

MIRRORING THE CITY

Toward Web Technologies to Support City Stakeholders in the Orchestration of Local Development Actions

ABSTRACT

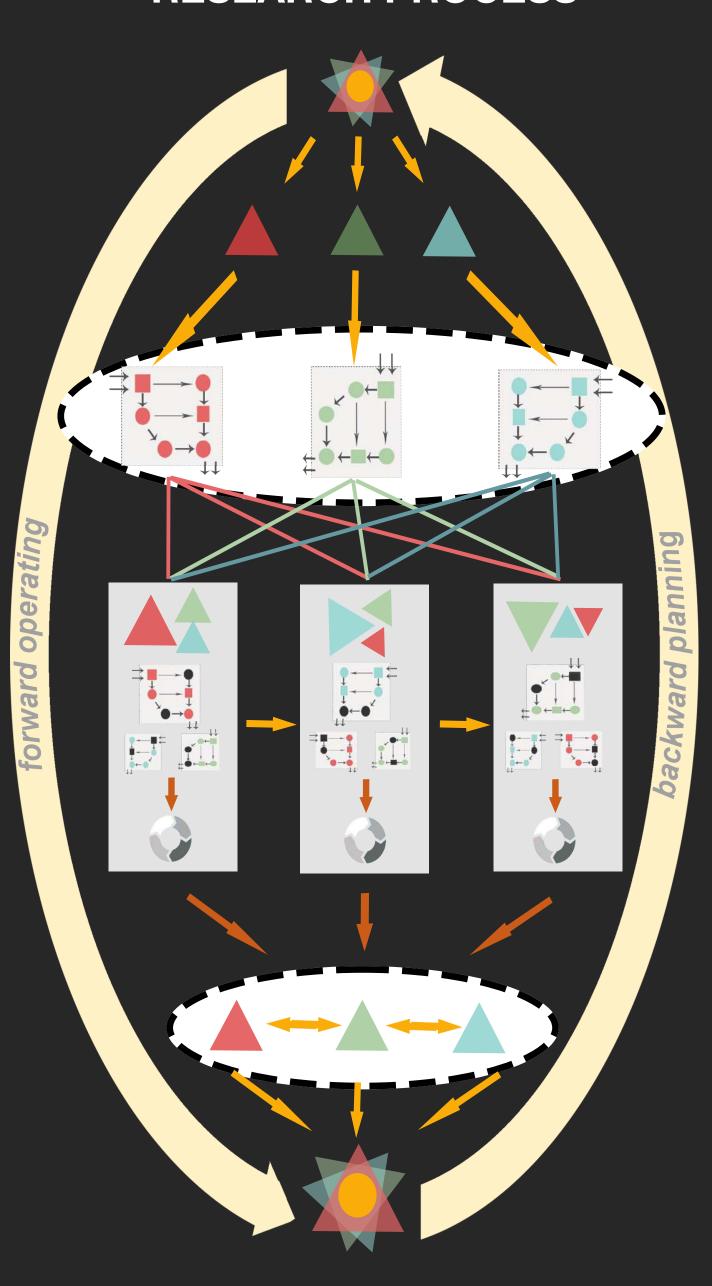
Despite massive investments and high expectations associated to the integration of smart city technologies into the city life, their support to everyday activities, initiatives, and projects of public institutions, companies, third sector organisations, and citizens groups is still marginal, and the promise of a technology-driven local development is far from being firmed up. Among them, city-oriented web technologies do not reflect urban dynamics because they are focused on individual users or on the dichotomy between local governments and customers/citizens/voters, hiding the plurality of social structures and relationships among city stakeholders. Moreover, the silos logic to deal with urban problems on existing digital platforms contrasts with the ecosystemic nature of the city characterised by a tight interdependence between built-unbuilt environment, local activities, social norms and practices.

By focusing on web technologies because of their accessibility, scalability, versatility, and low cost, this research is aimed to understand how to design future technologies enabling city stakeholders in understanding better the complex context of their actions, making better decisions on the use of local resources, and activating inter-sectoral synergies among urban initiatives. To address this challenge, the work explored the integration between approaches, methods and theories in urban planning, design, and development with informatics and system design disciplines, within a transdisciplinary research process adapting the TIPS framework to the specificity of a complex design problem.

