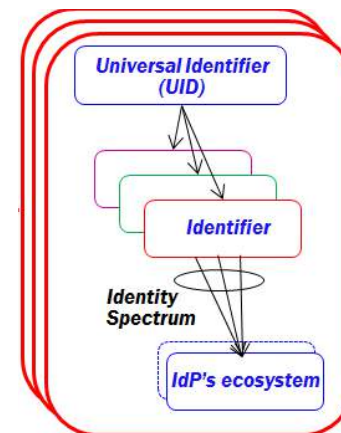
- ▶ To create a seamless system to authenticate a user to a digitally permeated urban space in respect of the user privacy and control, managing the attributes sharing, in relation and to the limits of the service goal

Current Cases

- ▶ NemID in Denmark [<https://www.nemid.nu/dk-en/>]

Companies Involved

- ▶ DanID <https://www.nets-danid.dk/>, Danish NemID provider
- ▶ Gigya <http://www.gigya.com/user-management/single-sign-on> permission-based social identity data



User-centric IdPs

- Ecosystems specific
- Full FIM
- Portable identifier
- Full Identity Spectrum support
- Identity owned & controlled by people
- Privacy & security
- Law respectful
- Pay

Big Data

Reason why

- ▶ At a rough estimate, we will generate **4.1 terabytes per day per square kilometer** of urbanized land area by 2016 ¹
- ▶ How can a city use data on everything (from weather to traffic patterns to the location of sidewalks and park) and technology to better serve its residents? Open-source **predictive analytics platform** to offer real-time pattern detection gleaned from multiple types of data. What if your city could tackle a problem before it happens by analyzing historical data, add real-time information, and cross-correlate all of these? ²

Challenge

- ▶ Mainly the **algorithms**, that have to extract relevant information for the smart citizens. Also the availability of the data to all parties (open data and personal data and internet of/with things)

Current Cases

- ▶ **Chicago SmartData** platform ²
- ▶ **LIVE Singapore!** The real-time city ³

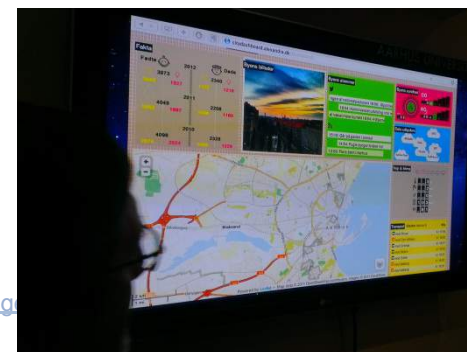
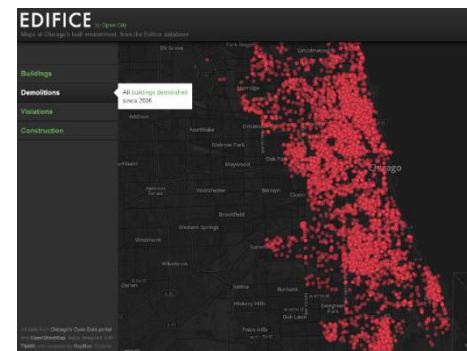
Companies Involved

- ▶ Actian www.actian.com – products for big data: analytics engine that delivers real-time results on large scale databases

¹ <http://blogs.actian.com/seanjackson/2012/12/10/big-data-the-rise-of-the-smart-city>

² http://www.huffingtonpost.com/rahm-emanuel/mayors-challenge-chicago-b-2711059.html?utm_hp_ref=mayors-challenge

³ <http://senseable.mit.edu/livesingapore>



(Public) Data Visualization

Reason why

- ▶ How to access, communicate, visualize and interact with relevant information to the smart citizens, without or in cooperation with smart personal devices and/or public displays

Challenge

- ▶ Designing the visual interface, be effective and as much inclusive as possible, transferring complex information without textual description

Current Cases

- ▶ NYC Subway System MTA 47" touch-screen kiosks ¹
- ▶ Aarhus Climate on the Wall: interactive generator of climate statements that uses *Ridehuset*, a prominent building in the city centre, as a backdrop ²
- ▶ Aarhus City Bug Report: each light represents a bug in a different stage in respect of time and status ³

Companies Involved

- ▶ Control Group www.controlgroup.com/mta.html - consulting on digital and physical interactions
- ▶ D60 www.d60.dk - Data mining and Business Intelligence

¹ <http://www.statetechmagazine.com/article/2013/04/nyc-subway-system-launches-digital-interactive-experience>

² <http://www.digitalurbanliving.dk/projects/media-facades/climate-on-the-wall.php>

³ <http://www.mediaarchitecture.org/city-hall-tower-aarhus>



Interactions

Reason why

- ▶ Available information, tied to the individual can be visualized but also personalized, contextualized, adapted, modified, requested. Also actions based on the context could be performed

Challenge

- ▶ Make the interactions adequate to the context, user, situation, goal. Identify both technology and process involved (e.g. the iPad success was driven by the multitouch capability of its screen together with the actions to manipulate content through that)

Current Cases

- ▶ **British Gas** through their Smart Energy program enables their customers to compare their heating usage to the average data of their neighbours and thus to change their behaviour accordingly¹. This has risen interactions from 4 to over 17k reads per year per meter
- ▶ **Aarhus City Bug Report**: via mobile or web app citizens enter bugs, each bug lights a red dot on the tower, when the bug is addressed by the municipality it turns blue

Companies Involved

- ▶ IDEO www.ideo.com – global design consultancy. They contributed to design StreetBump, a mobile service for the Boston community to collect road conditions (e.g. potholes) while driving

¹ <http://www.britishgas.co.uk/products-and-services/gas-and-electricity/energysmart.html>

Joining the dots

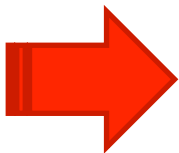


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Questions arising

- ▶ How much **acknowledged** the emerging field called “Urban Interaction Design” is?
- ▶ Which **position in the innovation process** of urban services and products should Interaction Design get?
- ▶ Which are the **main issues today for a Smart City** to take off? Is Interaction Design one of these?
- ▶ How **important is Interaction Design to innovate** urban products and services?
- ▶ Which **areas can benefit the most from applying Interaction Design** to innovate urban services?
- ▶ Within industry, what are **the financial implications for including Interaction Design** within the development of products and services?
- ▶ What **challenges for applying Interaction Design to the business** do we envision?
- ▶ How can we use **Interaction Design in a European context** where cities are already there and have a historical heritage?
- ▶ Which are the **"best of breed" service/product of Urban Interaction Design** in the Smart City context?
- ▶ Can we identify the **major industrial players, startups and SMEs** offering solutions based or related to Urban Interaction Design?



In this document we aim to respond those questions analyzing the results of an online survey to the extend community of the UrbanIxD project and Smart City stakeholders, specially innovators and the solutions providers working in this context.

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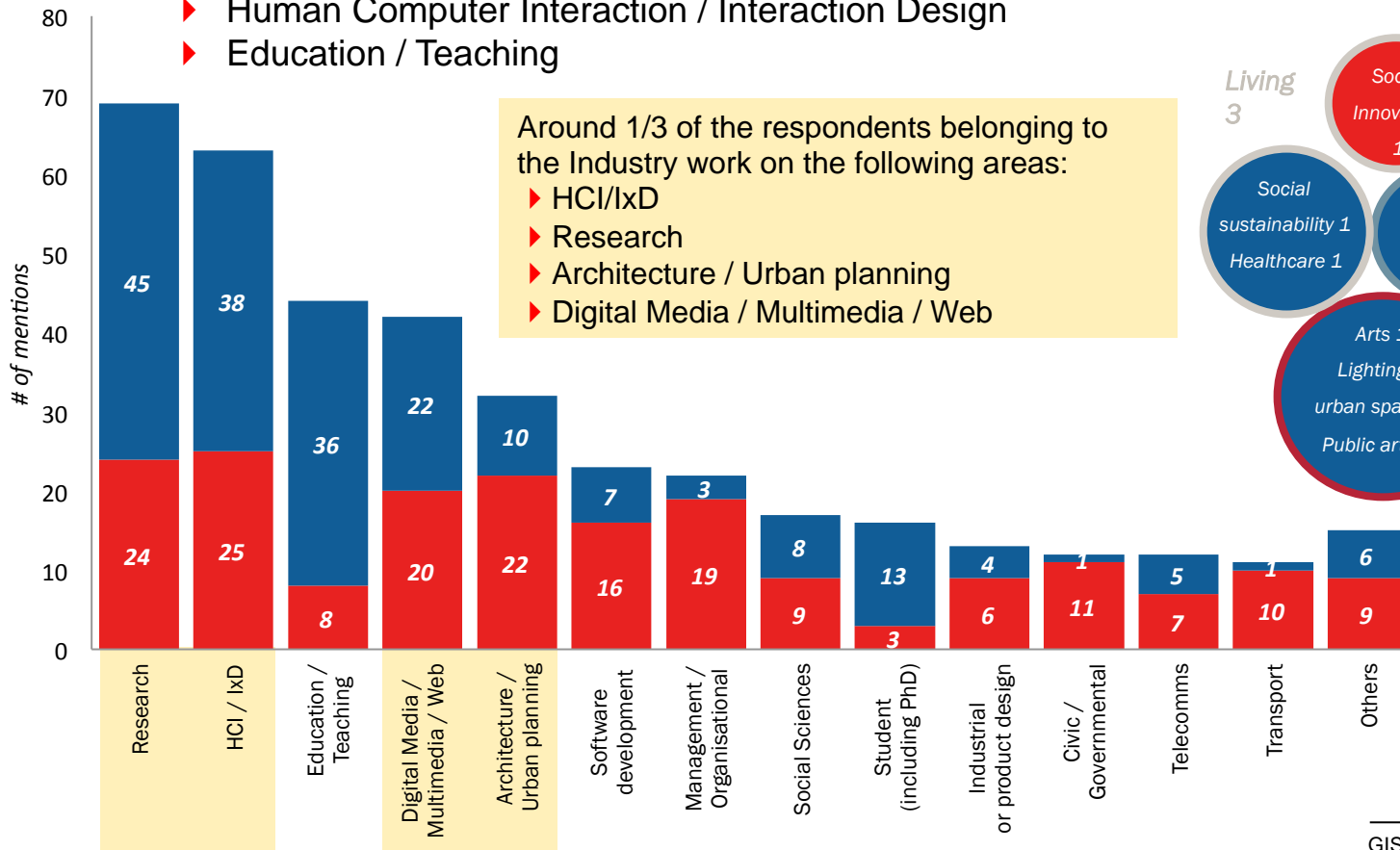
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About the respondent's area of activities...

The total number of respondents is 122

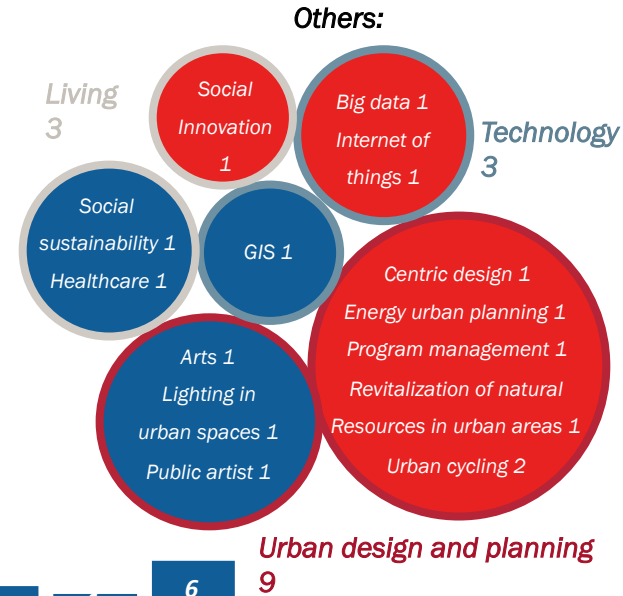
The main areas of activities within respondent's organization are:

- ▶ Research
- ▶ Human Computer Interaction / Interaction Design
- ▶ Education / Teaching



Around 1/3 of the respondents belonging to the Industry work on the following areas:

- ▶ HCI/IxD
- ▶ Research
- ▶ Architecture / Urban planning
- ▶ Digital Media / Multimedia / Web

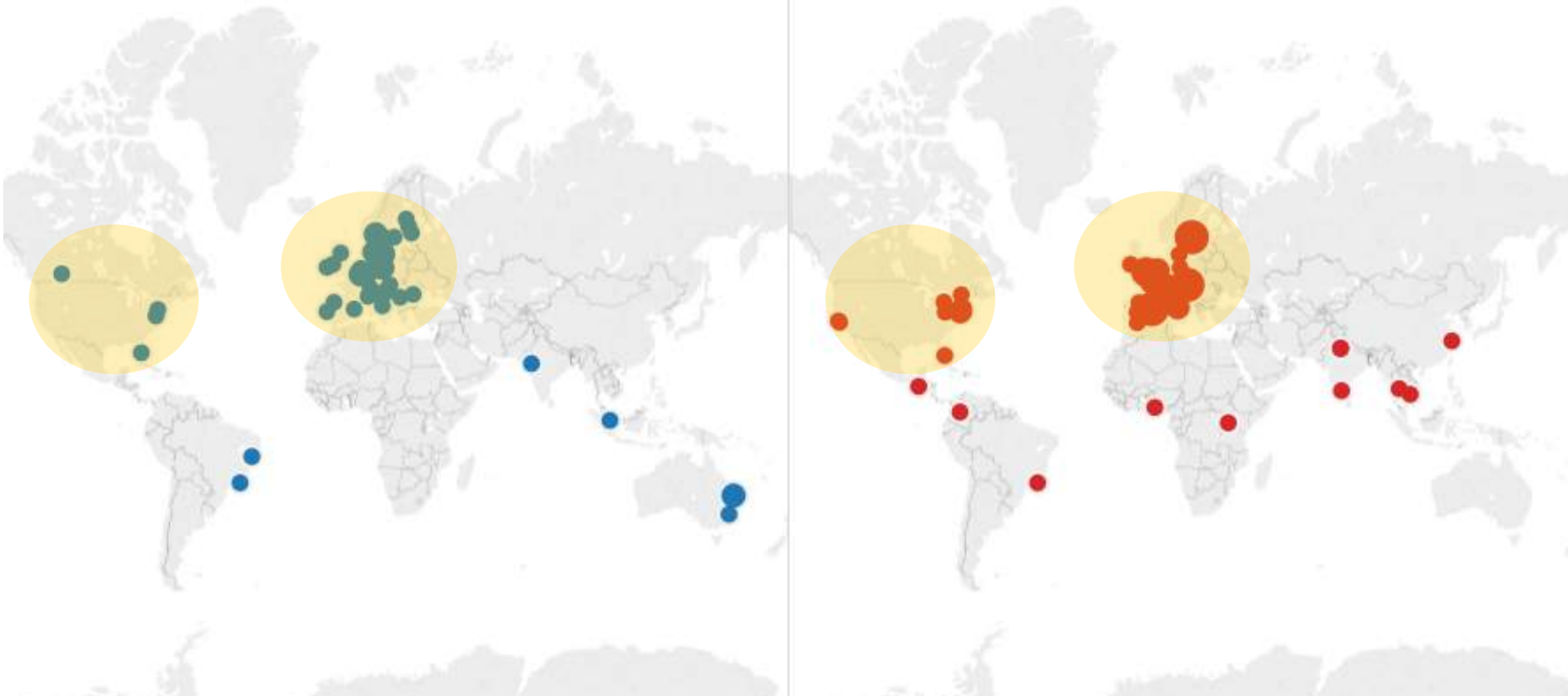


■ Industry ■ Academic and research

GIS = Geographic Information System
 HCI = Human Computer Interaction
 IxD = Interaction Design

Respondent's location by affiliation

The majority of our respondents are located in Europe and North America

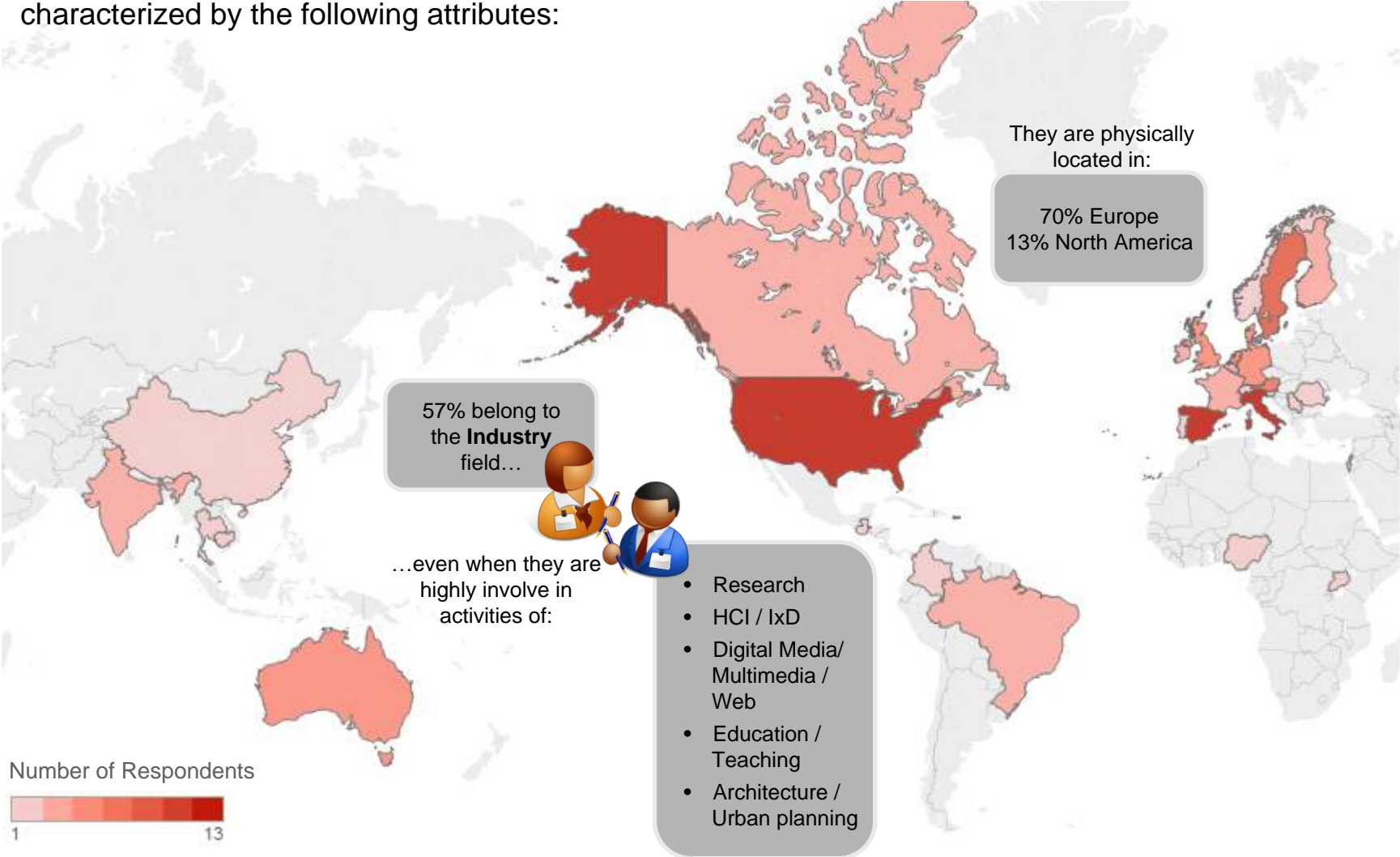


The size of the bubble is proportional to the number of respondents in each city



Respondent Profile

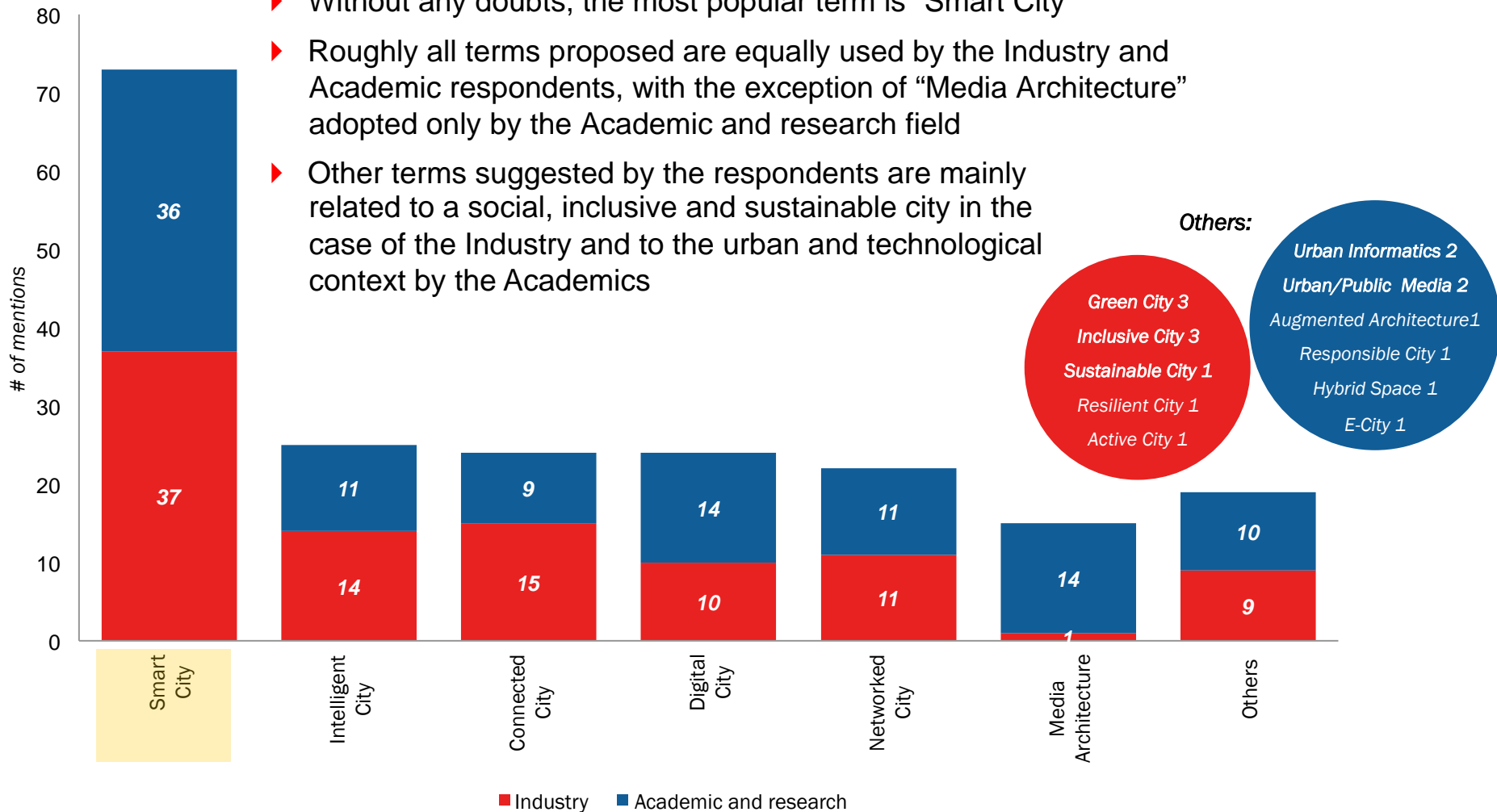
According to the data presented in the previous slides we can conclude that respondent's majority is characterized by the following attributes:



About the terminology used by the respondents

As the graphic shows:

- ▶ Without any doubts, the most popular term is “Smart City”
- ▶ Roughly all terms proposed are equally used by the Industry and Academic respondents, with the exception of “Media Architecture” adopted only by the Academic and research field
- ▶ Other terms suggested by the respondents are mainly related to a social, inclusive and sustainable city in the case of the Industry and to the urban and technological context by the Academics