The analysis and progressive conceptualisation of the link between design choices in web platform development and the implications for the technological support of local actions implemented by city stakeholders have been elaborated throughout three years of field activities. Three case studies centred on the development of web platforms (a civic social network, a collaborative urban governance platform, and a city data portal) provided the opportunity to explore limits and potential applications of a new class of digital tools imagined as multi-stakeholders, multi-purpose, and multi-scale for reflecting how cities work by providing a virtual environment coherent with the reality of the City. Action research methods combined with participatory design techniques have been applied during the development of the three prototypes to face the contextual constraints of real working environments in different domains of urban activities.

The lessons learned from these experiences provided a deep understanding about the system requirements defining a meaningful and acceptable representation of social structures and urban actions in a shared digital space oriented to mirror city dynamics, as well as insights on the contextual and technological factors to be considered under the perspective of the different types of stakeholders. At the end of the third case study, still on-going, the set of applicative scenarios synthesising the information gathered through the entire process will be analysed by using a grounded theory methodology. The goal is to systematise the findings across the three case studies in a theoretical framework of web technologies mirroring the city and operational guidelines for designers and decisions makers intended to build or adopt them in local initiatives.

RESEARCH PROCESS



TIPS framework (Transdisciplinary Integrated Planning and Synthesis framework) to the specificity of a design problem. The research process had been organised into the following steps.

The operational protocol followed in the research development is based on a readaptation of the

Step 1- problem definition and research questions

Step 2- problem faceting: users representations, city dynamics, technology roles

Step 3- definition of the research object as CITY MIRROR and user model, city model, tech model Step 4- construction of the research object variants in 3 case studies

Step 5- collection of applicative scenarios, system requirements, evaluation criteria Step 6- merging of the case studies results and facets integration

Step 7- operative guidelines and implications

REAL WORLD PROBLEM: THE DISCONNECTION PROBLEM

The problem driving the research is the marginal impact of current information technologies in improving synergies among the actions of the diverse stakeholders operating in the city. The analysis of the problem had been structured by applying a consolidated framework for exploring complex multi-dimensional problems such as the PESTLE framework (partially modified), and combined with an extended SWOT analysis referred to the aim of the research. The analysis of the problem had been performed by considering the perspectives of technology users and providers, as emerging by institutional and informal sources. The resulting key issues had been reformulated by using the analytic lens of "People", "City" and "Technology". This led to defining the problem of the marginal impact of information technologies on city activities as a problem rooted on the disconnection between social structures, urban activities, and local applications from their representation mediated by current platforms.

ROBLEM ANALYSIS ASPECTS: Economic TECHNOLOGY TECHNOLOGY Socio-cultural **PROVIDERS** USERS **Technological** of city-oriented in the city **Political** applications **Organisational** Legal/Regulatory **KEY ISSUES** Normative, organisational and procedural constraints of city activities Difficulty of overcoming silos-based logics in urban technologies Uncertain matching between roles of technology and tech-driven local development

DISCONNECTION PROBLEM Disconnection between representational logics in tech vs social structures

Disconnection between actions enabled by techs vs city operative frameworks

Disconenction between the scope of technology vs expectations

INTEGRATION THROUGH CONCEPTS

SOCIAL INFORMATICS

Technology as City Mirror

CITY SYSTEMS AND INTERMEDIATE SPACES

tech layer

TYPE OF PLATFORM:

SOCIAL NETWORKING

TRIAL SITES:

TURIN AND

PIEDMONT

REGION (IT)

FOCUS ON

FEATURES

INTERFACES

AND

LOCATION-BASED

INFORMATICS

COMMUNITY

INFORMATICS

ECHNOLOGY ROLES

socio-techical

for the

COMPUTER SUPPORTED COOPERATIVE WORK

inderstanding groups activities supported by ICT

The problem of designing a City Mirror is a "deep-design" problem that requires, first of all, a base theoretical model to inform the design choices. This model is the result of the

integration of concepts and frameworks coming from urban disciplines (urban planning,

design and development), from Informatics theories and approaches, and from the consolidated knowledge of system design disciplines dealing with complex socio-technical

problems (such as Information systems, Computer-Supported Cooperative Work,

CASE STUDY 1

CRAFTING A

CIVIC SOCIAL NETWORK

FirstLife is a map-based crowdsourcing platform developed at the Department of

Computer Science at the University of Turin (IT) by the "Social Computing" Research