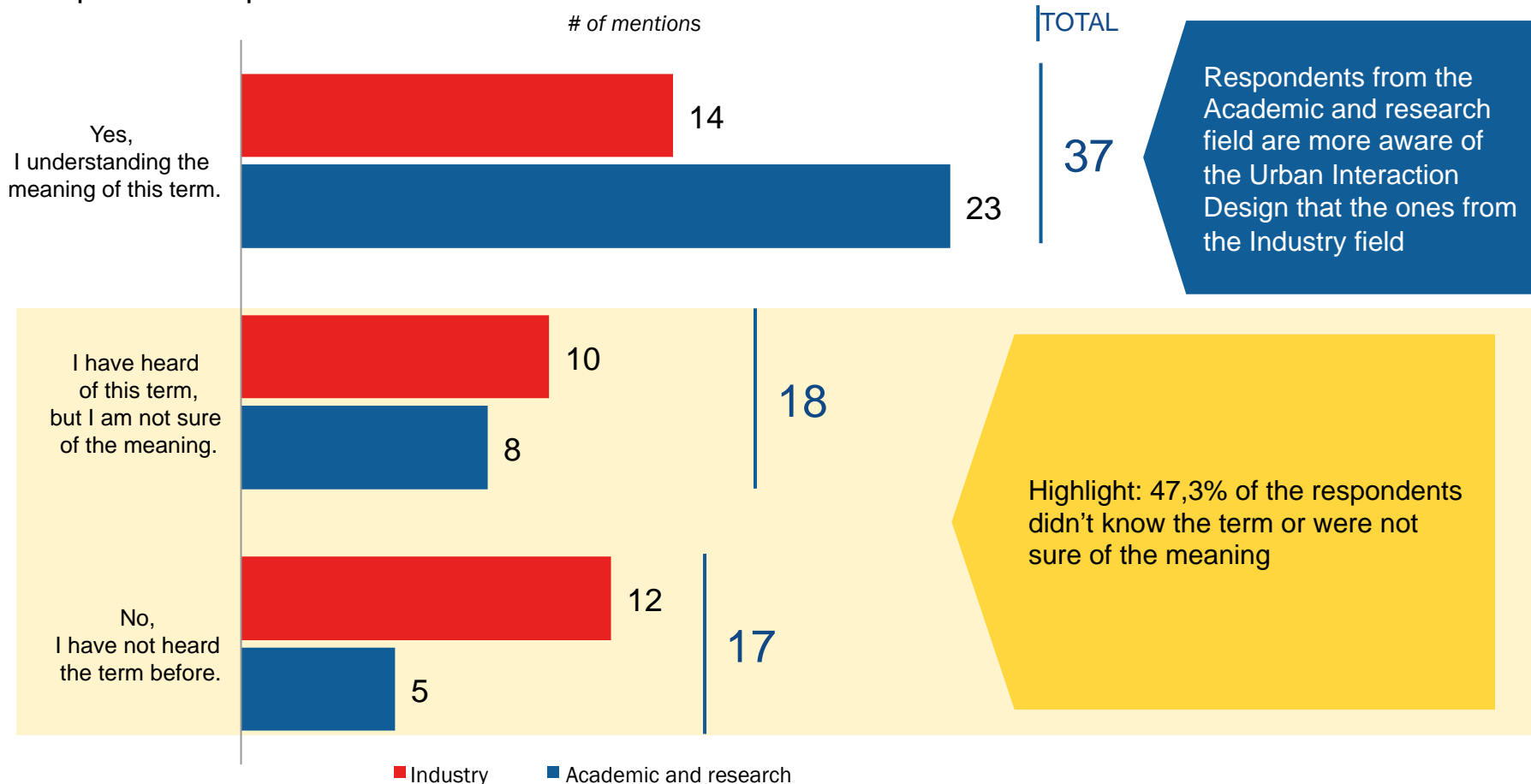


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Familiarity with the term Urban Interaction Design

To the question “Are you familiar with the field of Urban Interaction Design within your domain?” respondents replied:

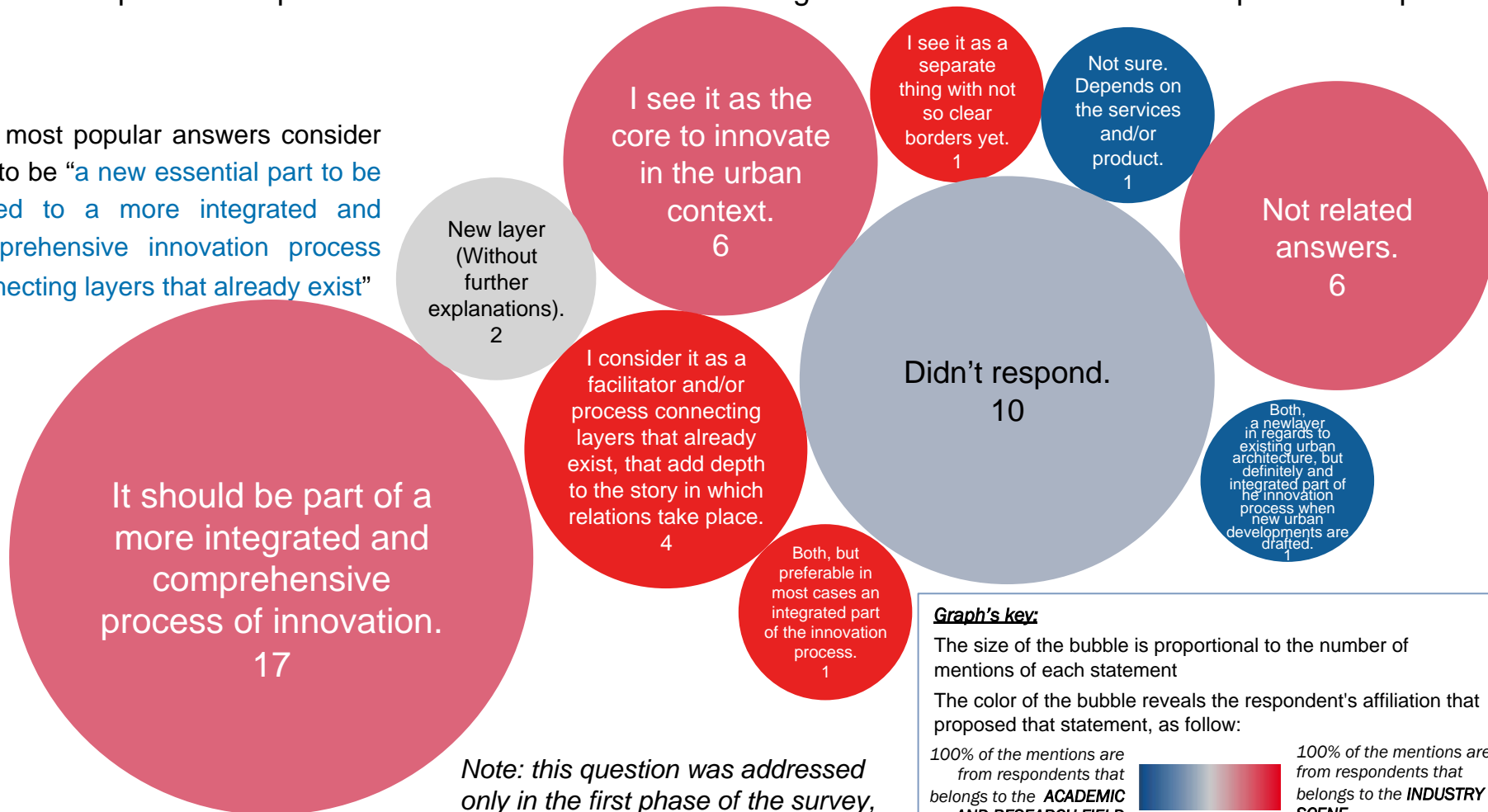


Abstinance rate = 3%

Innovation process: Urban IxD as a new layer or integral part?

To the question “Do you consider interaction design to be a new layer to be added or part of a more integrated and comprehensive process of innovation when addressing Urban service innovation?” respondents replied:

The most popular answers consider IxD to be “a new essential part to be added to a more integrated and comprehensive innovation process connecting layers that already exist”



Note: this question was addressed only in the first phase of the survey, therefore the total respondents = 48

Abstinance rate = 21%

Respondent's concerns for Smart City innovation

We asked to our respondents "In your opinion, which are the main three issues today for innovation in the Smart City?". This is the big picture of what we got:

NOTE: Smart Cities' literature broadly describes the global setting in which they emerged, outlining six main characteristics and/or fields of the city that can be enhanced with technology in order to become "smart"; **GOVERNANCE, LIVING, ENVIRONMENT, MOBILITY, PEOPLE and ECONOMY.**

25% of the issues mentioned on the survey are related to **Governance**, followed by **Living** with 18% confirming the **EMERGING HOLISTICS SMART CITY** model, which main focus is in this direction.

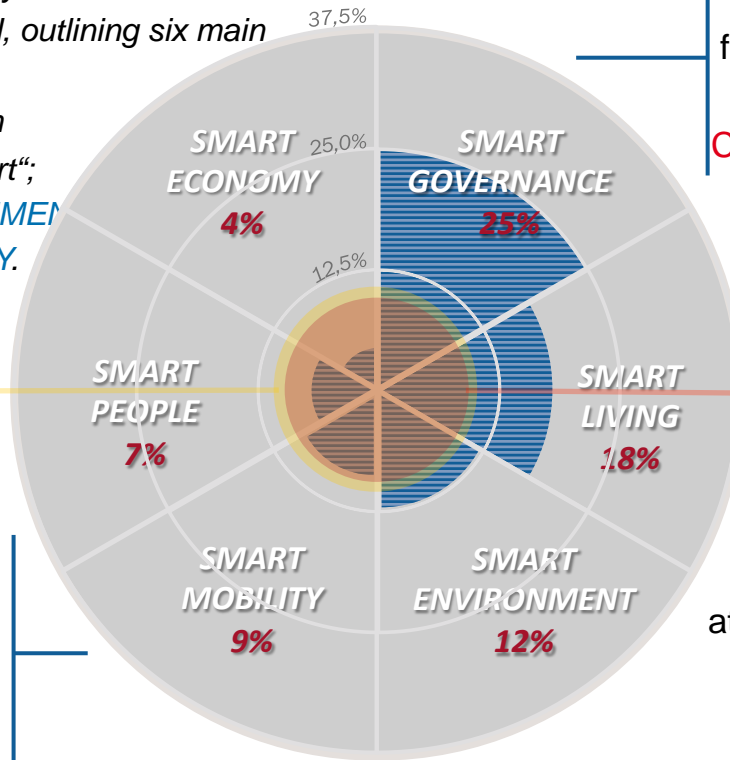
TECHNOLOGY; 11%

URBAN DESIGN AND PLANNING; 10%

Meanwhile, our respondents seem to be less interested in the **CLASSIC SMART CITY MODEL**, based on **environmental, mobility and healthcare solutions**

Some issues did not fit into any of the six main characteristics usually attributed to the Smart Cities, revealing two other relevant fields working integrated and across them: **URBAN DESIGN AND PLANNING** and **TECHNOLOGY.**

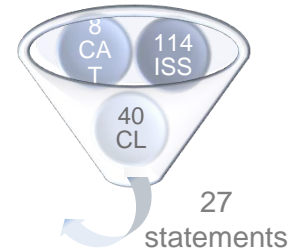
The existence of this new components confirm in a way the emerging field of Urban Interaction Design (Urban IxD)



Data sources:
68% of the issues reviewed came from the 2nd phase of the survey and 32% from the 1st one

Which issues emerge from the survey?

To the question “In your opinion, which are the main three issues today for innovation in the Smart City?” respondents answered:



Economic and social development; 1 Building better economy inside the city; 1
Need of systems for reduced complexity of interactions; 1

Open Data strategy and better access to public information; 6 Education and culture; 6

Funds to finance innovation; 13 Management and assurance of data quality; 9

Look of land policies that promote social welfare; 1

Lack of dynamic urban spaces that can self-organise and serve multiple purposes; 13 Sustaining the past in designing a future; 1

User readiness: smart requires also a shift of thinking, not only technology; 22

Strategic vision of decision makers: political leadership within a city can limit or spur innovation; 25

Create environment for enabling social interactions in order to reinvent the living together; 28

Informing, empowering and engaging citizens in the public decision making; 54

Privacy policies; 2

Energy consumption, ecological impact and environmental sustainability; 43 Diversity; 2

Breaking the digital divide, improving accessibility and quality of connectivity; 30

Understand and stimulate synergy between social sciences, people and technology; 24*

Lack of urban spaces designed to improve the life quality of the citizens; 19

Urban transportation and mobility; 30 Empowering the user: user controllable privacy of his data; 1
How to get real creativity; 1

New actor constellations in the city context: governance or business models for smart cities; 1

Unpersistence of experience in services, devices and apps is confusing users; 2

Social Justice; 2 Digital/Real Identity; 1

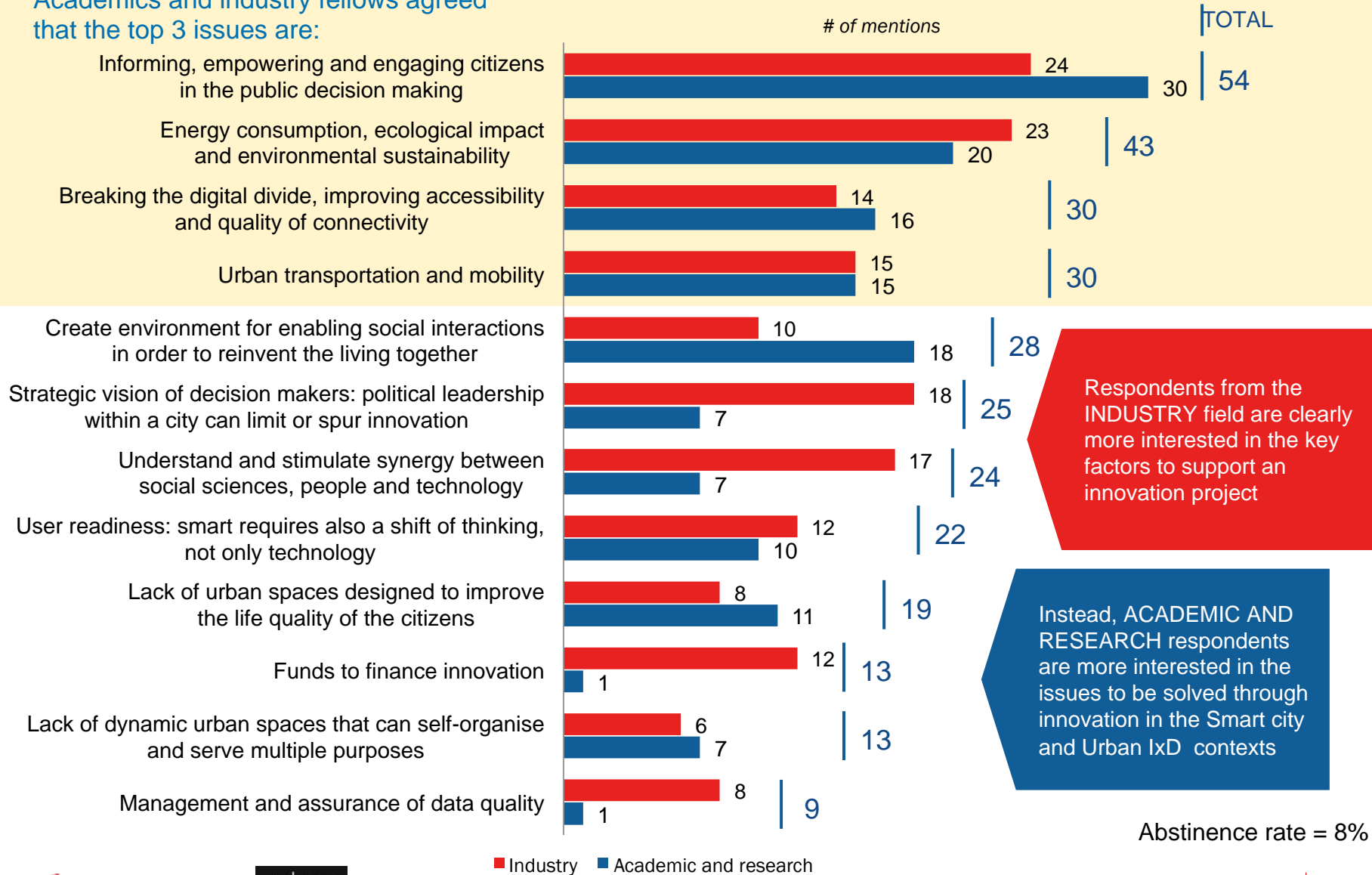
One interesting fact is that none of the respondents mentions health and wellness

Category: ■ Governance ■ Living ■ Technology ■ Environmental ■ Mobility ■ People ■ Urban design and planning ■ issues Economy

*Through the application of Human-Centered Design Process

Main issues according with the respondent's affiliation

Academics and industry fellows agreed that the top 3 issues are:

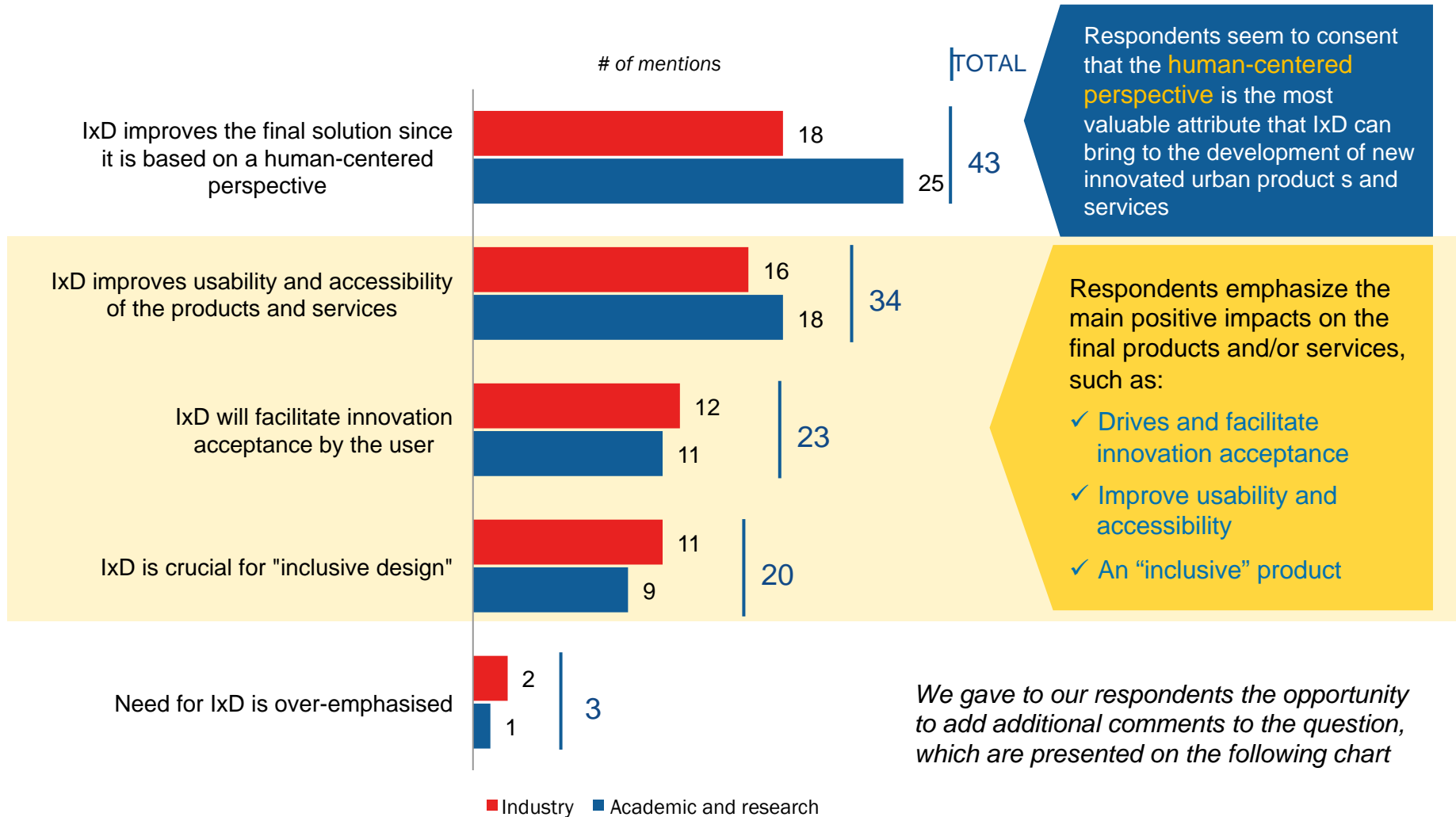


Respondents from the **INDUSTRY** field are clearly more interested in the key factors to support an innovation project

Instead, **ACADEMIC AND RESEARCH** respondents are more interested in the issues to be solved through innovation in the Smart city and Urban IxD contexts

Importance of IxD to develop urban products & services (1/2)

To the question “Concerning innovation, which of the following sentences better describes why IxD is important or not to the development of urban products and services?” respondents answered:



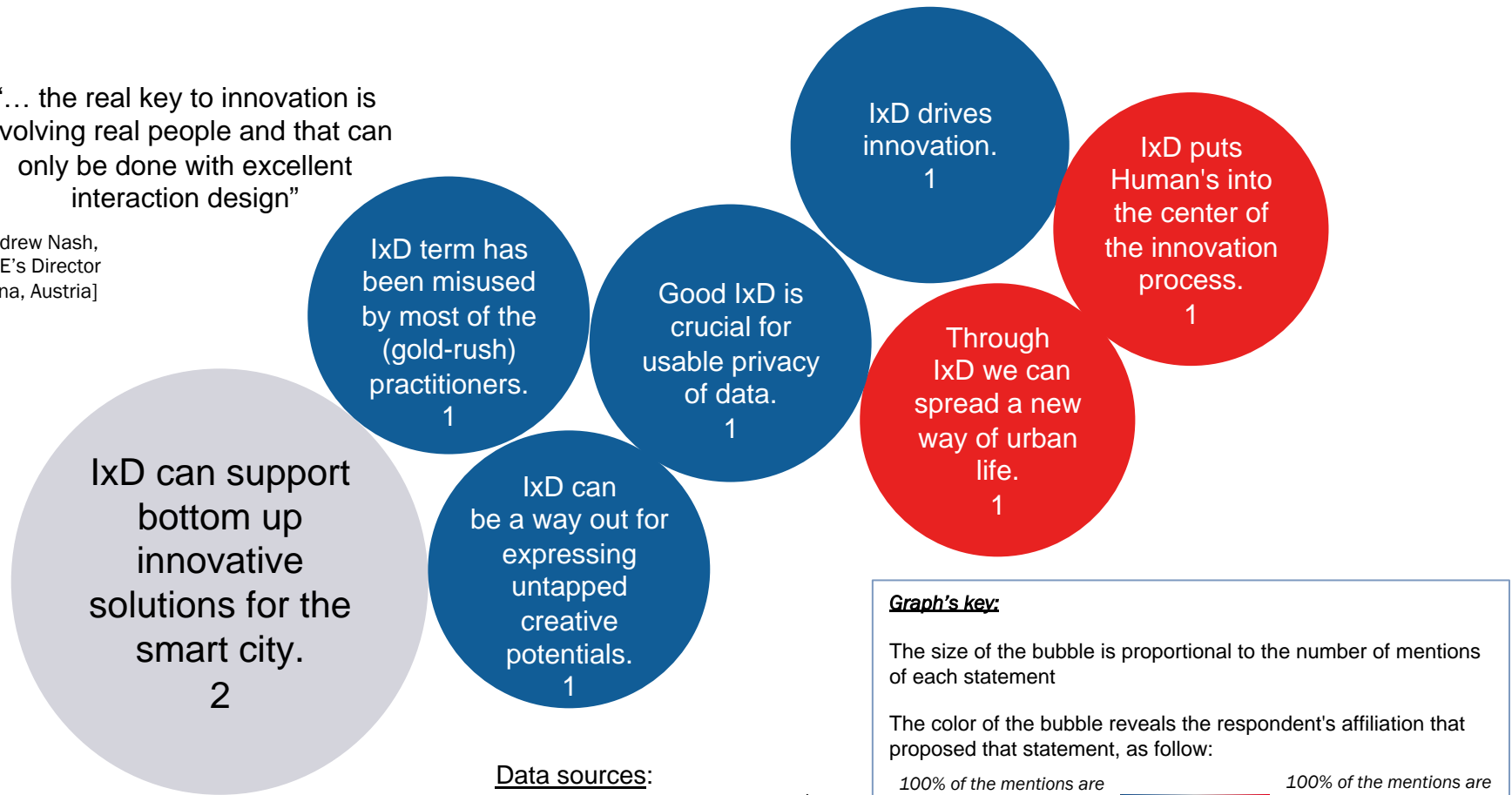
Abstinance rate = 12%

Importance of IxD to develop urban products & services (2/2)

We give to our respondents the opportunity to add additional comments to the question “Concerning innovation, which of the following sentences describe better why interaction design (IxD) is important or not to the development of urban products and services?” and those are their responses:

“... the real key to innovation is involving real people and that can only be done with excellent interaction design”

[Andrew Nash,
SME's Director
Vienna, Austria]



Graph's key:

The size of the bubble is proportional to the number of mentions of each statement

The color of the bubble reveals the respondent's affiliation that proposed that statement, as follow:

100% of the mentions are from respondents that belongs to the **ACADEMIC AND RESEARCH FIELD**



100% of the mentions are from respondents that belongs to the **INDUSTRY SCENE**

Data sources:

50% of this statements came from the 2nd phase of the survey and 50% from the 1st one

Which areas could benefit the most from IxD?

To the question “In your opinion, which three areas could benefit the most from the collaboration of Interaction Designers with Industry to innovate urban services?” respondents answered:

It is clear that our respondents think that all areas would benefit, specially:

- ▶ Mobility and transport
- ▶ Education, culture and art
- ▶ Smart governance and Urban planning and intelligent building

“I personally believe that the future services industry will be deeply changed by the concept of **sharing consumption**.”