Group. The research activities connected to this case study had been carried out from

March 2015 to January 2018, through the engagement of several civil society organiza-

tions, institutions and privates in defining functionalities and applications of a civic social

FirstLife

DESIGN GOAL: RETHINKING THE

INTERNAL EXPERT EVALUATION

OF THE PLATFORM REQUIREMENTS

BY THE DEVELOPMENT TEAM BASED

SCENARIOS BY CITY STAKEHODLERS

FOR CIVIC PURPOSES,

DESIGN OF A

FOR VIRTUAL

NOT-EXISTING

PRACTICES

NEW PLATFORM

BEYOND THE INDIVIDUAL

SCOPE OF SOCIAL NETWORKS SITES

PEOPLE-BASED

DESIGN PROCESS

LARGE-SCALE

PARTICIPATORY

DESIGN

ON AN EXTERNAL ASSESSEMENT IN REAL APPLICATIVE

network during the development process of the platform.

URBAN DESIGN

Human-Computer Interaction).

City as object

INTERMEDIATE SPACES

users layer

AND OPERATIVE GROUPS,

PERSONAL, TERRITORIAL.

FOCUS ON

FORMAL

system

scenarios

& tech

INDIVIDUALS

IN THEIR CONTEXT.

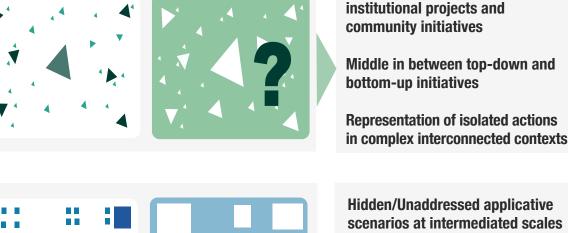
PROFESSIONAL

NETWORKS

of actions

KNOWLEDGE PROBLEM: THE RECOMPOSING PROBLEM





Middle between standardized and hyper-local solutions Static vertical problem-fixing

- The "Disconnection Problem" is transformed into a knowledge problem, the "Recomposing problem" by generalising the lens of People, City and Technology and identifying: - the Users as Subjects acting in the City through technology - the City in itself as Object and space of actions supported through technology - the Technology as a Means to act in the City and to interact with the city.
- The resulting research problem is aimed to understand how recomposing the disconnections highlighted before by studying what is in the intermediate spaces between - individuals and high-level organisations usually

The research adopted a multi-methods investigation approach, based on qualitative and

interpretative methods intertwined with design methods. The methods of Design Research

and Research through Design had been combined during the research relying on the fact

that there is a methodological convergence both in urban disciplines and informatics in considering the "design as a way of knowing". The Design Research, oriented to develop

specific solutions for the artefact to be produced, had been associated to Action Research

and participation techniques to involve city stakeholders in the elaboration of problems and

system requirements starting from their applicative scenarios and needs. The inputs

coming from this process had been conveyed into critical reflections on web technologies and city dynamics made visible by using the design object ad tool of enquiry, and then

progressively stratified, assessed, systematised and refined by using Grounded Theory

practical and social

constraints to consider

Problem

oriented

Process

oriented

concepts to be investigate

more in depth

 top-down institutional projects and bottom-up local initiatives - global and hyper-local technological solutions all overrepresented in current techs respect to ordinary city dynamics.

METHODOLOGY

PROBLEM FRAMING

DESIGN PROPOSAL

A web platform for:

Multiple stakeholders

Individuals framed in social

Competing values and goals

structures from groups to

in fluid hierarchies

A web platform for:

city activities

- Multi-purpose, covering

ordinary and extraordinary

- Supporting planning and

- Enabling a distributed

orchestration of actions

A web platform for:

in new scenarios

- Dynamic transversal

applications to support

processes and decisions

multi-purpose, and multi-scale.

management of local processes

- Opening up the role of techs

- Interscalar and transferable

organizations

DESIGN PROBLEM:

THE CITY MIRROR PROPOSAL

RQ1 USER REPRESENTATION

What users' characteristics

stakeholders a better

RQ2 CITY ACTIVITIES

considered for matching the

specificity of the city context

development actions with the

environment definedby a city

What type of processes and

actions could be effectively

supported by a web platform

A possible alternative development for information technologies aimed to improve their

integration in city life is associated to the needs of having new platforms representing the

complexity of the city social structures, urban activities and the different scales of actions

of the local development. On this basis, the Recomposing problem is reformulated as a

Design problem because of the lack of existing artifacts that are multi-stakeholder,

The City Mirror model is a design proposal aimed to explore alternatives to the current

technology for understanding to what extend local development actions could be better

orchestrated through the use of shared platforms among city stakeholders.

other existing tools?

naving the characteristics of a

decisions in local developmen

RO3 ROLE OF TECHNOLOGY

inspecificity of the online

and the patterns of local

should be represented on a city

mirror for providing to the local

nderstanding of the social

context in which they operate?

HOW TO DESIGN A CITY MIRROR?

RQ4_ PRE-DESIGN & CONTEXT ANALYSIS

ergration of a web platforn

What types of approaches could be

applied in the design process for

RQ5 SYSTEM DESIGN

palancing functional and

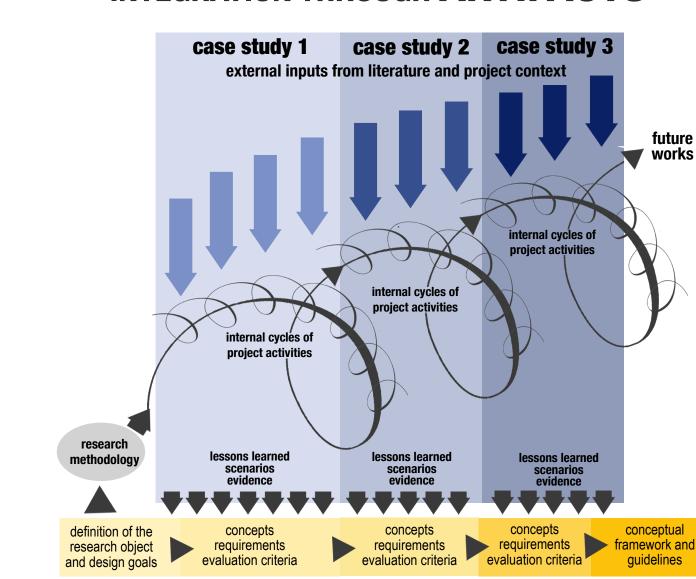
competing goals of local

RQ6 SOCIABILITY

expectations of the city

esigned as a city mirror in local

INTEGRATION THROUGH METHODS INTEGRATION THROUGH ARTIFACTS



problem elaboration of the progressive conceptualisation and information collection grounded theory

The research strategy had been structured on the implementation of three subsequent case studies consisting of the prototyping of web platforms that follow the City Mirror Model, and therefore intended to be Multi-stakeholder, Multi-purpose and Multi-scale. Every case study centred on the design of a specific instantiation of the model in a technological artifact internally advanced through local cycles combining action, analysis, design, and conceptualisation of contextualised findings (linked to the case study and the performed activities). The external inputs came from: - theories, analytic frameworks, and consolidated knowledge on one or more aspects

emerging from the design process - studies and applications related to the type of platform under design (e.g. social media tool, gov-platform, open data portal) - the collaboration with local stakeholders in their projects

- the topics explored through field activities (e.g. welfare services, urban regeneration, cultural initiatives).

CASE STUDY 3

BUILDING AN

OPEN CITY DATA PORTAL

MK:Insight 2:X is the redesign project of the Milton Keynes Open Data portal carried out by

the Smart Cities and Data Science research group at the Knowledge Media Institute, The

Open University (UK). The goal of the process is to design a city data portal opened to new

forms of production, use, and interaction with data aimed to transform publicly available

information into operational sources for the local actions of city stakeholders. The research

activities associated to this case study started in February 2018 and will end in July 2019.