[Alberto Massa,
Student of HCI/IxD/Software Development
Milan, Italy]

Graph's key:

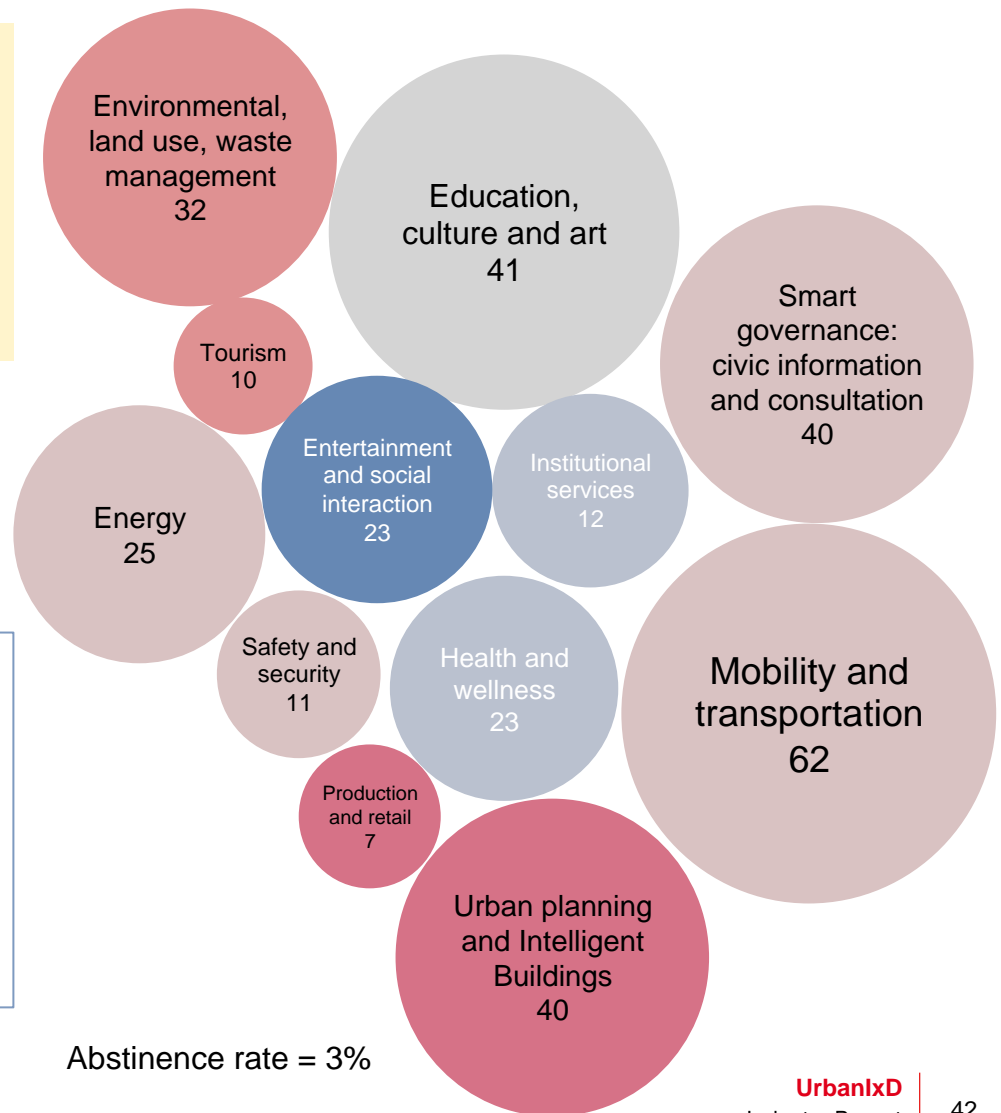
The size of the bubble is proportional to the number of mentions of each area

The color of the bubble reveals the respondent's affiliation that proposed that application area, as follow:

100% of the mentions are from respondents that belongs to the **ACADEMIC AND RESEARCH FIELD**

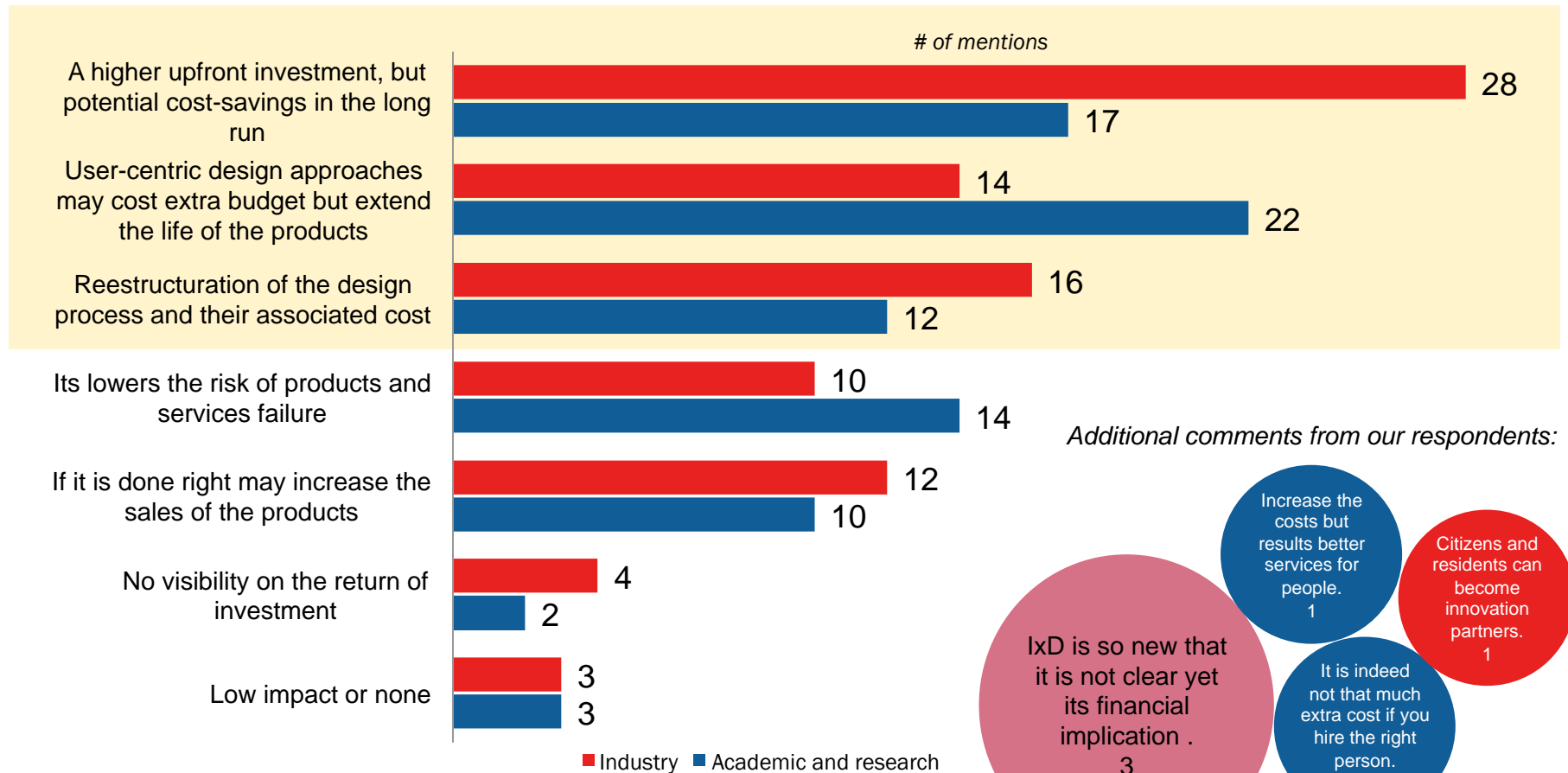


100% of the mentions are from respondents that belongs to the **INDUSTRY SCENE**

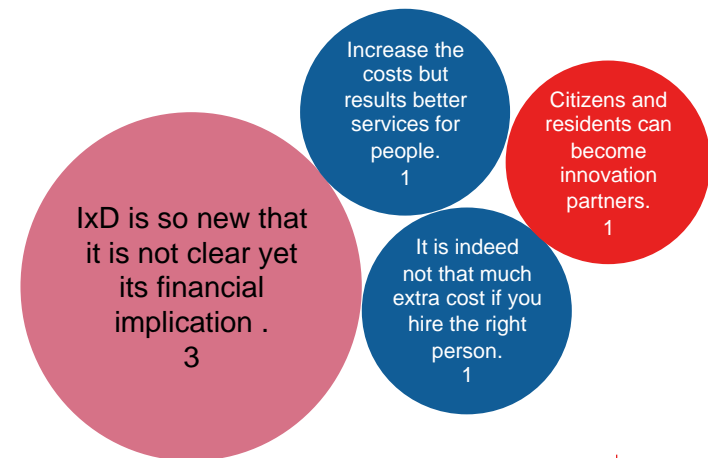


Which costs to include IxD when creating products/services?

To the question “Within Industry, what are the financial implications for including Interaction Design within the development of products and services?” respondents replied:



Additional comments from our respondents:



Abstinance rate = 16%

Challenges to overcome when using IxD in the Industry (1/2)

To the question “What challenges, if any, do you face when applying Interaction Design to your business? respondents replied:

About the perception of IxD field...

“The big challenge for me personally is getting Interaction Design projects outside the “digital-only” realm. From the outside, Interaction Design is still mostly seen as creating websites & apps, although the field could contribute a lot of knowledge & tools to conversations in more “important” sectors (civic services, urban design/placemaking, public decision-making ...).”

[Andreas Förster
Interaction Designer
Graz, Austria]

“Clients are not aware of the value and so are rarely willing to pay for the cost of the service.”

[Mayra Madriz,
Urban Strategist
San Francisco, USA]

“it’s often considered nice to have not a must have.”

[Andrew Nash
Director
Vienna, Austria]

“In my company there are different points of view on how and when to apply Interaction Design. A direct implementation of a technical solution when similar products already exist is much more appreciated instead of a more comprehensive approach applied to gain a new opportunity.”

[Rossana Simeoni,
Researcher
Italy]

“...there are also quite a few companies (particularly in the digital media and IT fields) who have increasingly adopted agile practices of iterative prototyping, continuous improvement and consultation with the final user from the outset of a project. Public offices, however, are often still in favor of a more top down approach for decision making, with only occasional public consultation.”

[Luke Hespanhol
PhD student and consultant
Sydney, Australia]

Note: this question was addressed only in the first phase of the survey, therefore the total respondents = 48

Challenges to overcome when using IxD in the Industry (2/2)

To the question “What challenges, if any, do you face when applying Interaction Design to your business? respondents replied:

About the implementation of IxD...

“In my perception, most challenges to the adoption/implementation of IxD best practices relate to budget, deadline constraints and lack of involvement of the final user on the design process...”

[Luke Hespanhol
PhD student and consultant
Sydney, Australia]

“Usually the user experience with the interaction is bought on board too late in the process - testing with public or communities of usage is important from the early stages of a product development - the design sector needs to shift somewhat in their beliefs about the end users knowledge to input at the earliest possible stage - from conception onwards”

[Ghislaine Boddington
Creative Director
London, UK]

“Funding, awareness, support.”

[Johan Sandsjö,
Interaction designer
Sweden]

“...People who are in charge who are reluctant to change...”

[Anonymous CEO SME
St. Louis, USA]

“IxD is often in conflict with development budget and time (programmers often start with a basic version that somehow works, later on there is no time or budget to improve it to high quality)...”

[Inga Klas
User Experience Designer
Ettlingen, Germany]

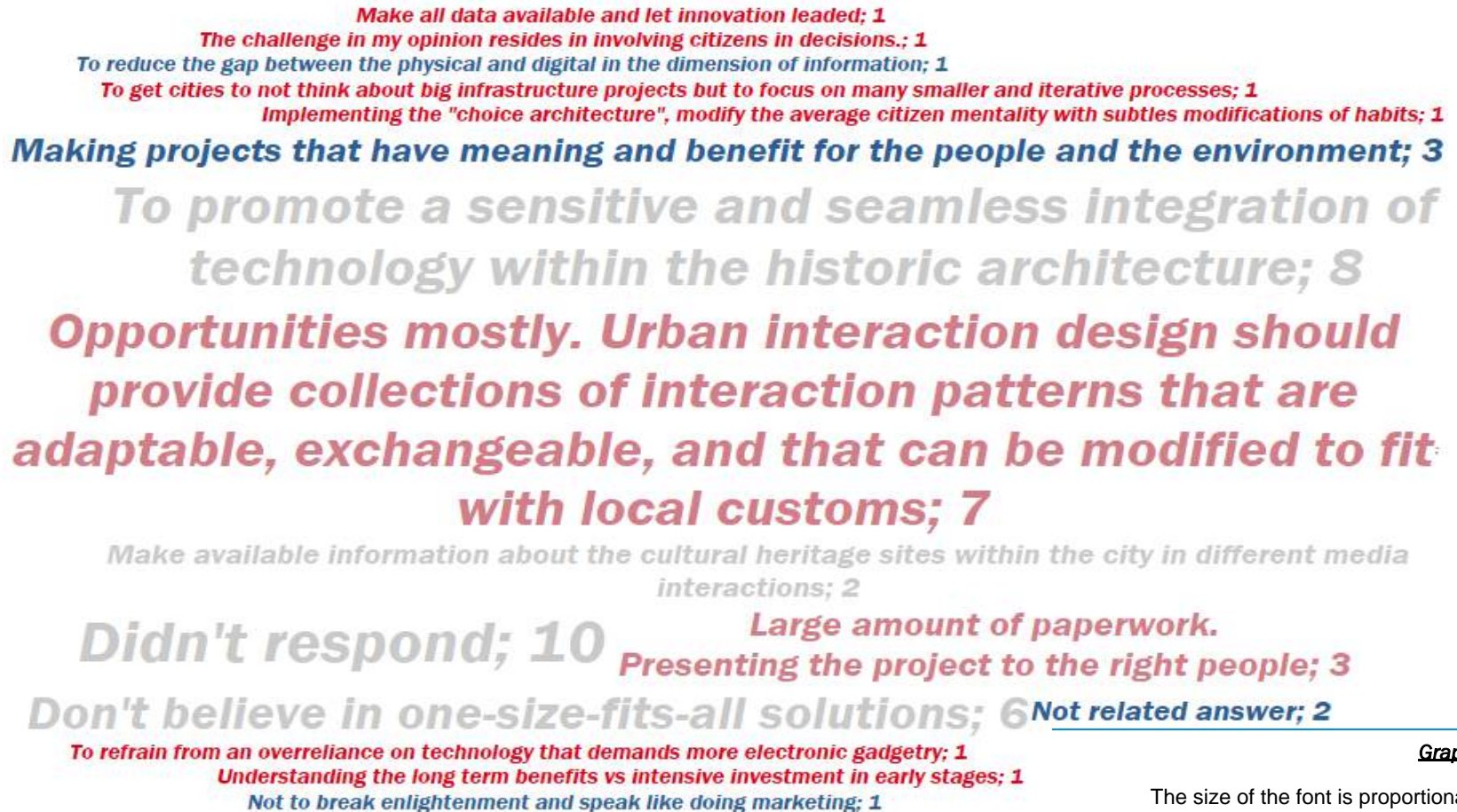
“Proving the financial benefit early in a project.”

[Ben Adamson
Digital Web Designer
Dublin, Ireland]

Note: this question was addressed only in the first phase of the survey, therefore the total respondents = 48

Urban IxD and the European historical&cultural heritage (1/2)

To the question “What do you think the challenges are for Urban IxD in a European context where cities have a substantial historical and cultural heritage? respondents reacted as follow:



Graph's key:

The size of the font is proportional to the number of mentions of each statement

The color of the font reveals the respondent's affiliation that proposed that statement, as follow:
100% of the mentions are from respondents that belongs to the **ACADEMIC AND RESEARCH FIELD**  100% of the mentions are from respondents that belongs to the **INDUSTRY SCENE**

Urban IxD and the European historical&cultural heritage (2/2)

To summarize the point of view of both sides we can said:

Industry

For the industry's fellows, the unique European context bring not only **challenges in terms of development and deployment** but also huge **opportunities in terms of ideas and solutions**. They agree that one big challenge is **to position Urban IxD in a way that is understandable for city governments and decision makers**

Both agree

Both academics, researchers and industry members appear to agree that the challenge is to design taking into account tradition, local historical and cultural particularities of each city without "copy and paste" solutions from other countries... This is exactly why it is needed urban interaction designers who are in tune not just with technology but with the cultural and social aspects of life and by definition contribute with solutions unobtrusive...

Academic and research

Some of them stated that the challenges are related to improve citizen's quality of life in a sustainable way and paying more attention to culture...
One interesting thought came from Karan Dudeja, and Indian student, that said "The challenge mostly lies in **reducing the gap between the physical and digital in the dimension of information...** This would allow the historical and cultural traditions to live on beyond the effects of urbanization, and not be bounded by geographical limitations"

Additional comments about Urban IxD from the survey

About the present...

"If you look at any forum, there are many people with the claim of UxD, IxD etc. and they are still debating on the definition of this or that. **There is hardly any quality research out there. Most of the practitioners/business agencies are misusing the term**"

[Nasim Mahmud
Postdoctoral Researcher
Ireland, Dublin]

"Interaction design in architecture seems to be dominated by a private and commercial agenda, it is used to enhance sales of certain retailers or to brand premium spaces. For years I have been working to bring interaction design principles into the design of public spaces and public services. It is a challenge, but I hope we will continue to make progress in that direction."

[Mayra Madriz
Urban Strategist
San Francisco, USA]

"...to me its not about those 1% that went to university and know about this therefore use the apps and other things that exists, for me it should be to engage more than those, **to make it intuitively understandable by all people that are taking part in urban life.**"

[Wieke Villerius
Intern
Berlin, Germany]

About the future...

"I believe that in future, many studios and agencies will move from interaction design to social design."

[Eusebio Reyero
User Experience Designer
Madrid, Spain]

"It's the only way things will ultimately make a city smart and workable to the satisfaction of its citizens. But its early days. Needs at least one or two wins for people to understand better or more widespread adoptability."

[Anonymous CEO SME
St. Louis, USA]

"I do like to investigate the **urban interaction design on mobile devices**. Sometimes the discussion around this topic goes more into media architecture field, and less on mobile. Also mobile focused projects tends to be placed on HCI field, but not so strong in the urban interaction."

I believe analyzing the interaction of humans and urban spaces through mobile media is a very interesting topic that could appear more on UrbanIxD discussions"

[PhD Student
Germany]

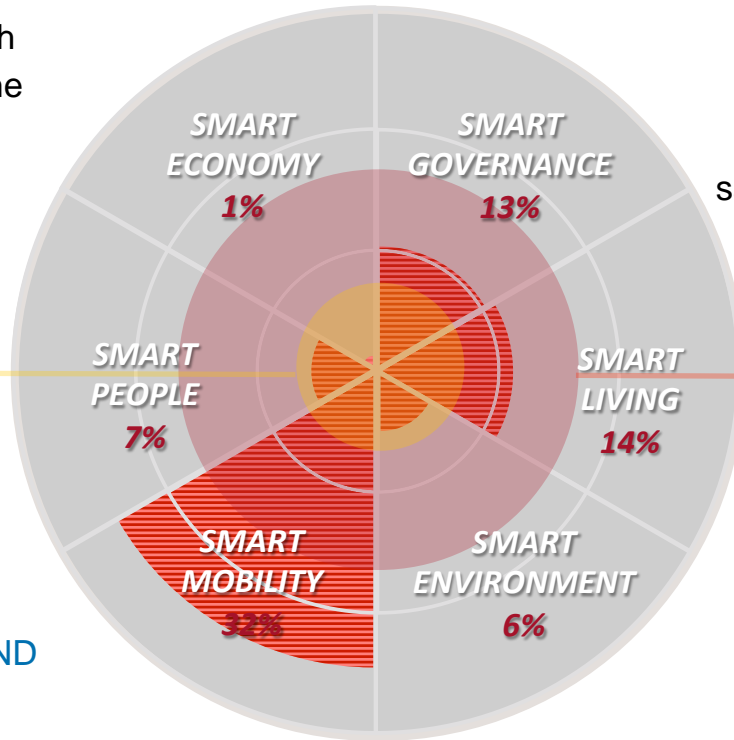
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- ▶ **Conclusions and recommendations**

Respondent's best cases in the Smart City context

We asked “Can you provide an example or “best case” of Interaction Design applied to a service/ product related to a smart city?”. This is the big picture of what we got:

78 respondents contributed with 104 examples, distributed in the smart city context as it showing on the chart :



Academics and researchers on one side and industry fellows on the other contributed with the same intensity with 51% and 49% of the examples respectively

TECHNOLOGY; 9%

URBAN DESIGN AND PLANNING; 19%

The more recurrent examples belong to:

MOBILITY, URBAN DESIGN AND PLANNING, LIVING and GOVERNANCE

Only 38% of the respondents claimed to work or be involved with the example suggested, the rest just affirmed to know about it

Data sources:

56% of the issues reviewed came from the 1st phase of the survey and 44% from the 2nd one

Abstinence rate = 36%

Best cases by application area (1/2)

Application area *	
Culture & Tourism 22 <i>examples</i>	<p>Cascina cuccagna - social interaction Temporioso - citizen participation platform 21 Balançoires (21 Swings) - social interaction The Akerselva Digitalt project - interactive exhibitions Terra Icons app - cultural and tourism app Interactive display solutions - unidentified service The Digital Natives exhibition - interactive exhibitions Smart Interactive Maps - unidentified service Birloki System - interactive display solutions Pointssign - interactive display solutions Park(ing)day - social interaction</p> <p>3D virtual reality - unidentified service Inteligencias Colectivas - online platform and free database AirBnB - collaborative peer-to-peer service for accommodation Danmarks Borgcenter - interactive exhibitions City Icons - cultural and tourism app using augmented reality Diner-en-blanc - social interaction Parkour - creativity and sport SmartAppCity - social app</p>
Mobility/ Transport 33 <i>examples</i>	<p>Redesigned bus stop by Philips Biceberg - automated bike parking Bysykkel Oslo - sharing bike app Car2go - accessible and flexible car renting system My Smart Route - traffic management service in real-time Carshare, Rideshare, Toolshare, etc.- sharing unidentified service</p> <p>Sfpark - smart pricing for vehicle parking Innovative display solutions - undefined service My bustracker - public transport apps in Edinburgh My Smart Route - traffic management service in real-time Copenhagen Wheel - sustainable transport</p> <p>Public transportation apps - unidentified service Interactive bus stop - unidentified service OpenStreetMap - collaborative mapping and social hub Car toll - unidentified service</p> <p>Infrared Asphalt Repair - environmental friendly infrared asphalt repairing Charging points in Amsterdam - sustainable Transport Mobi.E - portuguese programme for electric mobility San Francisco GPS analysis - unidentified service Bike and car sharing app - unidentified service VelowSpace - automated bike parking The traffic control - unidentified service</p> <p>Velo Bleu Nice - sharing bike app CityMapper - public transport apps Bike and car sharing - unidentified service Platform for public participation in the mobility context - unidentified service Easybring - collaborative peer-to-peer service Autobleue - electric car sharing service</p>
Environment 13 <i>examples</i>	<p>Seed bombing - turning unused acres green Geographic information system - unidentified service Bottle Bank Arcade machine - gamification applied into recycling 596 acres - turning unused acres green CSIRO low-income household energy efficient study Mapping the sun power in urban environments</p> <p>Carbon footprint calculator - unidentified service Co2nfession/Co2mmitment - platform for public participation The World's Deepest Bin - gamification applied into maintenance and cleaning Burnsville Rainwater Gardens - green infrastructure features for stormwater management Garbage Jukebox - gamification applied into maintenance and cleaning</p>

* Application areas according to the Programme for Digital Services set by the Italian Government (Agenzia per l'Italia Digitale)

Category: ■ Environmental ■ Governance ■ Living ■ Mobility ■ People ■ Technology ■ Urban design and planning ■ Economy

Name broken down by Application area. Color shows details about General Category. Size shows sum of Number of Records.