MK:Insight 2.X

CASE STUDIES

CASE STUDY 2 ASSEMBLING AN URBAN GOVERNANCE PLATFORM

WeGovNow is a European H2020 project for developing a unified citizens engagement platform aimed to lead the transition from e-government to we-government models by integrating seven consolidated technologies for citizens reporting, digital participation, shared planning and co-production activities and open data analysis. The project started in February 2016 and will end in January 2019, and the research activities connected to this

WeGovNow

users layer

FOCUS ON

DESIGN-

CENTRED

METHODS

Design

Research

Research

through

Design

Complementary

perspectives

city layer

ORGANISATIONS AND INTER-ORGATIONAL RELATIONSHIPS, FORMAL

AND INFORMAL GROUPS,

TYPE OF PLATFORM: CITY DASHBOARD

DESIGN PROCESS

COMPETENCE/

MISSION

pre-design & context

SPATIALLY DEFINED

COMMUNITIES

scenarios

evaluation

constraints

& tech

DESIGN GOAL: RETHINKING E-GOV TOOLS AND PROCESSES TOWARD THE IMPLEMENTATION OF A COLLABORATIVE OPEN CITY GOVERNANCE

MIXING OF EXISTING IN A NEW PLATFORM

COMPONENTS

TRIAL SITES

FRAMEWORK NEGOTIATION BETWEEN INTERNAL EXPERT EVALUATION AND THE EXTERNAL NOT EXPERT EVALUATION OF THE PLATFORM REQUIREMENTS CARRIED OUT BY MULTIPLE DEVELOPMENT TEAMS AND LEADING STAKEHODLERS IN THE

tech layer

TRIAL SITES:

DI PIAVE (IT),

SOUTHWARK

FOCUS ON

SERVICES

COMPLIANCE

WORKFLOW AND

-LONDON (UK)

TURIN, SAN DONA'

QUALITATIVE &

METHODS

INTERPRETATIVE

From rich data

to interpretation

Action

Research

Grounded

Theory

case study had been implemented from October 2016 to September 2017.

users layer

ORGANISATION AND

INTER-ORGATIONAL

SPATIALLY DEFINED

RELATIONSHIPS,

COMMUNITIES,

TERRITORIAL AND

FOCUS ON

TYPE OF PLATFORM: **OPEN DATA PORTAL**

tech layer

PROFESSIONAL NETWORKS TRIAL SITE: DESIGN GOAL: **RETHINKING ROLES** MILTON KEYNES AND **GOALS OF DATA PRODUCERS** AND DATA USERS IN DATA-ENABLED JRBAN ACTIONS

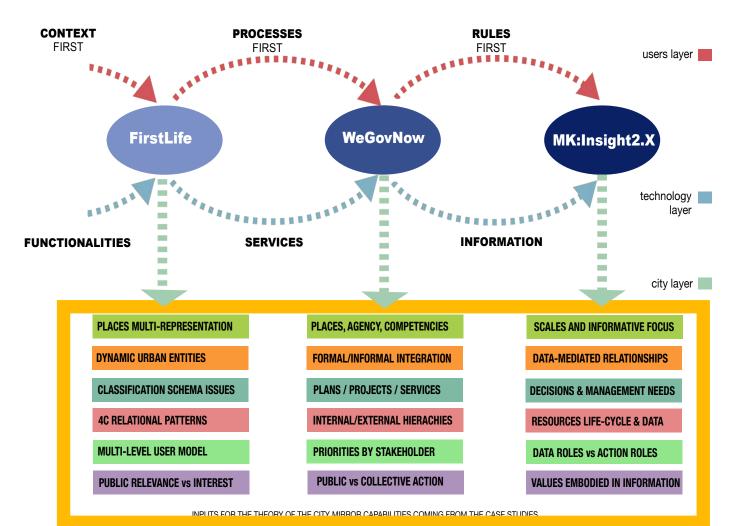
DESIGN PROCESS: A PREVIOUS DATA NEEDS. DATA-DRIVEN PLATFORM WITH DATA PRODUCTION, **DECISIONS AND** ITS SOCIO-TECHNI-DATA USE CAL SYSTEMS