Best cases by application area (2/2)

Application area *	
Intelligent Buildings	<p>7 examples</p> <p>Datagrove - intelligent building Xeromax Envelope - intelligent building</p> <p>Thermaspheres - intelligent building Scratch Mat - gamification applied into maintenance and cleaning Hydramax Port Machines - intelligent building</p> <p>Light Lines - urban furniture Piano Staircase - intelligent building</p>
Government	<p>12 examples</p> <p>Changify - citizen participation platform Smart City Plus - citizen participation platform with 3D real-time environment</p> <p>PartecipaMi - citizen participation platform Public benches - unidentified product Social app - unidentified service Tidepools - collaborative mapping and social hub</p> <p>FixMyStreet - citizen participation platform Geodesign participatory tool - unidentified service</p> <p>Brickstarter - citizen participation platform Hackity App - citizen participation platform</p>
ICT development	<p>6 examples</p> <p>Smart CitySDK - user-centered open data app YEA: Your Evidence to Achieve - data and megadata management</p> <p>Smart Citizen project - citizen participation platform working with Internet of things</p> <p>Google Maps - interactive maps Smart Campus - develop and evaluation of new services and apps</p> <p>Smart Santander project - ICT development testbench</p>
Urban design	<p>4 examples</p> <p>Jalan Tun Razak Exchange in Malaysia - urban technology and intelligent building</p> <p>Agronautas - Research, design and construction of spaces and systems that reformulate the relationship between people and nature project</p> <p>Transit Oriented Development (TOD) project in Delhi - unidentified service</p> <p>Curitiba, Brazil urban plan</p>
Security/Monitoring	<p>3 examples</p> <p>The Wiki traffic light - gamification applied into road security</p> <p>The Speed Camera Lottery - gamification applied into road security</p> <p>The Play Belt - gamification applied into car security</p>
Training & Education	<p>2 examples</p> <p>YKON Game - citizen participation game Greencitystreets - public transport apps</p>
Local economy	<p>1 example</p> <p>Matching Markets - mobile network of vendors using real-time communication</p>
Other	<p>1 example</p> <p>Gamification projects - unidentified service</p>

Additional application areas arising from the survey

* Application areas according to the Programme for Digital Services set by the Italian Government (Agenzia per l'Italia Digitale)

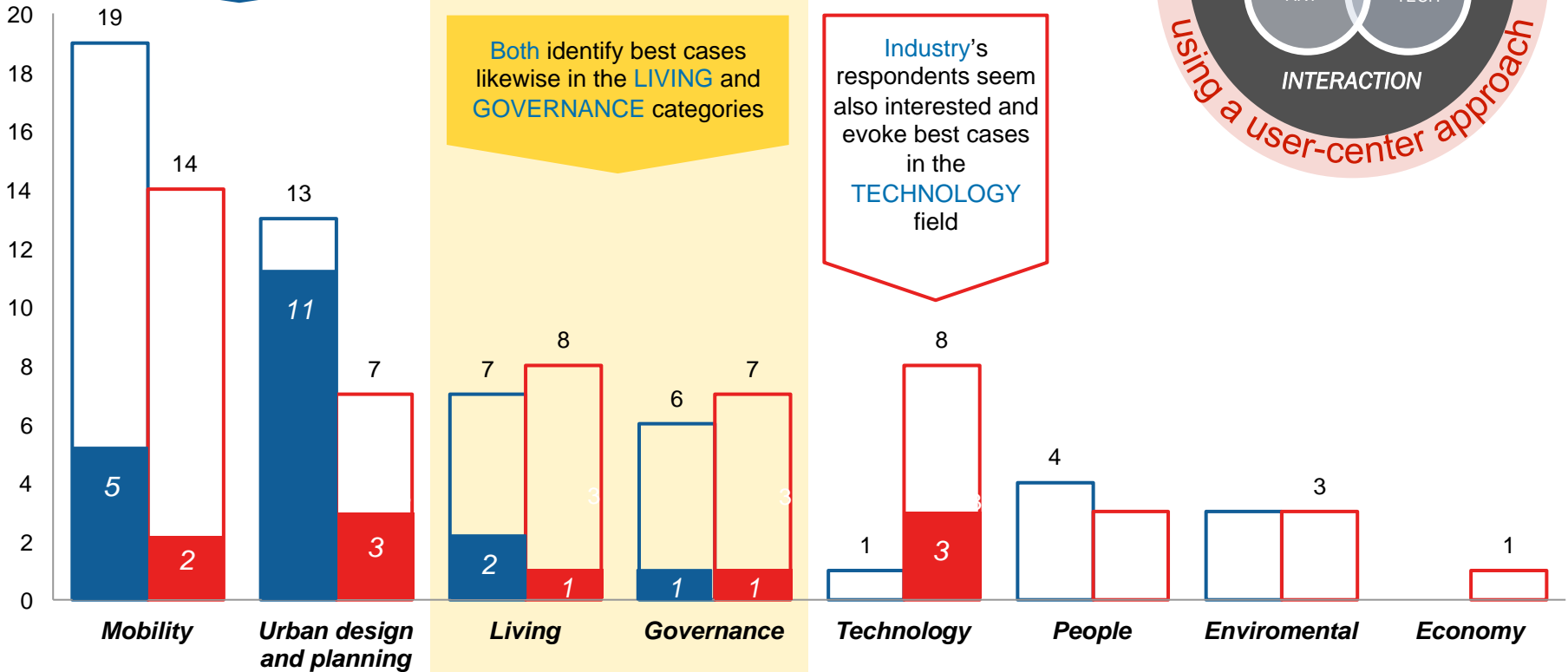
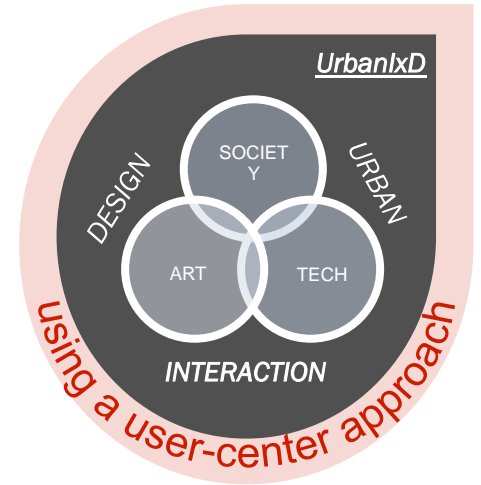
Category: ■ Environmental ■ Governance ■ Living ■ Mobility ■ People ■ Technology ■ Urban design and planning ■ Economy

Name broken down by Application area. Color shows details about General Category. Size shows sum of Number of Records.

Best cases relevance and respondent's affiliation (1/2)

Academics and researchers acknowledge more best cases in the field of **MOBILITY** and **URBAN DESIGN AND PLANNING**

Only **30%** of the examples given are relevant for the field of **UrbanIXD**, number, that certainly doesn't surprise being an emerging field.



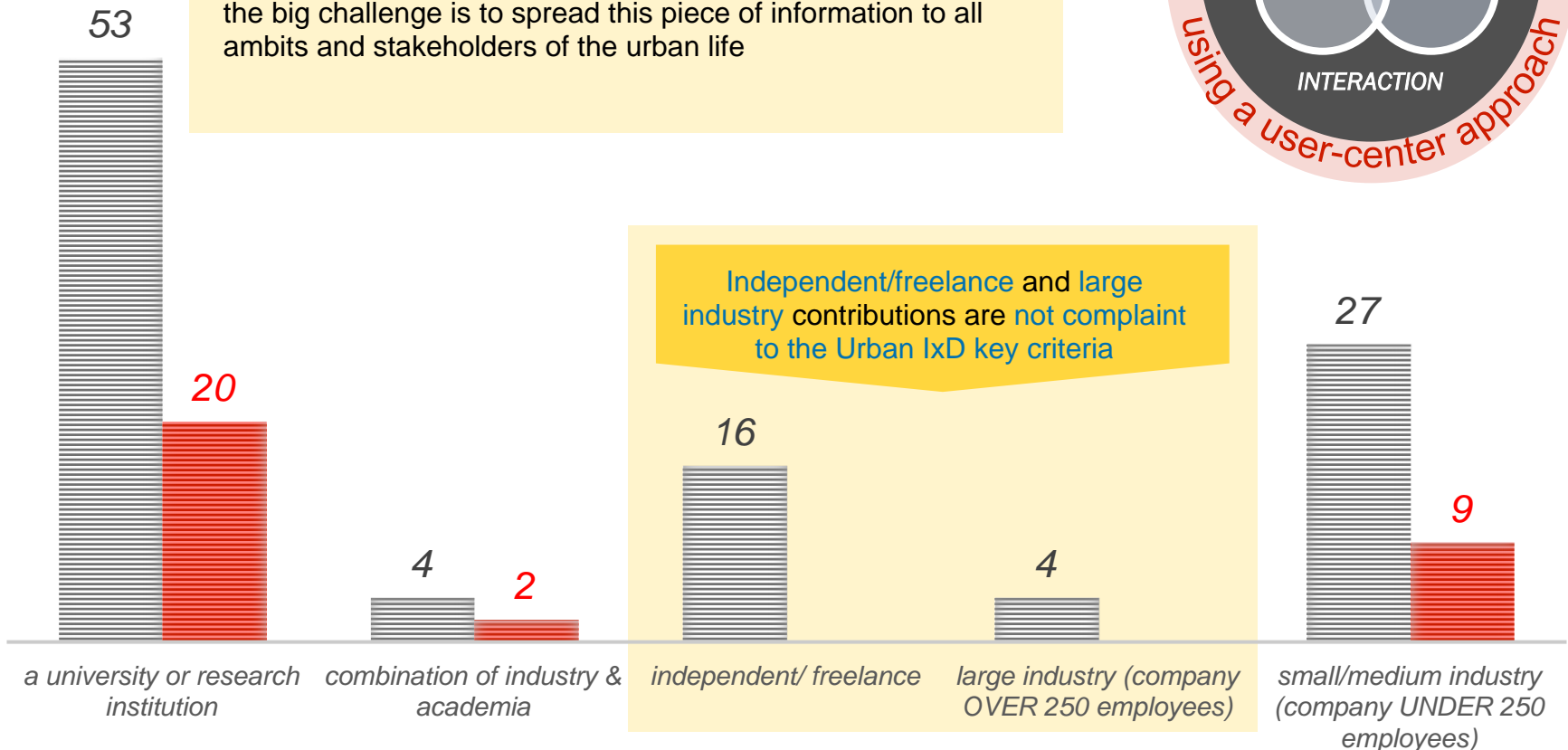
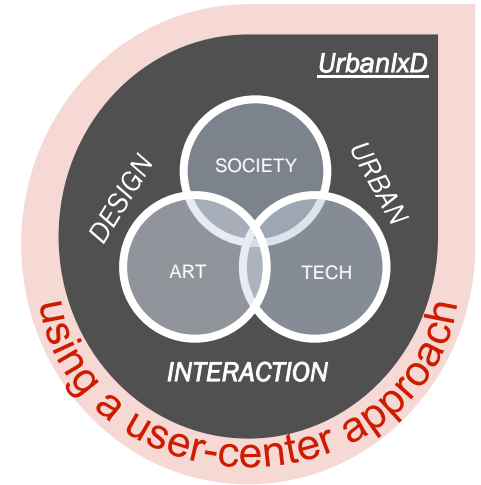
Both identify best cases likewise in the **LIVING** and **GOVERNANCE** categories

Industry's respondents seem also interested and evoke best cases in the **TECHNOLOGY** field

Industry: ■ Total examples ■ Representative examples of UrbanIXD
 Academic and research: ■ Total examples ■ Representative examples of UrbanIXD

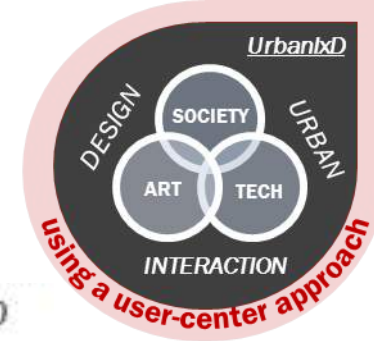
Best cases relevance and respondent's affiliation (2/2)

65% of the examples were suggested by respondents from the academic and research scene. That make us believe that the academic body has a clearer perception and knowledge of what it is Urban IxD and puts in evidence that the big challenge is to spread this piece of information to all ambits and stakeholders of the urban life



≡ Total examples ■ Relevant for the project

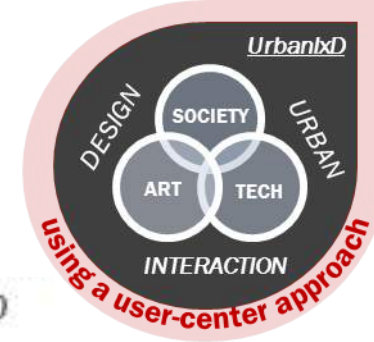
Best cases matching Urban IxD criteria by application area (1/2)



Application area *	Relevant for the project ■ YES ■ NO
Culture & Tourism	<p>Cascina cuccagna - social interaction Temporiuso - citizen participation platform 3D virtual reality - unidentified service 21. Balançoires (21 Swings) - social interaction The Akerselva Digitalt project - interactive exhibitions Terra Icons app - cultural and tourism app Inteligencias Colectivas - online platform and free database Airbnb - collaborative peer-to-peer service for accommodation Interactive display solutions - unidentified service Danmarks Borgcenter - interactive exhibitions The Digital Natives exhibition - interactive exhibitions City Icons - cultural and tourism app using augmented reality Smart Interactive Maps - unidentified service Diner-en-blanc - social interaction Parkour - creativity and sport Birloki System - interactive display solutions Älvtennis - social interaction SmartAppCity - social app Pointssign - interactive display solutions Yarn bombing - street art Park(ing)day - social interaction</p>
Mobility/ Transport	<p>Redesigned bus stop by Philips Sfpark - smart pricing for vehicke parking Velo Bleu Nice - sharing bike app Biceberg - automated bike parking Innovative display solutions - undefined service CityMapper - public transport apps Bysykkel Oslo - sharing bike app My bustracker - public transport apps in Edinburgh Car2go - accessible and flexible car renting system Interactive bus stop - unidentified service My Smart Route - traffic management service in real-time OpenStreetMap - collaborative mapping and social hub Carshare, Rideshare, Toolshare, etc.- sharing unidentified service Copenhagen Wheel - sustainable transport Public transportation apps - unidentified service Car toll - unidentified service Infrared Asphalt Repair - enviromental friendly infrared asphalt repairing Bike and car sharing - unidentified service Charging points in Amsterdam - sustainable Transport Platform for public participation in the mobility context - unidentified service Mobi.E - portuguese programme for electric mbility Easybrng - collaborative peer-to-peer service San Francisco GPS analysis - unidentified service Autobleue - electric car sharing service Bike and car sharing app - unidentified service VelovSpace - automated bike parking The traffic control - unidentified service</p>
Environment	<p>Seed bombing - turning unused acresgGreen Carbon footprint calculator - unidentified service Geographic information system - unidentified service Co2nfession/Co2mmitment - platform for public participation Bottle Bank Arcade machine - gamification applied into recycling The World's Deepest Bin - gamification applied into maintenance and cleaning 596 acres - turning unused acresgGreen Burnsville Rainwater Gardens - green infrastructure features for stormwater management CSIRO low-income household energy efficient study Garbage Jukebox - gamification applied into maintenance and cleaning Mapping the sun power in urban environments</p>

* Application areas according to the Programme for Digital Services set by the Italian Government (Agenzia per l'Italia Digitale)

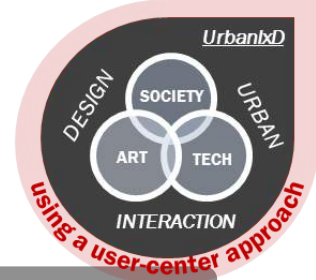
Best cases matching Urban IxD criteria by application area (2/2)



Application area *	Relevant for the project ■ YES ■ NO
Intelligent Buildings	<p><i>Thermaspheres - intelligent building</i> <i>Light Lines - urban furniture</i> <i>Xeromax Envelope - intelligent building</i></p> <p><i>Scratch Mat - gamification applied into maintenance and cleaning</i> <i>Hydramax Port Machines - intelligent building</i></p> <p><i>Datagrove - intelligent building</i> <i>Piano Staircase - intelligent building</i></p>
Government	<p><i>Changify - citizen participation platform</i> <i>Smart City Plus - citizen participation platform with 3D real-time environment</i></p> <p><i>ParticipaMi - citizen participation platform</i> <i>Social app - unidentified service</i> <i>Tidepools - collaborative mapping and social hub</i></p> <p><i>FixMyStreet - citizen participation platform</i> <i>Geodesign participatory tool - unidentified service</i></p> <p><i>Brickstarter - citizen participation platform</i> <i>Hackity App - citizen participation platform</i></p> <p><i>Public benches - unidentified product</i></p>
ICT development	<p><i>Smart CitySDK - user-centered open data app</i> <i>YEA: Your Evidence to Achieve - data and megadata management</i></p> <p><i>Smart Citizen project - citizen participation platform working with Internet of things</i></p> <p><i>Google Maps - interactive maps</i> <i>Smart Campus - develop and evaluation of new services and apps</i></p> <p><i>Smart Santander project - IGT development testbench</i></p>
Urban design	<p><i>Jalan Tun Razak Exchange in Malaysia - urban technology and intelligent building</i></p> <p><i>Agronautas - Research, design and construction of spaces and systems that reformulate the relationship between people and nature project</i></p> <p><i>Transit Oriented Development (TOD) project in Delhi - unidentified service</i></p> <p><i>Curitiba, Brazil urban plan</i></p>
Security/Monitoring	<p><i>The Wiki traffic light - gamification applied into road security</i></p> <p><i>The Speed Camera Lottery - gamification applied into road security</i></p> <p><i>The Play Belt - gamification applied into car security</i></p>
Training& Education	<p><i>YKON Game - citizen participation game</i> <i>Greencitystreets - public transport apps</i></p>
Local economy	<p><i>Matching Markets - mobile network of vendors using real-time communication</i></p>
Other	<p><i>Gamification projects - unidentified service</i></p>

* Application areas according to the Programme for Digital Services set by the Italian Government (Agenzia per l'Italia Digitale)

Mapping of the most relevant best cases (1/2)



Gamification applied into:

Environment,
facility
maintenance
and cleaning

Bottle Bank Arcade Machine

Proposal of the Funtheory.com by Volkswagen to incentivate recycling

Scratch Mat

Idea of the Funtheory.com to cheer people entering buildings to clean their shoes

The World's Deepest Bin

Proposal of the Funtheory.com by Volkswagen to incentivate bin use

Garbage Jukebox

Proposal of the Funtheory.com to keep the streets cleaner after street parties

Speed Camera Lottery

Idea of the Funtheory.com to get more people to obey the speed limit

Play Belt

Proposal of the Funtheory.com to ensure everyone keeps their safety belt on

Wiki Traffic Light

Proposal of the Funtheory.com to get more drivers to respect a red light

Road
security and
monitoring

ICT development

Development
of new
services and
apps

Smart Citizen Project

Citizen participation platform with development of low-cost sensors for building productive and open indicators in cities

Smart Campus

Playground to develop and evaluate new services and apps for the city of Trento using and bottom-up and user-center approach

Smart CitySDK

The project aims to develop a user-centered open data app

Interactive
Maps

Google Maps

Web mapping service: satellite imagery, route planning, street maps and views

Mobility and transport

Sustainable
Transport

Copenhagen Wheel

Wireless pedal assist system: it helps you pedal, when you need it

Public
transport

Redesigned bus stop by Philips

Dynamic and flexible bus-service system idea by Philips

Car sharing
service

Car2Go

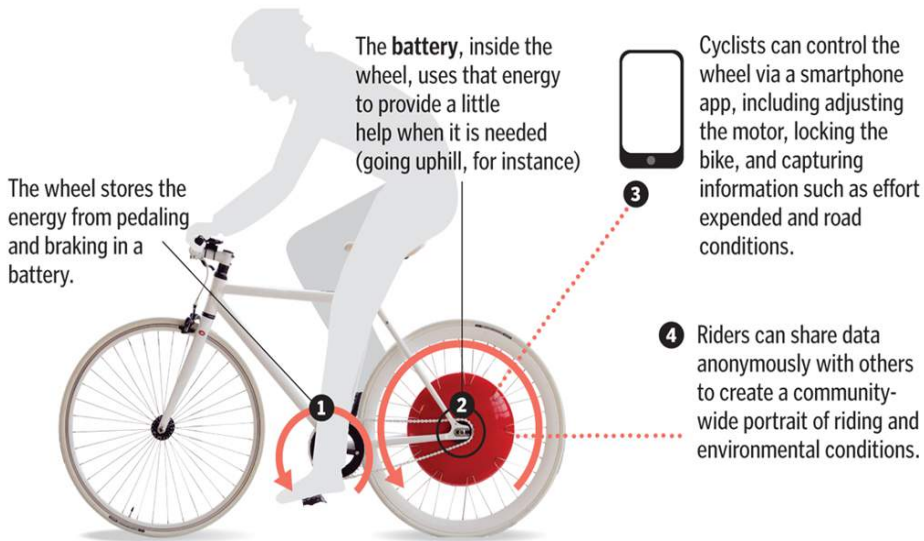
Accessible and flexible car rental system

Best case applied to sustainable transport

Copenhagen Wheel

To promote and broaden cycling uses in large urban areas by transforming the ordinary bike in a smart electric-hybrid, by simply replacing the back wheel, downloading the app and connecting it to the smartphone

Status: On the market



SOURCE: MIT SENSEable City Lab

CHIQUI ESTEBAN/GLOBE STAFF

<http://innovation-factory.org/copenhagen-wheel/>

What the Copenhagen wheel does?

It learns how you pedal (measuring for example the slope [%], cadence [rpm] and torque [nm]) and it integrates seamlessly with your motion. It captures your energy when you break or go downhill and gives you a push when you need it (3 to 10 times your regular foot power)

The red case device contains the motor, a removable battery, a wireless connectivity, smart locking, multiple sensors and an embedded control system

Using the smartphone application you can customize the ride, monitor physical activity, gather information from the environment to share with friends and fellow cyclists and if you are a software developer you can even create your own biking paths

The Copenhagen Wheel aims to allow cycling everywhere, overcoming long distances and hills. Transform your bike and your city

Video:

https://www.youtube.com/watch?v=S10GMfG2NMY&feature=player_embedded

Company: Superpedestrian, Inc

Link: <https://www.superpedestrian.com>

Foundation year: 2012

Headquarter: Cambridge, Massachusetts, USA

Best case applied to car sharing service


Car2go

Unlike traditional car sharing programs, car2go allows its members to use the vehicle for as long as they like, without committing to a specific return time or location.

Status: On the market

Car2go Smart electric car

Good for the environment - good for you




saves on fuel

↓CO₂ reduced emissions


Ways to find a car2go

via App ...

Online, ... or directly on the street



Car2go official app



1. App launches and updates in under 10 seconds.
2. App automatically retrieves vehicles near your current location.
3. Select a vehicle based on proximity and gas available.
4. Review details and confirm vehicle reservation.

What is car2go? How does it work?

Car2go is a completely new mobility program that is revolutionizing urban transportation: Hundreds of car2go vehicles are located throughout the city and are available for rent "on-demand" or can be reserved a day in advance. As car2go is not station-based, customers can finish the rental in any free public parking space within the car2go business area or at one of the specially marked car2go parking spots. car2go allows customers to use cars for shorter periods of time, allowing them to spend their driving time and driving money wisely; Attractive "by-the-minute" rates include costs for fuel, insurance, mileage, maintenance and even parking.

The car2go mobility program provides a fleet of free-floating, low-emission, fuel-efficient, self-service smart "car2go edition" which is the world's first series-produced car-sharing vehicle. An innovative hardware and software makes the fully automated rental process as simple as using a cell phone. Furthermore, car2go's unique automobile model includes a solar roof that is connected to telematics and the car battery and thus decreases fuel consumption by up to ten percent

The car2go business model is similar in all markets, although rates vary by location. The company charges a per minute rate, with discounted fixed rates for hourly and daily usage also available and applied automatically. The rates are all-inclusive and cover rental, gas, insurance, parking (in authorized areas), and maintenance. A low fixed annual fee is sometimes also charged.

By May 2014, car2go was operating over 10,000 vehicles, in eight countries and 26 cities worldwide with over 700,000 customer

Video:

<http://www.youtube.com/watch?v=vEmYbjFNekU>

Company: Car2go

Link: <https://www.car2go.com>

Foundation year: 2008

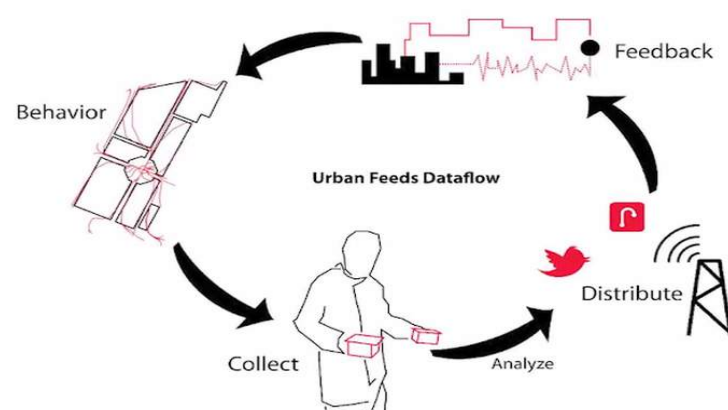
Headquarter: Ulm, Germany

Best case applied to ICT development – Internet of Things

Smart Citizen Project

Platform to generate participatory processes of people in the cities. Connecting data, people and knowledge, the objective of the platform is to serve as a node for building productive and open indicators, and distributed tools, and thereafter the collective construction of the city for its own inhabitants.

Status: Active



What is the Smart Citizen Project?

The Smart Citizen project is based on geolocation, Internet and free hardware and software for data collection and sharing (Smart Citizen Kit - SCK, RESTful api, Mobile App and the web community), and (in a second phase) the production of objects; it connects people with their environment and their city to create more effective and optimized relationships between resources, technology, communities, services and events in the urban environment.

The team launched the project with an 'Ambient Board' that has built-in sensors for measuring air composition (CO and NO2), light intensity, temperature, sound, and humidity levels. Once the device captures these data it wirelessly sends them to a web service to visualize and track the measurements, it shares the information with the community and it enables others to mash the data with companion projects using an API.

The sensor's power can be provided by either solar or battery, and a forthcoming mobile app will provide easy access and ways to engage with the device and its data remotely.

All design files for the device are being released under an Open-Source licenses and the team's next step is launching additional shields for use in urban agriculture, measuring electromagnetic fields, energy consumption levels and monitoring certain biometrics.

Video:

https://d2pq0u4uni88oo.cloudfront.net/projects/513937/video-246624-h264_high.mp4



Company: Fab Lab Barcelona
Link: <http://www.smartcitizen.me>

Foundation year: 2009
Headquarter: Barcelona, Spain

Best cases applied to environment, facility maintenance and cleaning

Scratch Mat

Status: Pilot

This idea, submitted by Felix Möller and Daniel Westhof in Germany, aims to encourage people entering a building to clean their shoes, avoiding the dirt all over the floor, of course by making it fun to do it.



How it works?



Video: http://www.youtube.com/watch?feature=player_detailpage&v=NfFzmRQriss

Initiative: Thefuntheory.com by Volkswagen

Link initiative: <http://www.thefuntheory.com>

Bottle Bank Arcade Machine

Status: Pilot

This idea aims to increase glass recycling in a way you are not just rewarded with a good conscience, you also get a smile.

How to play?

1. Press start
2. Wait for the light
3. Put the bottle in the illuminated hole
4. Collect points



Result:

Over one night the Bottle Bank Arcade Machine was used by almost one hundred people, meanwhile a nearby conventional bottle bank was used only twice

Video:

http://www.youtube.com/watch?v=zSiHjMU-MUo&feature=player_embedded

Foundation year: 2009

Headquarter: Sweden

Best cases applied to road security and monitoring

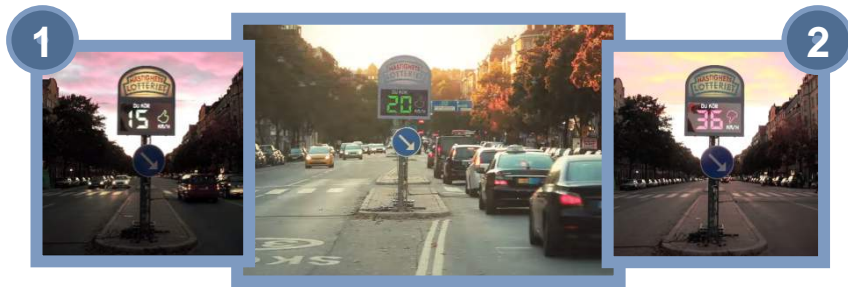
Speed Camera Lottery

Status: Pilot

The winning idea of the fun theory award, submitted by Kevin Richardson, USA, aims at getting more people to obey the speed limit by making it fun to do it. This idea was so good that Volkswagen, together with The Swedish National Society for Road Safety, actually made it a reality in Stockholm, Sweden obtaining a reduction in speed of 22%.

The initiative works like this:

1. The speed camera photographs the speeders, gives them a citation and this money goes to a pot
2. If you obey the law your plate gets also snap and you automatically enter to a lottery and you get a chance to win a fraction of the money collected through fines



Video: <http://www.youtube.com/watch?v=iynzHWwJXaA>

Initiative: Thefuntheory.com by Volkswagen

Link initiative: <http://www.thefuntheory.com>

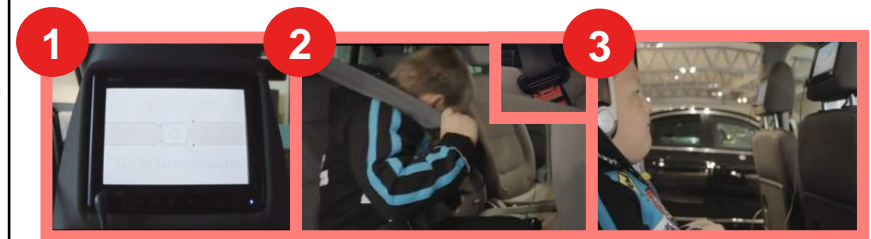
Play Belt

Status: Pilot

This is a simple but genial idea created by Nevena Stojanovic from Serbia to ensure everyone keeps their safety belt on by make it fun to do it. This idea made it to the final of the fun theory award and it is being tested in Sweden in the hope it could be applied to all vehicles in the future.

The main idea is:

You sit in the car, follow the message on the screen, fasten your seat belt and only then you can use the in-car entertainment system

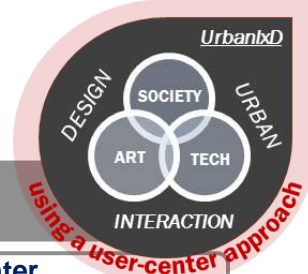


Video: http://www.youtube.com/watch?v=0AbQSE4ZKvk&feature=player_embedded

Foundation year: 2009

Headquarter: Sweden

Mapping of the most relevant best cases (2/2)



Intelligent building

Intelligent building

Xeromax Envelope
Interactive second-skin for building that records, presents and forecasts conditions

Datagrove
Outdoor structure that thrives on information from its urban environment

Thermaspheres
Proposal for a public thermal bath and event pavilion facing the sea

Hydramax Port Machines
Urban waterfront post sea-level rise proposal

Piano staircase
Piano staircase to incentive their use

Interactive display solutions

Pointssign
Interactive advanced directional sign

Birloki System
Adaptive outdoor piece that serves as interface between the city and the citizen

Urban furniture

Light Lines
Modular illuminated furniture solution engineered for the outdoors

Culture and tourism

Interactive exhibitions

Danmarks Borgcenter
User-generated content and interactive exhibit on the castle ruins of Vordingborg, Denmark

The Akerselva Digitalt project
Project aimed at mediating industrial history at authentic and interesting locations along Oslo's Akerselva river in Norway, integrating social media and digital technologies

The Digital Natives exhibition
Museum exhibition about "Digital Nativeness", in which digital technology was designed as an integral part of the exhibition to encourage dialogue between audiences and the exhibition materials

Platform for public participation

Smart governance

Hackity App
An app for citizens to take part in design of public space




FixMyStreet
Website through which users can report issues to the local government

Smart City +
Project based on modes of representation and promotion of urban data in 3D real-time environment

Smart economy

Matching Markets
Mobile network of vendors using real-time communication

Best cases applied to intelligent building and urban furniture

<p>Xeromax Envelope Status: Gallery Installation, 2010 Pratt Manhattan Gallery, New York, NY</p>	<p>Datagrove Status: Prototype for ZERO1 "Seeking Silicon Valley" 2012 Biennial</p>	<p>Light Lines Status: Preparing commercialization in partnership with THE NWBLK</p>
 <p>A photograph showing a gallery installation of the Xeromax Envelope. It features a large, white, faceted structure resembling a beehive or a modern architectural facade. Several people are gathered around it, looking at the structure and talking to each other. The structure is composed of many small, interconnected white panels.</p>	 <p>A photograph of the Datagrove installation at night. It is a large, illuminated structure made of thin, purple, wire-like frames that form a complex, organic shape. The structure is lit from within, creating a glowing effect. It is set outdoors at night, with trees and buildings visible in the background.</p>	 <p>A photograph of the Light Lines installation. It shows a long, curved, illuminated structure made of white, modular segments. The structure is lit from within, creating a bright, glowing effect. It is set outdoors at night, with people sitting on it and walking around it.</p>
<p>Xeromax Envelope is proposed as a second-skin to an existing building and becomes a register of present and forecasted conditions. Part robotic structure, part experimental interface, and part microclimatic machine it registers energy cycles and interactions over time while harvesting solar energy and protecting the building from the local climate. The model weaves ultra thin custom actuators, arrays of light and proximity sensors through the extent of the surface which transforms as it registers the changing conditions around it</p>	<p>The Datagrove thrives on information from its urban environment working as a social media "whispering wall" that responds to the proximity of visitors. It renders invisible data and atmospheric phenomena into variable intensities of light and sound. It provides shelter and a place of calm to contemplate data streams from sources near and far. It aggregates local trending Twitter feeds from San Jose and then whispers these back into the Datagrove. Video: http://vimeo.com/50590952</p>	<p>Light Lines is a modular illuminated furniture solution that can be configured for any site, creating an ambient and illuminated environment in residential, commercial and public settings. Engineered for the outdoors using state-of-the-art technology, Light Lines provides fully integrated and controllable LED illumination and integrated heating options. It is made using sustainable bio-resin materials to create a complete UV and environmentally stable furniture system that stands up to the harshest outdoor environments</p>
<p>Company: Future Cities Lab Link company: http://www.future-cities-lab.net/</p>		<p>Foundation year: 2002 Headquarter: San Francisco, California, USA</p>

Best case applied to interactive display solutions

Pointssign

Points is a rotational, digital and connected sign that features a menu which updates as everything around it does. As more appropriate, popular, or timely events approach, the menu refreshes its options.

Status: On the market



What is the Pointssign?

Interactive directional sign, which manages real-time event data, designed for a variety of locations:



Cities:

By leveraging an array of real-time data, cities can keep tourists and locals informed with the latest city-related information while also promoting local restaurants, stores, parks, museums, etc...

Brand Events/Locations:

By leveraging social and brand data, Points can serve up brand relevant content and bridge a physical store or event back to what's happening around the web.



Conferences:

Providing attendees with an easy way to find talks, events, and local destinations. Points helps to direct people to a conference room; or a BBQ restaurant across town. It also drives people towards events just as they are about to begin.

Transit:

By leveraging real-time APIs, Points can serve up where transportation can be found and when the next bus/train/plane/car will be departing or arriving.



Video:

<http://www.youtube.com/watch?v=mEvc0RjghbY>

Company: Breakfast

Link: <http://pointssign.com>

Foundation year: 2010

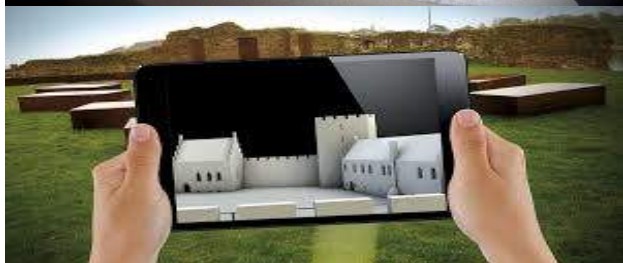
Headquarter: Brooklyn, New York

Best case applied to culture and tourism

Danmarks Borgcenter

Danmarks Borgcenter, translated in English as The Danish Castle Center, is the national research and experience centre for the castles, kings and powers of the middle ages full of high tech experiences and interactive exhibitions.

Status: Open to the public



What is the Danmarks Borgcenter?

The Danmarks Borgcenter is a combined research center, museum and event park devoted to re-telling the history of castles, kings and the gain and loss of power in medieval Denmark.

Danmarks Borgcenter is situated in the grounds of the ruined medieval Vordingborg Castle. Where, during the middle ages, the rule of King Valdemar Atterdag established a Danish center of power.

The castle ruins of Vordingborg are one of the most important sights in Denmark. The original fortress was built in 1175, but was mostly demolished in the 17th century to make way for the construction of a palace. The only part of the castle that remains completely intact today is the Goose Tower (the symbol of the town).

A new museum has been constructed on the castle site in spring 2014. The Museum Southeast Denmark and the Danish Castle Centre in cooperation with Nous Scandinavia developed concepts for the museum and implemented a comprehensive museum guide, a public app and a learning lab. Visitors trigger content via radio-frequency identification (RFID) in the exhibition rooms and via GPS outside the museum building. A 3D model will enable them to experience the historic castle in the exact location where it once stood. Background loops are punctuated by specific information. The “true blood academy” is a way for children to get to know the castle, its history and inhabitants interactively. Furthermore, a public app provide information about all the castles and rulers of Denmark.

Video trailer:

<http://www.youtube.com/watch?v=E4IVgWdZ-C8>

Company: Museum Southeast Denmark (state-supported museum)

Foundation year: 2014

Link: <http://www.danmarksborgcenter.dk/en>

Headquarter: Vordingborg, Denmark

Best case applied to platforms for public participation

Hackity App

An App for citizens to take part to the design of public spaces, currently in beta version. The idea is to give the people a tool to propose other ways "to make the cities". If you ask the people about where to put a new zebra crossing is possible that people will use more and them are more happy.

Status: Beta version



What is the Hackity project?

“Hackity is a project, is an incubator of the concerns of the people who form it. Hackity allows to reflect about the interests regarding the cities, towns and people. We want to stress people. Because we believe that cities are the result of those who inhabit them. **For us the challenge of the future is not in the smart city concept, but the smart citizens. They are the ones who build the new urban reality.**”

How the Hackity App works?

When you see something you do not like, take a picture and tell about it. Among all we would arrive at the best solution to resolve it.

What are you able to do?

- ▶ To suggest an improvement
- ▶ To identify what you do not like, for example the bump near the crosswalk, the broken sidewalk, or the garden without flowers.
- ▶ Be involved, the street belongs to everyone, as more ideas and opinions a proposal gets more likely will be that the solution will satisfy everyone.
- ▶ The user can choose how much he wants to participate. Maybe you just want to identify what is not working in the city, or just want to evaluate proposals for your neighborhood or maybe you are a person of action and can not wait to hack the city

Company: HACKITY, social design & urban innovation
Headquarter: London, UK

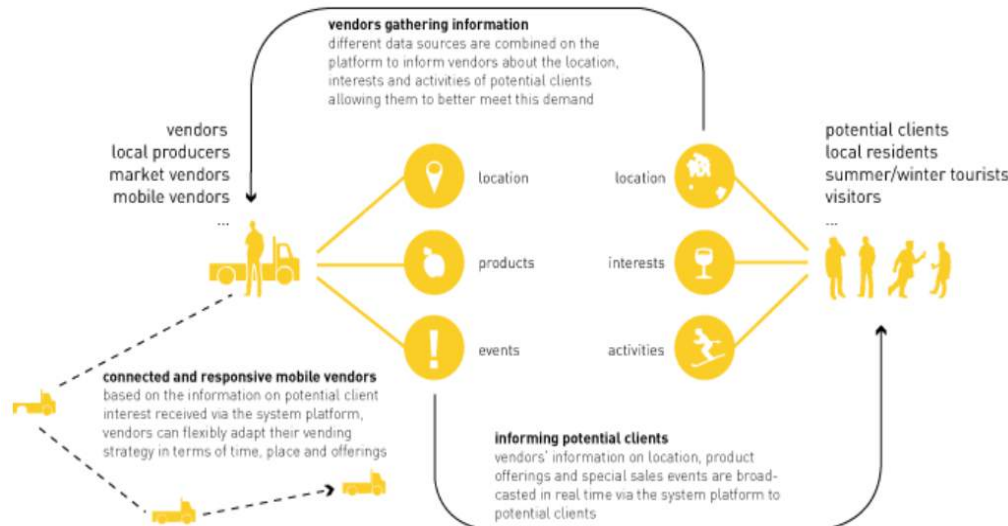
Link project: <http://www.letshackity.com/>
Link App: <http://app.letshackity.com/>

Best case applied to smart economy

Matching Markets

Mobile network of vendors using real-time communication to optimize distribution, to increase awareness of local products, to respond to seasonal activity patterns, and to strengthen connections between local supply and demand.

Status: Project on progress



How it works?

Vendors' vehicles are tracked using a GPS device, which sends location data to the system platform. Together with this, product information is broadcasted including details of type, price, production, and origin. Through an online interface, people can browse the "internet of food" while their location and interests are anonymously collected for use by vendors seeking better locations and strategies for selling products. Tourists can also view location data to find populated areas where events are taking place or avoid crowds where clusters emerge on the map. As the network around MatchingMarkets grows, farmers can build stronger relationships with frequent customers while locals and tourists can increase their knowledge of regional agriculture and indulge in the seasonal nuances of homegrown products.

What is the Matching Markets project?

The past years have seen a rising interest for quality grown, fresh and local products distributed through farmer's markets, on-site-purchases or mobile vendors. As cities continue to grow in size and complexity with urban populations increasingly connected and mobile, an opportunity arises to re-examine food distribution strategies and design the farmer's market in a way that improves efficiency by enhancing communication between producers and consumers.

Matching markets, a project by MIT Senseable City Lab illustrates the potential of Interaction Design in the context of a market opportunity, in this case improving the local economy by connecting producers and vendors with clients across physical boundaries, seasons and interests.

Company: MIT Senseable City Lab

Link: <http://senseable.mit.edu>

Foundation year: 2004

Headquarter: Cambridge, Massachusetts, USA

Business opportunities in the Smart City context

In order to discover if all concerns and issues in the Smart City context expressed by our respondents are currently satisfied by commercial solutions, services and products, we studied the correlation between it and the best cases also evoked by our respondents and this is the result:

It is clear the **big gap between concerns and recognized general solutions** addressing them in the following fields:

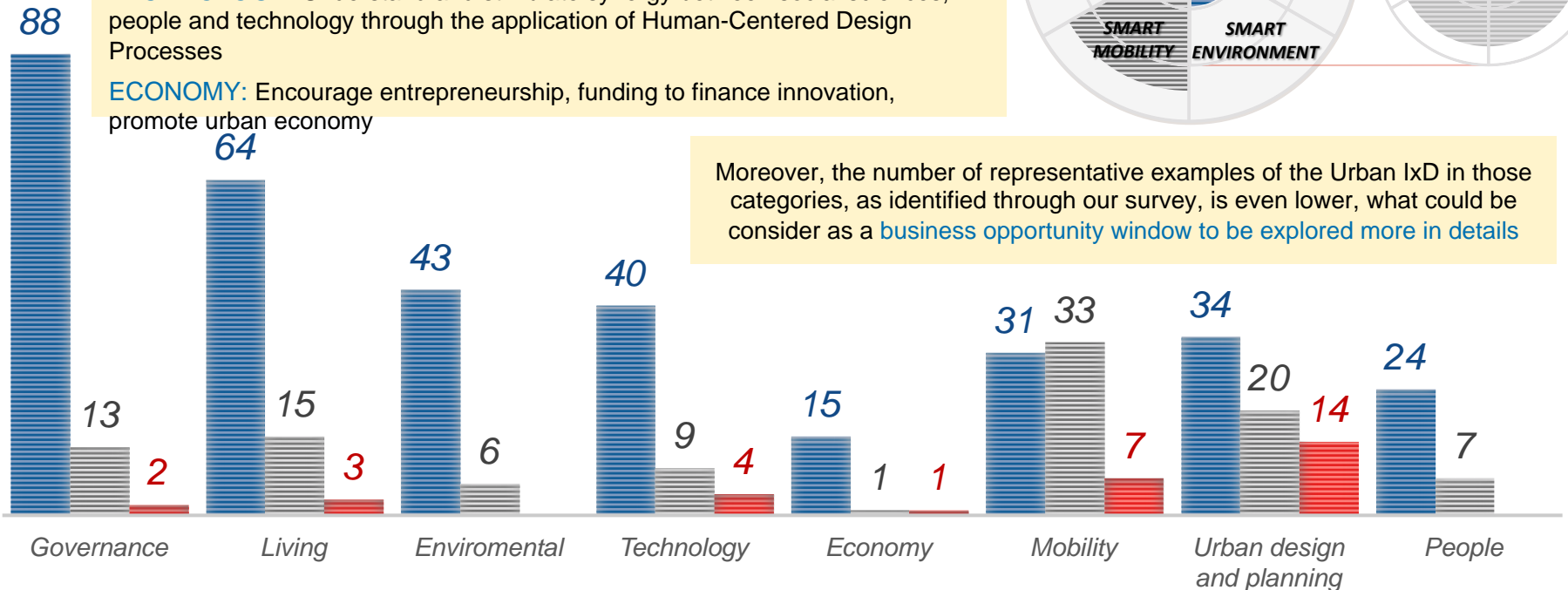
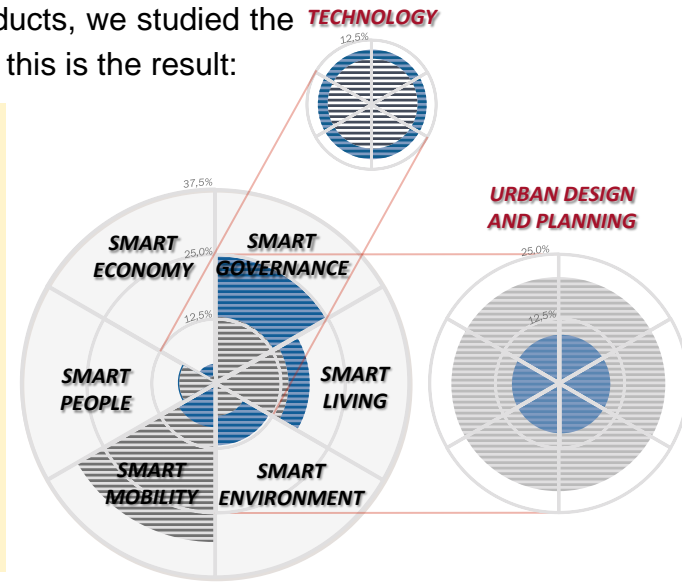
GOVERNANCE: Informing, empowering and engaging citizens in the public decision making

LIVING: Breaking the digital divide, improving accessibility and quality of connectivity and creating the environment for enabling social interactions

ENVIRONMENT: Energy consumption, ecological impact and environmental sustainability

TECHNOLOGY: Understand and stimulate synergy between social sciences, people and technology through the application of Human-Centered Design Processes

ECONOMY: Encourage entrepreneurship, funding to finance innovation, promote urban economy



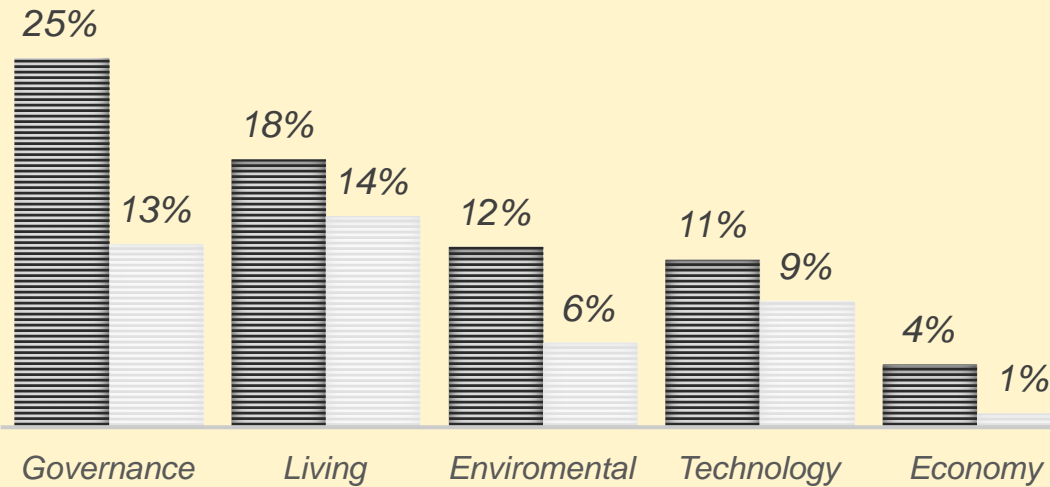
Moreover, the number of representative examples of the Urban IxD in those categories, as identified through our survey, is even lower, what could be consider as a **business opportunity window to be explored more in details**

Best cases versus issues relationship by smart category

In the following graph we can see the proportional relationship between the concerns about innovation expressed by the respondents and the best cases stated:

Business Opportunity!

Once again, our respondents are not aware of an appreciable range of solutions for the more important issues stated by them during the survey for innovation in the smart city in the categories of: **GOVERNANCE, LIVING, ENVIRONMENT, TECHNOLOGY** and **ECONOMY**

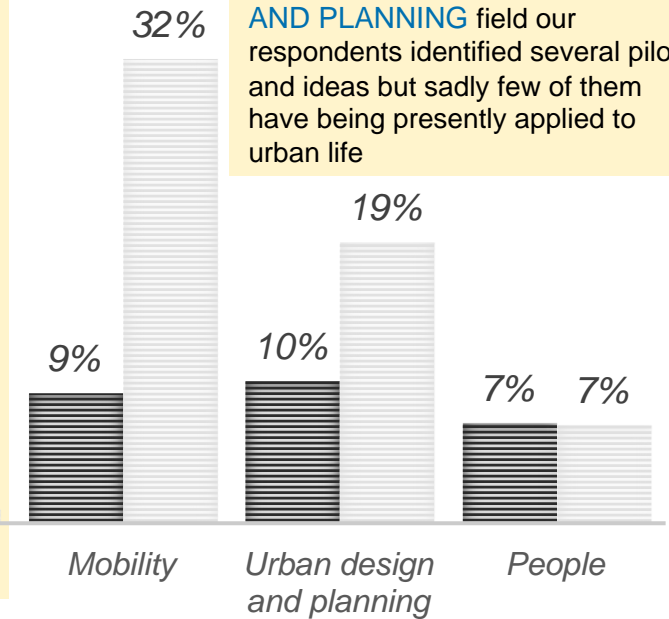


■ % Issues □ % examples

Saturation of the market?