& tech

EXTERNAL NOT EXPERT EVALUATION OF THE PLATFORM SCOPE AND REQUIREMENTS BASED ON THE INFORMATION NEEDS ASSOCIATED TO REAL APPLICATIVE SCENARIOS IN DIFFERENT DOMAINS OF ACTIVITIES

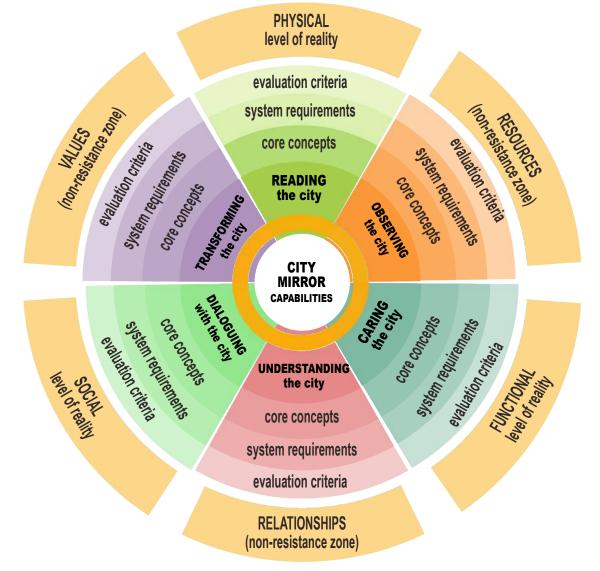
RESEARCH CONTRIBUTION

CONSTRUCTING A GROUNDED THEORY THROUGH A CROSS-ANALYSIS OF THE CASE STUDIES



The sequence of the three case studies allowed to progressively move the focus of the research from the analysis of the contextual factors impacting on the relationship between web technologies sand city dynamics, to the analysis of the processes to be supported, and then to the rules to put in place to make the system work into a complex social environment. Similarly, the object of design expanded from the platform functionalities, to the services and then to the structure of the information ecosystem. The results led to extract relevant elements concerning the modelling of the city systems on a platform informed by the model of the City Mirror.

THEORY OF THE CITY MIRROR CAPABILITIES **CONCEPTS - REQUIREMENTS - EVALUATION CRITERIA**



As last step, the elements collected through the empirical investigation across the three case studies is systematised and make functional to the integration of the city model, user model and technology model organised through a set of key concepts connecting these dimensions in a theoretical design framework, and in more concrete operational guidelines and evaluation criteria for practitioners and decision-makers that will have the responsibility to design and chooce the appropriate web technologies to foster synergic development processes.

ANSWERING TO THE OVERALL RESEARCH QUESTION

How to design a web platform to support the orchestration of local development actions implemented by different stakeholders?

Designing a platform able to support city stakeholders in: • LIGHTING ON the richness of places where they live by READING THE CITY MONITORING shared material and immaterial resources by OBSERVING THE CITY CHANGE KNOWING what is on-going by DIALOGUING WITH OTHER CITY STAKEHOLDERS NAVIGATING across practices, services, and connections to UNDERSTAND THE CITY FUNCTIONING BEING AWARE of evolving local needs to TAKE CARE OF THE CITY CREATING a dialogue space for competing values to TRANSFORM THE CITY. Designing a platform in which city stakeholders can find a real support for their decisions and actions

through information and relationships contextualized in city dynamics. The ORCHESTRATION OF LOCAL DEVELOPMENT ACTIONS is the potential outcome of: • Mediating the meanings, the projections and the priorities of city transformations for its inhabitants Enhancing the social capital in the city to better exploit local resources and opportunities

 Supporting coordination, cooperation and collaboration mechanisms across different social structures • Enabling new practices, services, social norms reactive to local changes Opening up new governance models to address local needs • in a shared virtual space where each stakeholder can make evident its contribution to the city development.

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