The less important field for our respondents in term of innovation in the smart city seems to be the one with more recognized solutions and examples: **MOBILITY**

In the case of **URBAN DESIGN AND PLANNING** field our respondents identified several pilots and ideas but sadly few of them have being presently applied to urban life



Index

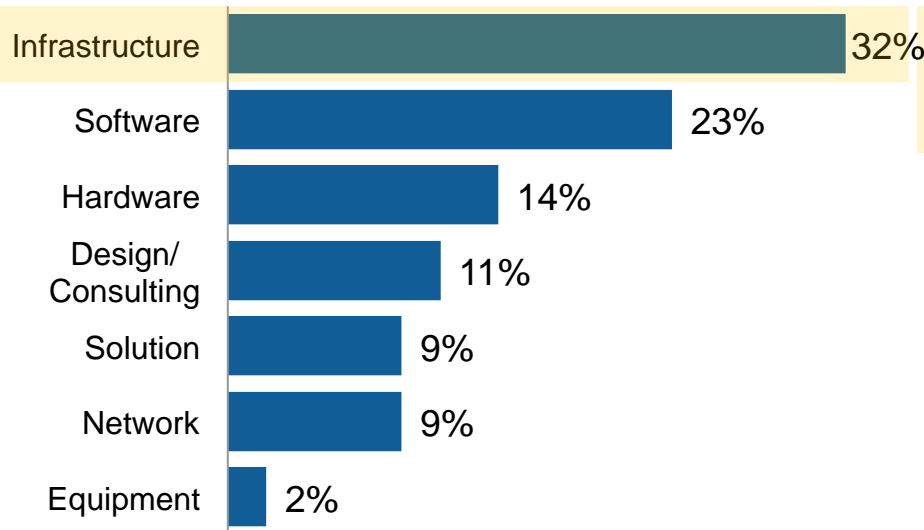
- ▶ **Background**
- ▶ **About Smart Cities**
- ▶ **Applying Interaction Design to this market**
- ▶ **Technological framework and challenges**
- ▶ **Questions arising**
- ▶ **Online survey report**
 - ▶ **About respondents**
 - ▶ **Results analysis**
 - ▶ **Best cases and market opportunities**
- ▶ **Who is in the market**
- ▶ **Conclusions and recommendations**

Solutions for Smart Cities: Company Landscape

The following slides contain a list of big companies providing solutions for Smart Cities

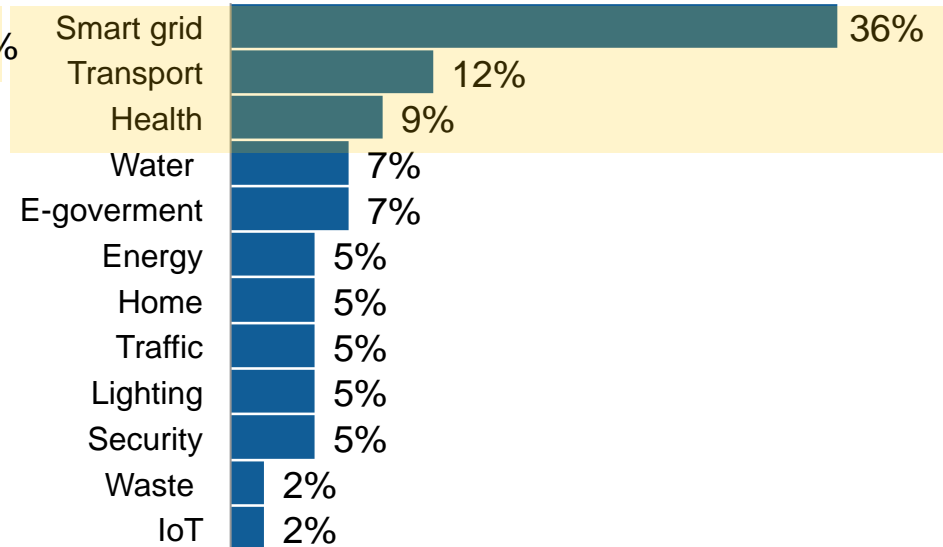


Solution categories for Smart Cities



Most of the companies offer **infrastructure for vertical solutions**. Design is present, mainly as a consulting service to the solution's implementations.

Main application areas



The top 3 application areas addressed are **smart grid, transport and health**, which are the main axes of the known **classical Smart City model**. Between them the most popular is **smart grid** followed by several vertical areas.

Companies providing solutions for the Smart Cities (1/5)

Company	Solution	Description
3M	Smart Cities (HW&Infrastructure: PlanIT Valley)	3M are partners in creating a Songdo International City Hospital within the city. 3M is also developing digital signs and 'stick-on-film" for use in the Meixi Lake project (China) and New Songdo City (S. Korea).
ABB	Smart Grid	ABB is one of the largest engineering companies in the world operating in robotics, power and automation technology areas. According to ABB the Smart Grid is the future for electrical systems. ABB collaborates with learning Institutions and external partners in several Smart Grid demonstration projects.
Accenture	Intelligent City Network (Consulting: PlanIT Valley, New SongDo)	Accenture offers smart grid solutions under the banner "Intelligent City Network' claiming they can provide tools to manage "massive volumes of smart grid data into actionable, intelligent information, intelligent transport system. The commercial model is offering governance for Smart City projects.
AECOM	Smart Cities	AECOM is a global provider of professional technical and management support services. The company is a partner with Cisco's Smart + Connected Communities web platform, and is working with IBM on a new Smarter Cities initiative by contributing its expertise in water infrastructure.
Alstom	Alstom Grid	The company provides energy and transport infrastructure. Alstom's grid management solutions includes software for control rooms as well as project management and engineering services. Alstom is collaborating with IBM, Toshiba, Cisco and Microsoft in a field of Smart City products.
Arup	Urban Information Architecture (Consulting: PlanIT Valley, New SongDo)	Arup provides engineering, design, planning, project management, and consulting services. Arup uses 'Urban Information Architecture' as a market name for smart city solutions provided by Amp. The company in involved in numerous Smart City projects.
Autodesk	Building Information Modelling	Focused on 3D design software for use in the architecture, engineering, construction, manufacturing, media, and entertainment industries. Autodesk's idea is to create future cities by using Building Information Modeling (BIM) software.
Bleak & Veatch	Smart Integrated Infrastructure	A global engineering, consulting, construction and operations company specializing in infrastructure development in energy, water, telecommunications, management consulting, and environmental markets. The company is involved in different Smart Grid projects and promotes the concept of 'Smart integrated infrastructure' which is based on many large infrastructure groups interacting with each other across platforms.

Ref. integration to "City in a Box", Dec 2012, pages 112-113, vol #34

Companies providing solutions for the Smart Cities (2/5)

Company	Solution	Description
Buro Happold	Smart Solutions (Consulting: PlanIT Valley)	The company provides engineering consultancy, design, planning, project management and other consulting services. The company is working worldwide with major experience in the Middle East market. Smart Solutions is Buro Happold's computational innovation service based on 'Smart Structural Solution', 'Smart Crowd Flow Simulations', and 'Smart Software Solutions'.
Cisco	Smart + Connected Communities (HW & Infrastructure: New SongDo, PlanIT Valley, Lavasa)	Cisco is one of the main players in the smart cities market through than Smart+Connect Communities. The company presents network solutions, such as Telepresence and Telehealth as key elements in future cities. Area addressed: Smart Grid, Smart and Connected Communities, Health solution, Real Estate, Sport and Entertainment. Commercial model is promoting an evolved broadband infrastructure.
Deutsche Telekom	Smart Cities (HW&Infrastructure: T-City)	The company has promoted the "T-City Friedrichshafen. Living the future" (www.t-city.net) partnership, a field lab for trialling 30 projects; implemented in 2009, concluded in 2012. Solutions addressed: Learning and research, Mobility e Transport, Business and Work, eCitizens, Health and care. Deutsche Telekom provided the most innovative fix and mobile broadband connectivity over the city.
Eaton	Smart Grid	Eaton Corporation is a diversified power management company providing electrical, hydraulic, and mechanical power management solutions. Eaton provides Smart Grid solutions for utility, commercial, industrial, and residential markets.
Ericsson	Smart Solutions	Ericsson is working on solutions addressing Utilities, Safety & Security, Transports. Its commercial model is an offer to Power utilities, offering safety and security solutions to first responders and emergency response agencies; expanding to electric-car charging, municipal administration e-governance solutions.
Fujitsu	Smart Cities (Japan and Saudi Arabia)	Fujitsu is mainly working to harness ICT in solutions on energy, the environment and citizen quality of life.
General Electric	Ecomagination	The Ecomagination initiative presents General Electric's interest in sustainable solutions. The company uses a smart grid concept in order to become an Infrastructure provider for different cities all around the world.
Hitachi	Smart Cities (HW&Infrastructure: PlanIT Valley)	Hitachi plans to help create an eco-friendly, energy-efficient city in Sandai, Dalian, and Kashiwa. The company is considering setting up an in-house group specializing in smart city planning that would be self-supporting and responsible for its sales and profits.

Ref. integration to "City in a Box", Dec 2012, pages 112-113, vol #34

Companies providing solutions for the Smart Cities (3/5)

Company	Solution	Description
HP	Central Nervous System of the Earth	HP's in developing Central Nervous System of the Earth or CeNSE - an Internet of Things concept. The idea is that by installing big network of sensors to collect data around the world, HP is trying to build a central nervous system for the earth. HP will deploy CeNSE to help Shall drill for oil.
Huawei	eCities	Huawei recognizes that the ICT market has great possibilities in the future and their company offers: Smart Transportation Solutions, Smart Grid Solutions, Smart Financial Solutions. Huawei promotes the eCity concept which is based on grid monitoring and management tools for municipal administrative facilities, municipal infrastructure, etc.
IBM	Smarter Planet Strategy	IBM provides HW, SW and consultancy services for hundreds of cities all around the world. With its Smarter Planet strategy IBM presents itself as one of the leaders in smart cities market. Area addressed: Building & Energy Management, Public security, Trasports, Energy & Utilities, Education. Commercial model: Support services: monetization will be tied to the results (new revenues and saves); Creation (with mayor resolution) of a joint IBM and City council committee for innovation; Target: for big cities on-premises offering, for small towns IBM infrastructure based hosted-cloud.
Intel	Sustainable Connected Cities	Intel provides sensors used in different ICT projects. In collaboration with Imperial College London & University College London Company started the Collaborative Research Institute for Sustainable Connected Cities.
KPN	Amsterdam Smart City	The company has taken part to the smart grid project of Amsterdam Smart City, collaborating to offer solutions on: intelligent building (security), victim tracking system, smart metering, supply chain-wide RFID
Landis & Gyr	Smart Metering	Landis + Gyr focus on metering and energy management solutions. The company announces the development of Gridstream MDUS, a smart meter data unification and synchronization system.
LG	U-Life	U-Life (Ubiquitous Life) is the nucleus of LG Homnet intelligent home products. It focuses on using ubiquitous computing to connect communities and create public Innovation in Songdo City, Korea.
Lockheed Martin	Smart Grid	Lockheed Martin is global company operating in four main business segments: aeronautics, electronic systems, information systems & global solutions, and space systems. Lockheed Martin entered the demand response market in 2010. Company provides Smart Grid products such as Smart Energy Enterprise Suite.
McLaren Group	Smart Cities	McLaren Electronic Systems is among a group of companies that have agreed to work together on technologies that will enable the construction of smart cities in the UK. McLaren Electronic System developed the UrbanOS for connecting sensors in the Living PlanIT project.

Ref: integration to "City in a Box", Dec 2012, pages 112-113, vol #34

Companies providing solutions for the Smart Cities (4/5)

Company	Solution	Description
Microsoft	Smart Community System (SW: New SongDo, PlanIT Valley, Lavasa)	Microsoft markets their Connected Governance Framework (CGF) built upon the foundation of the Citizen Services Platform. CGF is a set of concepts, guidelines, and resources for the central government, a regional government or a local government to improve their services and productivity. They are involved in New Songdo, PlanIT Valley, and other smart city projects. In July 2013 Microsoft launched also the smart city initiative CityNext, which leverages on big data, cloud and mobility.
Mitsubishi	Smart Community System	Mitsubishi, together with Hitachi, is working on the infrastructure for the development of new cities along the Mumbai-New Delhi corridor also announcing a Smart Community system demo project in Spain.
Oracle	Government	Developing computer hardware systems and enterprise software products, Oracle's solution for Smart Cities built on a web foundation to streamline transactions and create multi-channel communications among constituents and local agencies.
Orange	Orange Smart Cities Program	A part of France Telecom - Orange Group, it delivers telecommunications infrastructure solutions to cities that provide ubiquitous IP-based infrastructure and connectivity, backed by innovative ICT services, including Machine-to-Machine, smart metering, business and on-demand connectivity, public Wi-Fi. Solutions are: IT shared services, Governance, Risk, Compliance application suite, Analytics tools, Municipal Unit management (HR, Finance & Admin). The commercial model is to offer Hardware and application IT solutions to the public sector.
Panasonic	Smart Cities	Panasonic and Accenture are partners for a smart city in Fujisawa, Japan. Panasonic has also started a project of total energy solutions for public housing at Punggol Eco Town. The company is a lead partner on a new Smart City project in Skolkovo, Russia.
Philips	Livable Cities (HW&Infrastructure: PlanIT Valley)	Philips is interested in the possibility of selling more medical equipment and public lighting solutions presented as a 'smart lighting' grid. The company sponsoring a Livable Cities Award for ideas which can improve health and comfort in cities.
SAIC	Smart Grid	SAIC is an American defense company. SAIC works with Smart Grid technology and offers: advanced metering, energy management, smart grid as a service, smart grid infrastructure, smart grid security, technology and implementation, transmission and distribution. SAIC and IBM support 'Living in a Smart City' class at the Art Institute of Chicago.
Samsung	u-City	Samsung is heavily invested in emerging IT technologies such as u-city. u-City is a term widely used in Korea to refer to ubiquitous computing. Samsung is involved in several u-City developments in Korea.

Ref. integration to "City in a Box", Dec 2012, pages 112-113, vol #34

Companies providing solutions for the Smart Cities (5/5)

Company	Solution	Description
SAP	City Performance Management (SW: Lavasa)	One of the largest software companies in the world offers a performance management software for local governments called Business Objects City Performance Management.
Schneider Electric	Wiser Energy Management System	Schneider Electric is a French electric engineering company, specializing in electrical energy transmission and automation. The company is piloting the Wiser Energy Management System, which involves 60.000 consumers using smart thermostats and in-home displays.
Siemens	Sustainable cities	Siemens works on intelligent traffic solutions, green buildings, wastewater management, and smart grid infrastructure as technologies helping to steer today's urbanizations toward sustainability. Siemens Smart Grid Division is working with Accenture on smart metering solutions.
Tata	Smart Cities (SW: Lavasa)	The Tata group operates in communications and information technologies, engineering, materials, services, energy, consumer products and chemicals. In 2010 it was announced that Tata will team up with Mitsubishi on an Indian city project - Nikkei. Tata communications together with Cisco works on telepresence technologies.
Telefonica	Smart Cities (Hw&Infrastructure: Santander)	Smart Santander Project is led by Telefonica, University (tech coordinator), local and regional authorities. The project comprises the deployment of one M2M platform for 20.000 devices (sensors, actuators, cameras, mobile terminals). Applications are: city monitoring, traffic flows, air quality, noise and street lamps, refuse collection.
Toshiba	Smart Cities	Toshiba is an electronics, electrical equipment and information technology corporation. For Toshiba one of the most important features of a smart city is a smart electric power metering integrated into the smart grid system. Toshiba plans to realize its smart city ideas in the city of Ishinomaki, Miyagi prefecture, China. The company also plans to participate in twenty smart city projects in various parts of the world.
United Technologies	Sustainable Cities (SW: New SongDo)	United Technologies Corporation (UTC) is a diversified company that provides a broad range of high technology products and services to the global aerospace and building systems industries. The corporation is a subcontractor in New Songdo. The UTC Building Sustainable Cities initiative promotes environmental responsibility through sustainable building practices in urban areas.
WSP	Designing Future Cities	WSP Group provides engineering and design consultancy services. The company is organized into three businesses: Property, Transport & Infrastructure, and Environment & Energy. The company is currently working on City of Arabia in Dubai and Masdar City in Abu Dhabi.


Ref. integration to "City in a Box", Dec 2012, pages 112-113, vol #34

Mapping of SMEs identified through the online survey (1/5)

During the analysis of the best cases some companies and initiatives with relevant proposals in the Urban IxD context were identified. We have classified them in two big groups;



- ▶ the first one composed by organizations and companies that work in R&D of products integrating technology, design, art and sciences for social and urban innovation adopting a user-centered methodology in different fields
- ▶ the second one integrated by small, medium enterprises and initiatives with proposals that can be boost to fit in projects of Urban IxD.

1st Group: Companies and R&D labs working with Urban IxD criteria

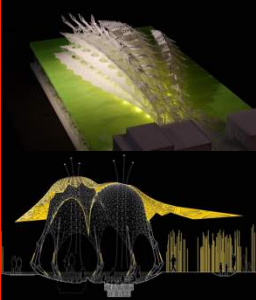

Company Name	About the company
<p data-bbox="141 848 378 919">MIT SENSEable City Laboratory</p>  <p data-bbox="175 1110 301 1189">/2011 Matching Markets</p>	<p data-bbox="436 772 799 832">Founded: 2004 Founder: Carlo Ratti (Director)</p> <p data-bbox="1190 772 1765 893">Category: R&D in City Design and Development Headquarter: Cambridge, Massachusetts, USA Company size: at least 35 employees Link: http://senseable.mit.edu</p> <p data-bbox="436 939 1775 999">Projects: Include "The Copenhagen Wheel" and "Matching Markets" studied previously, between others, for more details please go to the webpage pointed out above</p> <p data-bbox="436 1019 595 1046">Description:</p> <p data-bbox="436 1066 1785 1222">The MIT Senseable City Laboratory aims to investigate and anticipate how digital technologies are changing the way people live and their implications at the urban scale. Director Carlo Ratti founded the Senseable City Lab in 2004 within the City Design and Development group at the Department of Urban Studies and Planning, as well as in collaboration with the MIT Media Lab. The Lab's mission states that it seeks to creatively intervene and investigate the interface between people, technologies and the city</p>

Mapping of SMEs identified through the online survey (2/5)

All the companies and initiatives presented comply with the Smart Economy characteristics, such as: innovative spirit, entrepreneurship, productivity, flexibility of labor market, international embeddedness and ability to transform

Company Name	About the company	
<p>Superpedestrian, Inc.</p> 	<p>Founded: 2012 Funding: \$2.1M Founders: Assaf Biderman, Associate Director at MIT's SENSEable City Lab Investors: David Karp and Spark Capital</p> <p>Product: Copenhagen Wheel</p> <p>Description:</p> <p>Superpedestrian, Inc is a venture-backed company developing lightweight electric vehicles with integrated online platforms, finding new ways to connect people with their environment. Superpedestrian seeks to provide new forms of human-powered mobility for cities. Ultimately, their vision is to offer an improved quality of living to everybody</p>	<p>Category: Mobility and transport Headquarter: Cambridge, Massachusetts, USA Company size: 11-50 employees Link: https://www.superpedestrian.com</p>
<p>Breakfast</p> 	<p>Founded: 2010 Founders: Andrew Zolty, Mattias Gunneras, Michael Lipton</p> <p>Projects: Pointssign, Instaprint, Electromagnet Dot Display, Google The Verbalizer, etc.</p> <p>Description:</p> <p>Breakfast is a physical-digital agency specialized in creating digital experiences that utilize custom robotics and devices to bridge the gap between online and the real world.</p> <p>Their activity is also called “the internet of things” or “web 3.0.” In their opinion those definition does not apply. They consider themselves as inventors who are trying to bring what can be done online into some sort of device or experience in the real world. Stores can be smarter, an ad can come in the form of a hologram you can touch and museums can be as fun as playing with Kinect.</p> <p>Their goal is to make the real world as advanced as the virtual one that’s changed our lives in a single decade.</p>	<p>Category: Physical-digital, hardware, installations, design Headquarter: Brooklyn, New York, USA Company size: 1-10 employees Link: http://breakfastny.com</p>

Mapping of SMEs identified through the online survey (3/5)

Company Name	About the company	
<p data-bbox="79 372 336 404">Future Cities Lab</p> 	<p data-bbox="374 258 1043 415"> Founded: 2002 Founders: Jason Kelly Johnson Nataly Gattegno Projects: Xeromax Envelope, Hydramax Port Machines, Datagrove, Thermaspheres, Light Lines, etc. </p> <p data-bbox="374 436 537 462">Description:</p> <p data-bbox="374 486 1860 608"> Future Cities Lab is an interdisciplinary studio employing an adventurous team of interaction designers, architects, technologists, digital craftspeople, urban ecologists and more. Since its creation, principals founders Jason Kelly Johnson and Nataly Gattegno have collaborated on a range of award-winning projects exploring the intersections of art and design with advanced fabrication technologies, robotics, responsive building systems and public space. </p> <p data-bbox="374 629 1860 751"> While they are deeply rooted in this community of vanguard innovators, makers and thinkers, they also practice, teach and exhibit their work internationally. Over the past years they have carefully crafted a company that is deliberately nimble, experimental and independent, in fact, for each project they assemble a unique team of experts to address the specific needs of their clients. </p>	<p data-bbox="1180 258 1804 415"> Category: Design studio, workshop and architectural think tank Company size: >17 employees Headquarter: San Francisco, California, USA Link: http://www.future-cities-lab.net </p>
<p data-bbox="79 896 291 1018"> Waag Society, institute for art, science and technology </p> 	<p data-bbox="374 782 1120 875"> Founded: 1994 Funding: Yearly budget is 3.1 million euro which is financed by both public (around 30%) and private partners </p> <p data-bbox="374 925 1831 986"> Projects: SmartCitySDK and Smart Citizen Kit studied previously, Fearphone, Fear meter, between others, for more details please go to the webpage pointed out above </p> <p data-bbox="374 1008 537 1033">Description:</p> <p data-bbox="374 1058 1860 1272"> The Waag Society develops creative technology for social innovation. The foundation researches, develops concepts, pilots and prototypes and acts as an intermediate between the arts, science and the media. They cooperate with cultural, public and private parties. They follow the method of Creative Research. Creative Research is experimental, interdisciplinary research. Artists, creatives and end users have a central position and a large influence on the final result: Users as Designers. Within the organisation, specific themes are used to develop multiple projects, called Labs. At the moment there are six different Labs: Creative Care Lab, Creative Learning Lab, Future Internet Lab, Open Design Lab, Urban Reality Lab and Open Wetlab </p>	<p data-bbox="1209 782 1673 903"> Category: R&D non profit foundation Company size: >45 employees Headquarter: Amsterdam, Netherlands Link: http://waag.org/en </p>

Mapping of SMEs identified through the online survey (4/5)

2nd Group: Start-ups, SMEs and initiatives with interesting proposals that could be involved on projects of Urban IxD

Company Name	About the company
BlueMind Software	<p>CEO: Bogdan Deaky Category: Custom software development, research Headquarter: Harghita, Romania Link: http://bluemind-software.ro/index.php</p> <p>Description: Custom software development companies specialized on desktop applications, web applications, website development, webdesign, internal SEO, logo design, e-book development and more.</p>
i3 window	<p>Founded: 2008 Team: Scott Anthony, Managing Director Suresh Kumar, Media Sales & Marketing Adam Dixon, Media Director Category: Intelligent screen solutions provider with both hardware and software applications Headquarter: London, UK Link: http://i3window.com</p> <p>Products: Screens: retail window, freestanding, wall mounted, vehicle. 3D holograms. Solutions: i3 hospital, i3 leisure, i3 public sector</p> <p>Description: They are a European screen provider creating solutions such as virtual reception points, outdoor information kiosks and high street talking screens to stimulate sales even when a store is closed. Their objective is to develop intelligent, interactive, information through screen media communication.</p>

Mapping of SMEs identified through the online survey (5/5)

Company Name	About the company	
<p>Temporioso</p>	<p>Founded: 2008 Founders: Isabella Inti, Valeria Inguaggiato, Giulia Cantaluppi, Andrea Graglia Partners: Cantieri Isola and Precare.it</p> <p>Description: Temporioso.net is an association to promote temporary reuse projects in abandoned spaces and also a network of local and international partnerships with associations, activists and researchers. In recent years they have started local workshops, international seminars, lectures, guided tours, events, public meetings, calls for applications with Universities, Art Academies, Research Institutes, Architecture offices, cultural associations, stylists, designers and artists</p>	<p>Category: Association that promotes the temporary reuse of abandoned building, design, art Company size: 8-33 employees Headquarter: Milano, Italy Link: http://www.temporioso.org/?page_id=829</p>
<p>Thefuntheory.com by Volkswagen</p> <div data-bbox="115 978 367 1235" style="background-color: #e0f0e0; padding: 5px;"> <p>WIN € 2500</p> <ul style="list-style-type: none"> ▶ Competition is open for all ▶ Takes place between 1st October and 15th December ▶ The best entries will be placed on public display. ▶ First prize is € 2500 </div>	<p>Creation: 2009 Jury: Johan Tell, Amelie Silverstolpe Stefan Dahlin, Pedra Mede</p> <p>Description: They think that something as simple as fun is the easiest way to change people's behavior for the better. The Fun Theory proposed a competition for the most ingeniously "fun" takes on otherwise boring but important tasks, such as exercising, recycling, offering as price €2500 and the opportunity to see their ideas come true in a public display.</p>	<p>Category: Open competition for the best idea that help prove the fun theory Headquarter: Sweden Link: http://www.thefuntheory.com</p> <p>Proposals: Piano staircase, Wiki Traffic Light, Garbage Jukebox, The World's Deepest Bin, Bottle Bank Arcade Machine, Scratch Mat , Play Belt, Speed Camera Lottery, etc.</p>

Index

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- ▶ **About Smart Cities**
- ▶ **Applying Interaction Design to this market**
- ▶ **Technological framework and challenges**
- ▶ **Questions arising**
- ▶ **Online survey report**
 - ▶ **About respondents**
 - ▶ **Results analysis**
 - ▶ **Best cases and market opportunities**
- ▶ **Who is in the market**
- ▶ **Conclusions and recommendations**

Conclusions (1/7)

- ▶ More than **two-thirds** of the global population expected to live in urban contexts by 2050. Nowadays estimations are saying that **80% of global GDP is generated in cities**
- ▶ Market technologies and services needed to make Cities «smart» revenue will grow from **\$8.8 billion annually in 2014 to \$27.5 billion in 2023**
- ▶ The main **business models** in the smart cities solutions market include **build-operate-transfer (BOT)**, **build-operate-comply (BOC)** and **municipal-owned-deployment (MOD)**. The first one is the most popular, where city planners work closely with an external private partner that, in turn, develops the services and deploys the necessary infrastructure. The BOC and MOD models, in comparison, assign varying levels of responsibility in the building, operation or maintenance of smart city projects for the public and private sectors that are involved in those works
- ▶ The global trends for smart cities are:
 - In **North America**, projects often focus on a **single functional area**, with structured programmes from big industrial players, such as, IBM, Cisco and Siemens. Currently is the market generating more revenue.
 - In **Europe**, the is focus on **energy** and **entrepreneurship & human capital** policies; it is expected a **market growth after recession with slowly increasing investments in infrastructures** to improve public facilities
 - In **APAC** and **MEA**, projects are based on creating **new infrastructures, rather than replacing legacy systems** - the so called **smart cities from scratch**; nowadays, it represents the **most attractive market** for the players operating in this market because of their **high investments** in the smart cities projects
 - Currently, the major players in this market are IBM, Alcatel-Lucent, Accenture, ABB, Cisco, Cubic, Honeywell, Intel, Siemens and Oracle

Conclusions (2/7)

- ▶ Most of the companies offer **infrastructures for vertical solutions**. Design is present, mainly as a consulting service to the solution's implementations
- ▶ The top 3 application areas addressed by the big players are **smart grid, transport and health**, which are among the main axes of the known **classical smart city model**
- ▶ The most popular application area is **smart grid**, yet **smart transportation**, second most popular, is expected to gain a large market traction because of the rise in the solution such as traffic management, ticketing management, integrated supervision system, parking management and guidance system and passenger information system
- ▶ In the USA companies who effectively invest in **industrial design outperform their competitors by 75% on net sales** and have increased profits
- ▶ In Denmark companies **investing in design gained a growth 22 % greater** than companies that did not invest in design, and the difference rise up to 40 % when talking about continuous investing
- ▶ **Big data is driving the new industrial revolution**, but without design, such information at worst is meaningless and at best sub-optimal
- ▶ The **Internet of Things** is a promising technological development which **brings together the interface of physical objects and digital information**, spinning out into larger projects like the smart city
- ▶ Looking at the industry landscape drew in this work, we can conclude that **North America companies**, such as Apple and IDEO, have the main competences and skills in **interaction design**. Meanwhile, **European companies** have the competence and skills in **urban design, affecting the companies and market outcomes in the context of Urban IxD**.

Conclusions (3/7)

- ▶ According to our respondents the main issues today for innovation in the smart city are:
 - I. Informing, empowering and engaging citizens in the public decision making
 - II. Energy consumption, ecological impact and environmental sustainability
 - III. Breaking the digital divide, improving accessibility and quality of connectivity
 - IV. Urban transportation and mobility
- ▶ The application of the Urban IxD is considered essential to create and develop real innovation for the cities of the future. It is seen as a new part to be added to a more integrated innovation process connecting layers that already exist even when it is not clear how to accomplish this integration yet
 - The main concern of the Industry for innovation in the smart city is about the smart governance characterized by informing, empowering and engaging citizens in the public decision making.
 - The one from the academics & researchers is technology and how interacts with humans being
 - Both agree that improving the quality of life (smart living) is one of the most important issues
 - These statements highlight the relevance of the Urban IxD in creating a Smart City since they insist on the three main components of this field: society, technology, design & art
- ▶ Urban IxD is definitely an emerging field, currently more acknowledged in the academic & research ambit than in the industry one, putting in evidence the importance of generating and spreading information about it
 - From our survey we learned that around 1/4 of the consulted respondents affirmed to know the term Urban Interaction Design, not being sure of the meaning

Conclusions (4/7)

- ▶ It is a common thought that the **major challenge** today for Urban IxD is **the lack of information, knowledge and trainings available**. It is key for the development of this field to really understand it and make it understandable for others, it should become a concept that instinctively everybody could get on the urban life
- ▶ From the point of view of the perception of the field in the Industry, a shift of mentality is required. The **lack of awareness of the value** and contributions that IxD can bring in different sectors and the **difficulty to prove the financial benefits** early in the project, are two key factors to overcome for its implementation. Urban IxD is often considered a “nice to have” but not a “must have”
- ▶ According to our respondents **the greatest challenges to the adoption of IxD best practices in the Industry are related to budget, deadline constraints** and lack of involvement of the final user on the early stages of the design process
- ▶ Nowadays, it seems to be **more popular the implementation of IxD fundamentals in the private companies, while public offices seem to be more keen on a top down approach** for decision making, with occasional public consultations. According to our respondents, this last point is, in fact, the most important issue to tackle for a Smart City to take off. Here it comes the importance of positioning Urban IxD in a way that is understandable for city governments and decision makers
- ▶ Urban IxD is recognized for its **human-centered approach** and methodology more than for its clear boundaries, which are still in definition

Conclusions (5/7)

- ▶ The use of IxD on the development process of products/ services brings some positive impacts:
 - it drives and facilitates **innovation acceptance**
 - it improves **usability and accessibility**
 - it is key to generate an “**inclusive**” product
- ▶ One of the most relevant aspect of Urban IxD is that it can support **bottom up innovative solutions** for the **smart city**
- ▶ It is clear for our respondents that all **application areas could benefit** from the use of IxD, being the more popular ones “**mobility/transport**”, “**education, culture and art**”, “**governance**”, and “**urban planning and intelligent buildings**”
- ▶ Respondents agree that even when the inclusion of IxD will bring changes on the project cost structure also it will have a positive impact on the final result, such as, **client satisfaction and higher sales**. Specifically, the most popular believe is that the **adoption of IxD brings higher upfront investment**, but **potential cost-savings in the long-run**
- ▶ In the unique European context, respondents agree that design must take into account tradition, local historical and cultural particularities of each city without “copy and paste” solutions from other countries, which confirms **important role of urban interaction designers who are in tune not just with technology but with the cultural and social aspects of life** and by definition contribute with solutions unobtrusive
- ▶ In the unique European context, the challenge mostly lies in **reducing the gap between the physical and digital dimension**, allowing the historical and cultural traditions to live on beyond the effects of urbanization, and not be bounded by geographical limitations

Conclusions (6/7)

- ▶ The most representative examples of the application of Urban IxD in the Smart City context were found on [intelligent building, platform for public participation, interactive exhibitions, mobility and transport and the use of gamification to nudge people toward better behaviors](#)
- ▶ One possible [business opportunity](#) was identified analyzing the best cases: respondents are not aware of a wide range of solutions for the more important and popular issues for innovation in the smart city in the categories of: [governance, living, environment, technology and economy](#)
 - Moreover, the number of representative examples of the Urban IxD in those categories is even lower, what could be consider as a [business opportunity window to be explored in more details](#)
- ▶ The following companies, responsible for the development of some best cases named below, were identified and could be consider relevant references in the Urban IxD context (i.e. for sponsorships or partnerships):

Category	
Companies and R&D labs working with the elements of Urban IxD	Start up, SMEs and initiatives with interesting proposals that could be involved on projects of Urban IxD
MIT SENSEable City Laboratory	BlueMind Software
Superpedestrian, Inc.	I3 window
Breakfast	Thefuntheory.com by Volkswagen
Future Cities Lab	Temporioso
Waag Society	

Conclusions (7/7)

- ▶ The following best cases are the most relevant among all, because they put together the three pillars of the Urban IxD - technology & data, being society oriented, involving design & arts - and additional to that because they use a user-centered approach in the development of their solutions

Category							
Gamification to nudge toward better behaviors	Intelligent buildings	ICT development	Platform for public participation	Mobility and transport	Interactive exhibitions	Interactive display solutions	Urban furniture
Bottle Bank Arcade Machine	Datagrove	Smart Citizen Project	Matching Markets	Copenhagen Wheel	Danmarks Borgcenter	Pointssign	Light Lines
Garbage Jukebox	Hydramax Port Machines	Smart Campus	Hackity App	Car2Go	The Akerselva Digitalt project	Birloki System	
Scratch Mat	Piano staircase	Smart CitySDK	Smart City +	Redesigned bus stop by Philips	The Digital Natives exhibition		
The World's Deepest Bin	Thermaspheres	Google Maps	FixMyStreet				
The Play Belt	Xeromax Envelope						
The Speed Camera Lottery							
The Wiki Traffic Light							

Recommendations

- ▶ In order to push the adoption of Urban IxD best practices we recommend that the European Commission **includes IxD like a building block in all research and innovation projects** related to the smart city. The main idea with this action is to make Urban IxD a “must to have” instead of “nice to have”, starting from funded projects
- ▶ Strategic support to **nudge academic bodies to create papers, books, training and education courses**. The main idea with this action is to spread the knowledge about the field of Urban Interaction Design, starting from its theoretical and empirical foundations and finally reaching out the main stream within industry and society

Contributors



Melissa Bracuto

Industrial engineer from Caracas, Venezuela, with more than four years of working experience in project management within the Telecommunication field, holding a Master degree on Wireless Systems from the Politecnico of Torino, Italy. Currently, she works as in-company intern in Telecom Italia as part of the first edition of the Master “Smart Solutions Smart Communities” hosted by Telecom Italia and Scuola Superiore Sant’Anna from Pisa, Italy, collaborating with the UrbanIXD project to elaborate the Industry landscape.



Gianluca Zaffiro

A telecommunications expert and innovation advisor at Telecom Italia, working with the Future Centre group within the company Innovation & Industry Relations department. He explores how innovation in technology and services will impact the company business and he contributes to the Innovation strategic steering. Gianluca was responsible for the Market Interaction activities in the European FP6 Coordination Action PEACH on Presence from 2006 to 2009. From 2013 he has taken the Industry Liaison responsibility for UrbanIXD. Gianluca has a degree in Electronic Engineering (MEng) from the Politecnico of Torino, Italy.



UrbanIXD: Designing Human Interactions in the Networked City

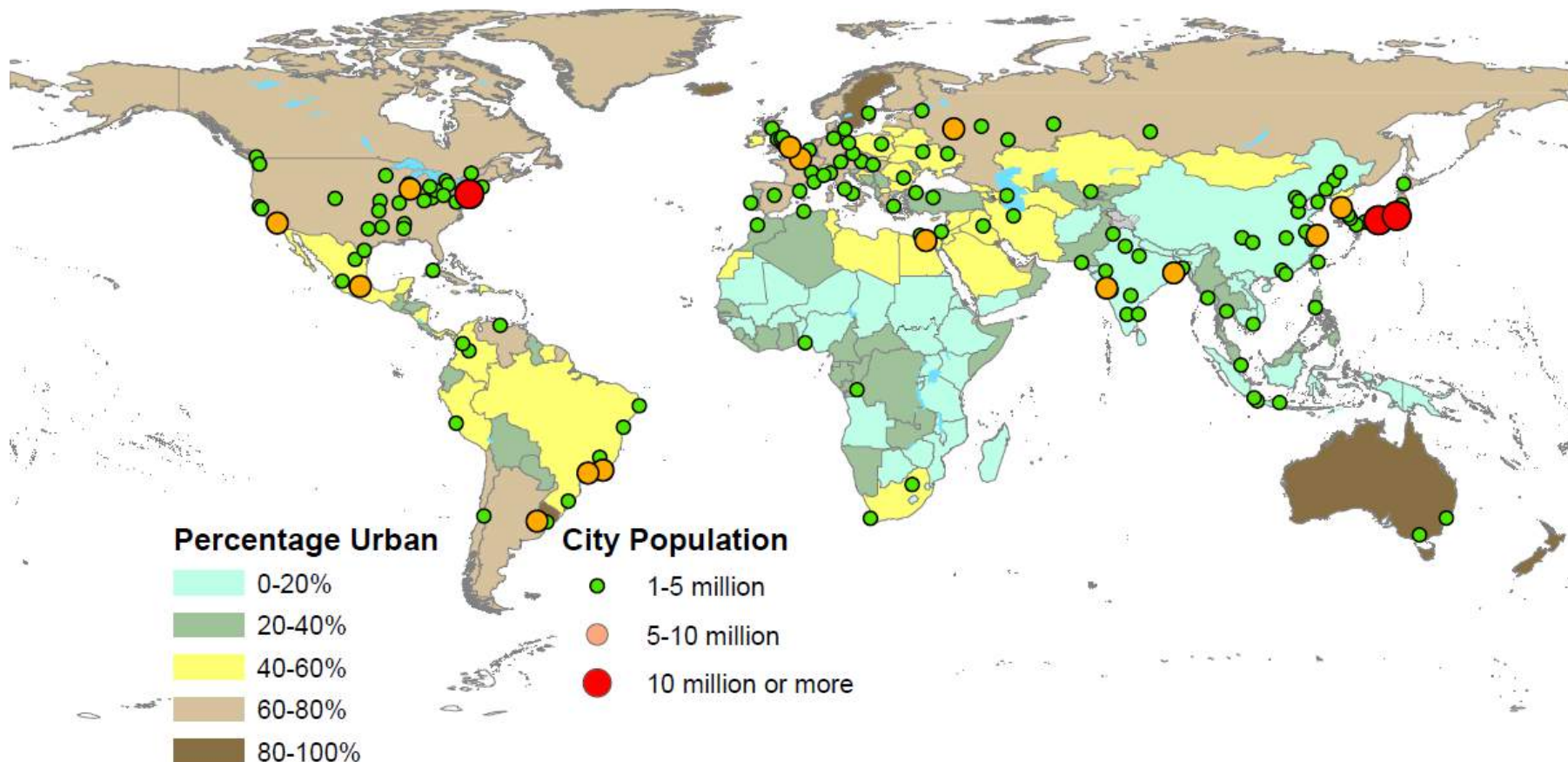
Coordination Action project, funded by the European Commission under the FP7-ICT Work Programme 2013. Project Number: 323687

Annexes

- ▶ **Annex 1:**
Percentage of urban population & agglomerations by size class, 1970-2030
- ▶ **Annex 2:**
Online survey report methodology
- ▶ **Annex 3:**
Open-questions survey deployed in the 1st phase
- ▶ **Annex 4:**
Multiple-choice survey deployed in the 2nd phase
- ▶ **Annex 5:**
Methodology used to analyze the open-answers from the 1st phase of the survey
- ▶ **Annex 6:**
Methodology to determine which examples are the best cases of Urban IxD
- ▶ **Annex 7:**
Extract of the Excel's DB built with all examples given and best cases analyzed

Percentage of urban population & cities by size class, 1970

World Urbanization Prospects, the 2014 revision

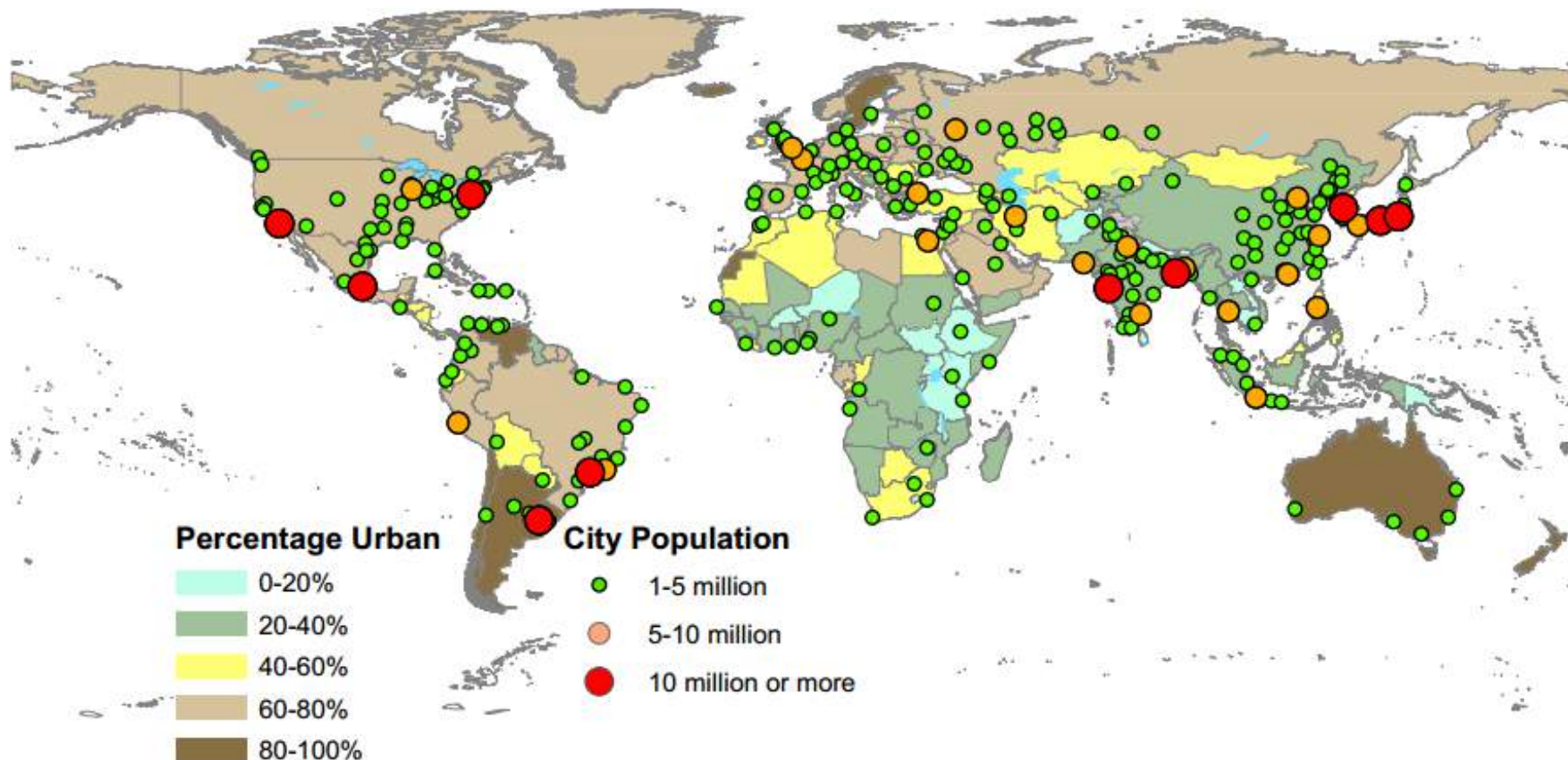


Note: Designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Source: <http://esa.un.org/unpd/wup/Maps/CityDistribution/CityPopulation/CityPop.aspx>

Percentage of urban population & cities by size class, 1990

World Urbanization Prospects, the 2014 revision

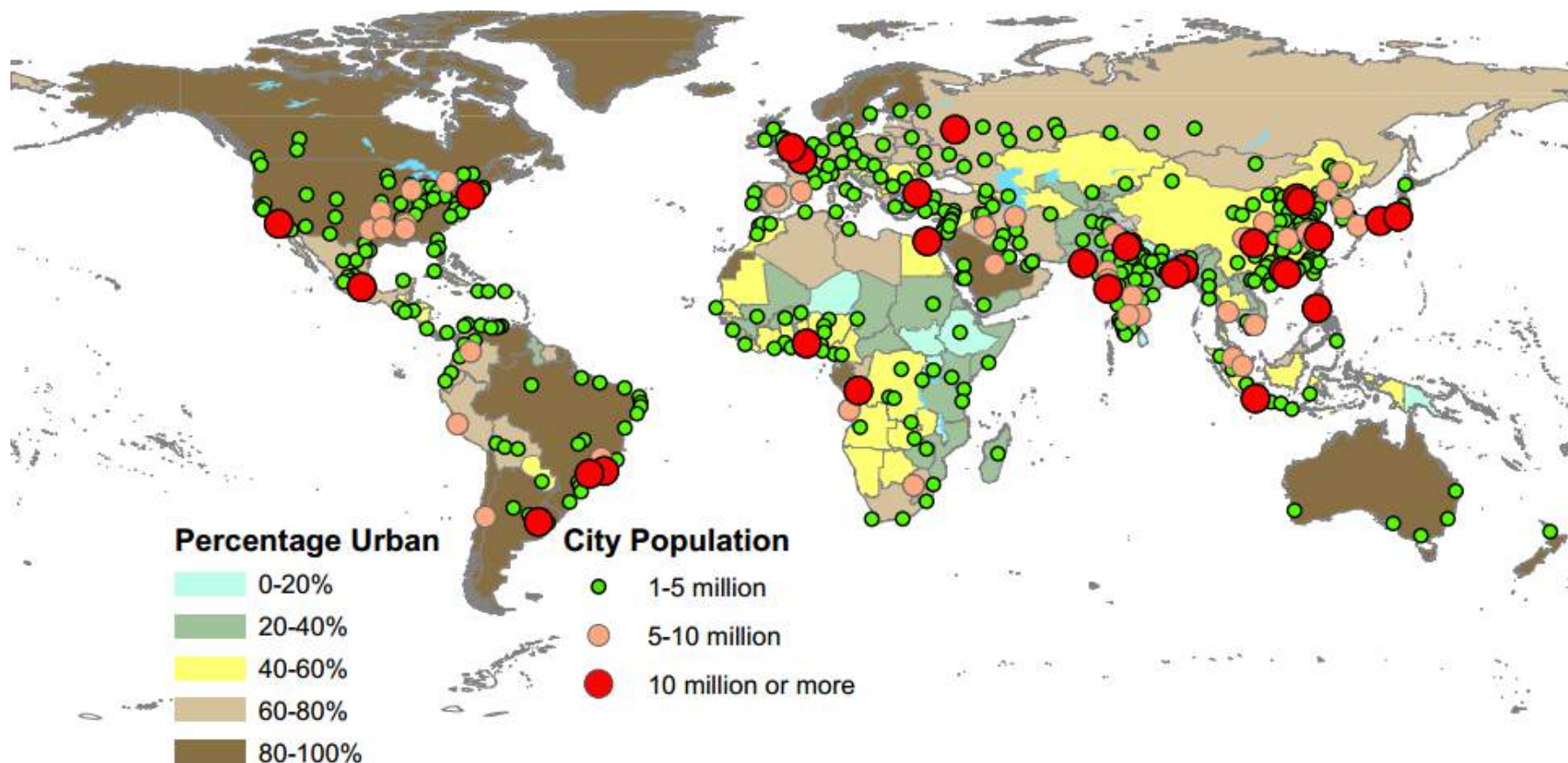


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Source: <http://esa.un.org/unpd/wup/Maps/CityDistribution/CityPopulation/CityPop.aspx>

Percentage of urban population & cities by size class, 2014

World Urbanization Prospects, the 2014 revision

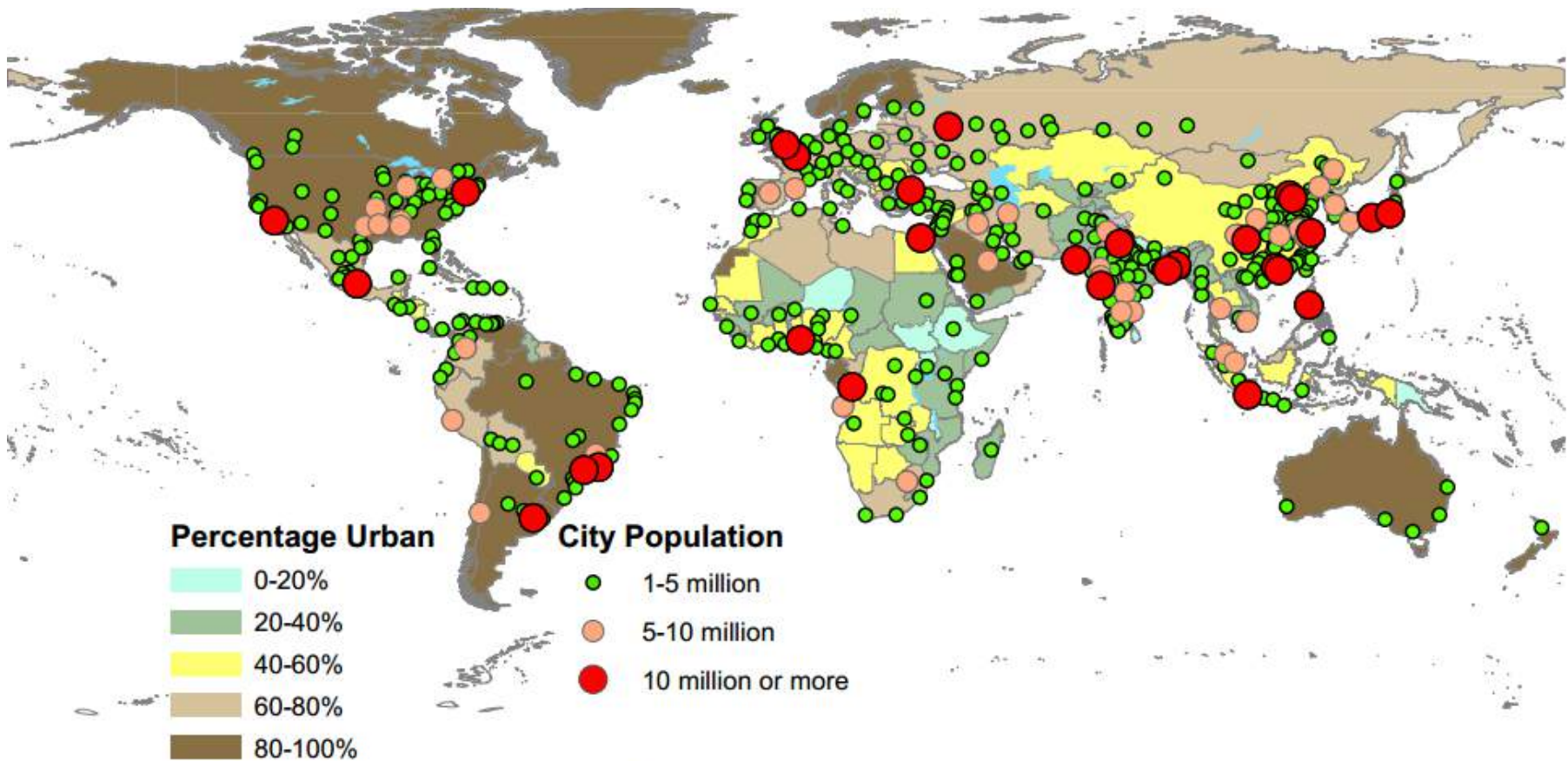


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Source: <http://esa.un.org/unpd/wup/Maps/CityDistribution/CityPopulation/CityPop.aspx>

Percentage of urban population & cities by size class, 2030

World Urbanization Prospects, the 2014 revision



Note: Designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Source: <http://esa.un.org/unpd/wup/Maps/CityDistribution/CityPopulation/CityPop.aspx>

The Survey (1/3)

As established before, the main goal of this [survey](#) was to review opinions on [what issues will be important in the near future for industrial and commercial innovation in the smart city context](#) and to [draw the Industry landscape and analyze the current state of commercial activities and players in the Urban IxD context](#).

In order to accomplish these goals, the survey was structured in two phases, as follow:

	1st PHASE: Qualitative assessment	2nd PHASE: Quantitative validation
Objectives	<ul style="list-style-type: none"> ▶ To assess the general opinion of the extended community related to the project UrbanIxD about innovation in the smart city context and the challenges and advantages of using Urban IxD in this manner ▶ To measure out the adequacy of the questionnaire and respond rates 	<ul style="list-style-type: none"> ▶ To provide clear, actionable and more valid results from a quantitative point of view by: increasing the survey sample, reducing the number of question not answered, converging the wider ideas gathered in the first phase and making more efficient (faster and easier) the data analysis ▶ To deliver and present the compressive final results of the consultation
Questionnaire structure	<p>Online questionnaire of nine open-questions arranged in four sections:</p> <ol style="list-style-type: none"> 1. Section A: about you → collection of basic information about the respondents 2. Section B: industry and innovation → aiming to assess respondent's opinion about the industry, innovation and interaction design 3. Section C: research and innovation → aiming to identify challenges and opportunities for Urban IxD in the future, examples of best practices and players 4. Section D: any other comments → available to leave free comments <p>Note: The survey questionnaire can be consulted in Annex 1</p>	<p>A fast and easy to answer online questionnaire of five multiple-choices questions and two open-questions arranged in three sections:</p> <ol style="list-style-type: none"> 1. Section A: about you → collection of basic information about the respondents and assessment of familiarity level with the term Urban Interaction Design (Urban IxD) 2. Section B: innovation, industry and research industry → aiming to assess respondent's opinion about the industry, innovation and interaction design and identify challenges and opportunities for Urban IxD in the future, examples of best practices and players, through multiple-choice questions 3. Section C: any other comments → available to leave free comments <p>Note: The survey questionnaire can be consulted in Annex 2</p>

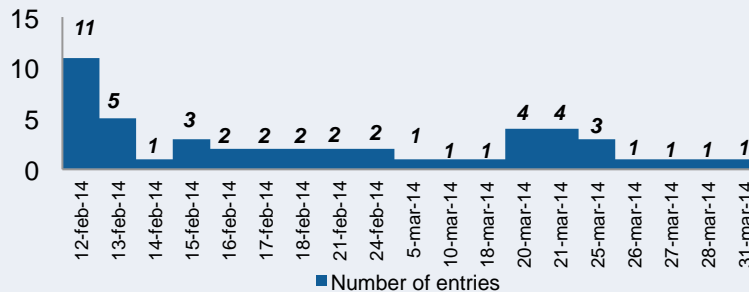
The Survey (2/3)

	1st PHASE: Qualitative assessment	2nd PHASE: Quantitative validation
<p style="text-align: center;">Data collection</p>	<ul style="list-style-type: none"> ▶ The request to complete the survey was distributed by email to the extended community involved and interested in the UrbanIXD Project ▶ The survey was promoted and advertised by Twitter and the official webpage of the project ▶ Due the multidisciplinary nature of the field we were interested in opinions from a wide public including industry, research and academia, so we did not make any distinction about the role and affiliation of the potentials respondents ▶ The data collection period was of 50 days between February 10th, 2014 and March 31st, 2014 	<ul style="list-style-type: none"> ▶ In order to increase the responses from the people involved in the industry scene, specially but not exclusively members of startups and SMEs who offers their services and solutions in the smart city context, the request to complete the survey was diffused through the following communities: <ul style="list-style-type: none"> – eu-smartcities.eu: a platform initiated by the European Commission which aims to identify and spread relevant information on technology solutions and needs required by practitioners in the Smart City context. They promoted this survey through their Twitter account and a note published on their public online blog – CityMart: a community that connects cities and solution providers. Its platform contains 1,385 showcases of available solutions from innovative solution providers - businesses, social-enterprises and universities. We directly contacted and invited to participate in the survey 201 solution providers relevant for the project through the "Get in Touch" tool of their platform – 12 emailing lists provided by Marcus Forth (Director of the Urban Informatics Research Lab of the Queensland University of Technology and member of the advisory board of the project). The request approval and forwarding confirmation of our invitation to the members was received by 4 of them – ITU-T SSC ((International Telecommunication Union – Telecommunication Standardization Sectors, Focus Group on Smart Sustainable Cities) Work Package leaders, via Telecom Italia ITU-T SSC Chairman, Flavio Cucchietti ▶ The survey was also promoted by offering a €50 gift voucher on Amazon, among those who took part to it within May 15th, 2014 ▶ The data collection period was of 15 days from May 1st, 2014 to May 15th, 2014

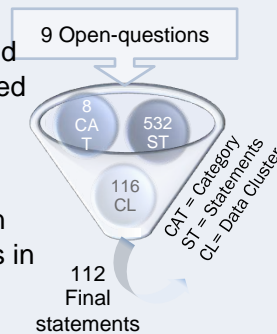
The Survey (3/3)

1st PHASE: Qualitative assessment

- ▶ We received the feedback of 48 persons, distributed during the data collection as follow:



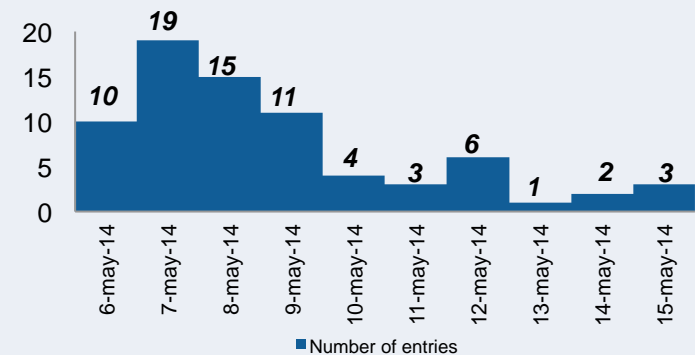
- ▶ The total answers to the 9 open-questions were reviewed, studied and translated in 532 statements, gathered in 116 data-cluster based on the similarities between them, classified (when applicable) in 8 smart city's categories, and finally transformed in 112 final statements that synthesizes in the most possible easiest way the opinions of our respondents



- ▶ After balancing the strengths and weaknesses of the 112 final statements described in the previous steps, the multi-choices answers to be used in the 2nd phase of the survey were selected from the said statements (to see the final results of the selection please review Annex 2)

2nd PHASE: Quantitative validation

- ▶ We received the feedback of 74 persons, 26 more than the ones received on the first phase, distributed in time as follow:



- ▶ The proportion of small and medium industry respondents increase in 8% respect to the first phase, passing from 23% to 31%, even when the general profile of the respondents remained the same: 57% respondents from the industry ambit and 43% from the academic and research field, versus 58% and 42% obtained earlier
- ▶ The abstinence rate decreased significantly, in average 17%
- ▶ **The results obtained in this second phase were aggregated to the first ones, resulting in the final results shown in the present document**

Data
analysis

Open-questions survey deployed in the 1st phase (1/2)

The UrbanIxD questionnaire

Urban Interaction Design (Urban IxD) is an emerging field putting the user and the citizen at the centre of the process of creating services, products and solutions in networked urban spaces.

The UrbanIxD FP7 project is conducting this short survey in order to inform the future research agenda in a European context. We are interested in opinions from a wide community including industry, research and academia. With your help, we hope to contribute to the wider discussion on the challenges and opportunities for urban interaction design in the future, as well as identifying and promoting current examples of good practice.

Thank you very much for taking the time to complete this short survey! Many of the questions are optional, so please feel free to skip over any that are not relevant to you.

More information about the project is here: www.urbanixd.eu

*Campo obbligatorio

Section A: about you

Please fill in all the questions in this section if you can. All the questions in the following sections are optional.

Is your primary employment or main affiliation with: *

- large industry (company OVER 250 employees)
- small/medium industry (company UNDER 250 employees)
- a university or research institution
- independent / freelance
- combination of industry & academia
- Altro:

What is your job title or role?

Where are you based?

Country - City

Optional: your details

First name / last name

Optional: your email address

What are your main areas of activity within your organisation?*

Select all the most relevant options that you are personally involved with on a group or department level.

- Telecomms
- Academic (education/teaching)
- Research
- Architecture / Urban planning
- Transport
- Human Computer Interaction / Interaction Design
- Digital Media / multimedia / Web
- Social Sciences
- Civic / governmental
- Software development
- Industrial or product design
- Management / organisational
- Student (including PhD)
- Altro:

Do you use any of the following terminology within your domain?

Select the most commonly used terms within your organisation or professional/academic community.

- Smart City
- Networked City
- Digital City
- Intelligent City
- Connected City
- Media Architecture
- Altro:

Section B: Industry and Innovation

This section is mostly relevant if you work in an industrial or commercial environment.

In your opinion, which are the main three issues today for innovation in the Smart City?

Open-questions survey deployed in the 1st phase (2/2)

Concerning innovation, how important is interaction design to the development of urban products and services?

In your opinion, which areas could benefit the most from the collaboration of Interaction Designers with Industry to innovate urban services?
e.g. transport, energy, education...

Within industry, what are the financial implications for including Interaction Design within the development of products and services?

What do you think the challenges are for urban interaction design in a European context where cities have a substantial historical and cultural heritage?

Do you consider interaction design to be a new layer to be added or part of a more integrated and comprehensive process of innovation when addressing Urban service innovation?

Section C: Research and innovation

Can you provide an example of a "best of breed" service/product related to a "smart city"?

This can be one that you were involved with or from an external source. e.g. StreetBump is an App that using mobile devices and their embedded sensors can report to the Municipality the potholes position in the city streets enabling the citizens to actively participate in the city maintenance and management.

Is the product or service:

- One that I or the company that I work for developed.
- One that I know of that I was not involved with.

Can you describe how Interaction Design adds value to this service/product innovation?

If you work in industry, what challenges, if any, do you face when applying Interaction Design to your business?

In your opinion, what opportunities or benefits could Interaction Design support in the present market?

Section D: any other comments

Do you have any further comments that you would like to make about the field of Urban Interaction Design as it relates to your field of interest?

Multiple-choice survey deployed in the 2nd phase (1/2)

The UrbanIXD questionnaire

Urban Interaction Design (Urban IxD) is an emerging field putting the user and the citizen at the centre of the process of creating services, products and solutions in networked urban spaces.

The UrbanIXD FP7 project is conducting this short survey in order to inform the future research agenda in a European context. We are interested in opinions from a wide community including industry, research and academia.

The survey is formed by three sections; the first one is about yourself, the second is to assess your opinion about the fields, and the latter section is available to leave comments. The approximate time of completion is 5 minutes.

With your help, we hope to contribute to the wider discussion on the challenges and opportunities for urban interaction design in the future, as well as identifying and promoting current examples of good practice.

Thank you very much for taking the time to complete this short survey!

More information about the project is here: www.urbanixd.eu

*Required field

Section A: about you

Please fill in all the questions in this section if you can. All the questions in the following sections are optional.

Is your primary employment or main affiliation with: *

- large industry (company OVER 250 employees)
- small/medium industry (company UNDER 250 employees)
- a university or research institution
- independent / freelance
- combination of industry & academia
- Other:

What is your job title or role?

Where are you based?

Country

City

Optional: your details

First name / last name

Optional: your email address

What are your main areas of activity within your organisation? *

Select all the most relevant options that you are personally involved with on a group or department level.

- Telecomms
- Academic (education/teaching)

- Research
- Architecture / Urban planning
- Transport
- Human Computer Interaction / Interaction Design
- Digital Media / multimedia / Web
- Social Sciences
- Civic / governmental
- Software development
- Industrial or product design
- Management / organisational
- Student (including PhD)
- Other:

Do you use any of the following terminology within your domain?

Select the most commonly used terms within your organisation or professional/academic community.

- Smart City
- Networked City
- Digital City
- Intelligent City
- Connected City
- Media Architecture
- Other:

Are you familiar with the field of Urban Interaction Design within your domain?

Select the most commonly used terms within your organisation or professional/academic community.

- Yes, I understand the meaning of this term
- I have heard of this term, but I am not sure of the meaning
- No, I have not heard the term before

Multiple-choice survey deployed in the 2nd phase (2/2)

Section B: Urban Interaction Design: Innovation, Industry and Research

In your opinion, which are the main three issues today for innovation in the Smart City?

- Informing, empowering and engaging citizens in the public decision-making
- Strategic vision of decision makers: political leadership within a city can limit or spur innovation
- Breaking the digital divide, improving accessibility and quality of connectivity
- Create environment for enabling social interactions in order to reinvent the living together
- Understanding and stimulating synergy between social sciences, people and technology
- Management and assurance of data quality
- User readiness: smart requires also a shift of thinking, not only technology
- Lack of dynamic urban spaces that can self-organize and serve multiple purposes
- Lack of urban spaces designed to improve the life quality of the citizens
- Energy consumption, ecological impact and environmental sustainability
- Urban transportation and mobility
- Funds to finance innovation
- Other:

Concerning innovation, which of the following sentences describe better why interaction design (IxD) is important or not to the development of urban products and services?

- IxD is crucial for "inclusive design"
- IxD improves usability and accessibility of the products and services
- IxD improves the final solution since it is based on a human-centered perspective
- IxD will facilitate innovation acceptance by the user
- Need for IxD is over-emphasized
- Other:

In your opinion, which three areas could benefit the most from the collaboration of Interaction Designers with Industry to innovate urban services?

- Mobility and transportation
- Smart governance: civic information and consultation
- Education, culture and art
- Energy
- Health and wellness
- Urban planning and intelligent buildings
- Environmental, land use, waste management
- Institutional services
- Entertainment and social interaction

- Production and retail
- Tourism
- Safety and security
- Altro:

Within industry, what are the financial implications for including Interaction Design within the development of products and services?

- A higher upfront investment, but potential cost-savings in the long run
- Restructuration of the design process and their associated cost
- User-centric design approaches may cost extra budget but extend the life of the products
- Low impact or none
- It lowers the risk of products and services failure
- No visibility on the return of investment
- If it is done right may increase the sales of the products
- Other:

Can you provide an example or "best case" of Interaction Design applied to a service/product related to a "smart city"?

This can be one that you were involved with or from an external source.

Is the product or service:

- One that I or the company that I work for developed.
- One that I know of that I was not involved with.

Can you describe how Interaction Design adds value to this service/product innovation?

Section C: any other comments

Do you have any further comments that you would like to make about the field of Urban Interaction Design as it relates to your field of interest?

Methodology to analyze the open-answers (survey 1st phase)

	Objective	Activity
Phase I Data collection and preparation	Collection and preparation of the open-question data for the statistical and quantitative analysis	<ul style="list-style-type: none"> ▶ Collecting the data in an excel file ▶ Creation of data clusters: qualitative comparison of the data and classification according with similarities between them ▶ Cataloging according to the macro categories related to the subject ▶ Synthesizing in one representative statement each data's cluster established on the previous phase ▶ Validating the data: identify missing, invalid or inconsistent entries
Phase II Data analysis	Statistical interpretation of the data and appropriate presentation of results	<ul style="list-style-type: none"> ▶ Computing frequency distribution and Pareto analysis of clusters ▶ Establishing most popular responds from each question ▶ Establishing relationships between the different clusters ▶ Representing clearly the results with the use of different types of graph like the nightingale rose, histogram, pie chart, bubble chart and treemap
Phase III Result interpretation	Conclusion and recommendations	<ul style="list-style-type: none"> ▶ Elaboration of the final conclusions and recommendations of the study

Methodology to identify the best cases of Urban IxD

	Objective	Activity
<p>Analysis of best cases</p>	<ol style="list-style-type: none"> I. Establish which best cases named by the respondents are relevant for the project II. Define which companies are involve in the development of the most relevant best cases III. Select at least one representative example of UrbanIxD by application area and company 	<p>In order to accomplish the 3 main objectives we create a database of best cases in an Excel file following the next steps:</p> <ul style="list-style-type: none"> ▶ Collecting and cataloging the examples given by the respondents according with the application area. We used the nine application areas set by Agenzie per l'Italia Digitale in the Programme for Digital Services: Energy, Environment, Intelligent Buildings, Mobility/Monitoring, Health & Wellness, Culture & Tourism, Training & Education and Government ▶ Identifying clearly each example with its name, functionality, brief description, comment made by the respondent, etc. ▶ Checking if each example involve any of the following aspect: technology and data, uses an user-center approach, be society oriented, involve design and arts. If the example put together the four elements we consider it as representative of the field Urban Interaction Design and relevant for our project. ▶ Searching the companies that develop the most relevant cases and mapping their main activities ▶ Selecting the most representative case by category and company

Methodology to identify the best cases of UrbanIxD

Extract of the database built in Excel

Affiliation	DATA/TECH	User-center	ART/DESIGN	URBAN Improve society	Relevant for the project	Status	Application area	Company	About the company	Name	Description	Web Link	Proposed by
a university or research institution	Y	Y	Y	Y	YES	Preparing commercialization	Intelligent Buildings	Future Cities Lab	Future Cities Lab is an experimental design studio, workshop and architectural think tank operating globally out of San Francisco, California. Since 2002, founding principals Jason Kelly Johnson and Nataly Gattegno have collaborated on a range of award-winning projects exploring the intersections of art and design with advanced fabrication technologies, robotics, responsive building systems and public space. Future Cities Lab is an interdisciplinary studio employing an adventurous team of interaction designers, architects, technologists, digital craftspeople, urban ecologists and more. http://www.future-cities-lab.net/about/	Light Lines	Light Lines is a modular illuminated furniture solution. Composed of standard and custom modules Light Lines can be configured for any site, creating an ambient and illuminated environment in residential, commercial and public settings. Engineered for the outdoors using state-of-the-art technology developed for extreme marine environments, Light Lines provides fully integrated and controllable LED illumination and integrated heating options. Designed and fabricated in California, Light Lines is made using sustainable bio-resin materials to create a complete UV and environmentally stable furniture system that stands up to the harshest outdoor environments. Many of us ream our plastic bottles and cans. Noticeably fewer recycle their glass. Maybe that's because we don't get any money in return, as we do for cans and plastic. Can we change this attitude by making recycling glass fun to do? So you are not just rewarded with a good conscience, you also get a smile. See the results here.	http://www.future-cities-lab.net/light-lines/	Karan Dudeja, University
a university or research institution	Y	Y	Y	Y	YES	Pilot	Environment	Thefuntheory.com by Volkswagen	This site is dedicated to the thought that something as simple as fun is the easiest way to change people's behaviour for the better. Be it for yourself, for the environment, or for something entirely different, the only thing that matters is that it's change for the better	Bottle Bank Arcade Machine		http://www.thefuntheory.com/bottle-bank-arcade-machines	Karan Dudeja, University
combination of industry & academia	Y	N	Y	Y	NO	Unidentified service	Culture & Tourism	BlueMind Software	Custom software development at BlueMind Software: desktop applications, web applications, website development, webdesign, internal SEO, logo design, ebook development and more. Located at Romania Also they are interested on being partners in research: organization has been validated under FPT programme as a SME, private body with the 985066235 PIC.	3D virtual reality – unidentified service	BlueMind-Software.ro is developing a realistic, connected and historically preserved virtual reality environment with immense application possibilities, including those for public services and urban planning	http://bluemind-software.ro/index.php	Bogdan Deaky, Industry + Academia
small/medium industry (company UNDER 250 employees)	Y	Y	N	Y	NO	Unidentified service	Mobility/ Transport	i3	i3 window was born as a result of the changing interface of the Digital sector. We are a European screen provider creating solutions such as virtual reception points, outdoor information kiosks and high street talking screens which generate sales even when your store is closed. Our objective is to develop intelligent, interactive, information through screen media communication http://i3window.com/abouti3.php	interactive screen that provide transportation info (ex: Innovative Display Solutions from i3)	A screen that exposes all passersby to all of what transportation is available near that screen and times and cost...not just buses and trains but also cars, taxis and rideshare, Uber, etc. (USA?)	http://i3window.com/ http://thisismn.com/press/miguide-shows-the-ways-to-manchester-interactive-screen-network-launches	void
independent/freelance	N	Y	Y	Y	NO	Active	Culture & Tourism	Temporiuso	temporiuso.org is an association that promotes the temporary reuse of many almost abandoned buildings in Milano temporiuso.net is an association to promote temporary reuse projects in abandoned spaces and also a network of local and international partnerships with associations, activists and researchers. In recent years we have started local workshops, international seminars, lectures, guided tours, events, public meetings, calls for applications with Universities, Art Academies, Research Institutes, Architecture offices, cultural associations, stylists, designers and artists http://www.temporiuso.org/?page_id=829	Temporiuso	temporiuso.org is an association that promotes the temporary reuse of many almost abandoned buildings in Milano temporiuso.net is an association to promote temporary reuse projects in abandoned spaces and also a network of local and international partnerships with associations, activists and researchers. In recent years we have started local workshops, international seminars, lectures, guided tours, events, public meetings, calls for applications with Universities, Art Academies, Research Institutes, Architecture offices, cultural associations, stylists, designers and artists	http://www.temporiuso.org/?page_id=26#sthash-2KFv4En.dpuf	Paolo Basso Ricci, Architect
small/medium industry (company UNDER 250 employees)	Y	Y	Y	Y	YES	On the market	Culture & Tourism	Breakfast	We simply think of ourselves as investors who take the amazingsness of what can be done online and bring it into never-been-done-before devices and real world experiences. Everyday objects can be smarter, an ad campaign can be a circuit board, and a public space can react when it knows who you are. ... It's time to make the real world as advanced as the virtual one that's changed our lives in a single decade. http://breakfastny.com/projects/	Pointssign	Pointz Smart Sign: the most advanced directional sign on earth. It knows what is happening up to the minute Pointz features a menu which updates as everything around it does. As more appropriate, popular, or timely events approach, the menu refreshes its options.	http://pointssign.com/	Anders Mellbratt, IoT Expert