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UNIVERSITÀ
DEGLI STUDI
DI TORINO

Doctoral Thesis

Doctoral Programme in Urban and Regional Development (XXXII Cycle)

Mirroring the City

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

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ABSTRACT

Despite massive investments and high expectations, information technologies are not yet driving radical changes in the way city activities are planned, managed and governed, and even less in the way people interact in cities to address shared challenges collectively. In this landscape, smart city technologies limit their scope to monitoring physical phenomena in urban environments without directly supporting the social dynamics of local development processes. Differently, web-based technologies have profoundly revolutionised our experience of the city at an individual level, but they still struggle in infrastructuring the support to local actions that require continuous negotiation and mutual arrangements among public, private and third sector organisations in everyday activities, initiatives, services and projects in cities. The **limited impact of smart city technologies and the under-exploitation of the potentialities of web-based technologies in local development actions** are rooted in a disconnection between these technologies and the nature and quality of city dynamics, strongly tied to fluid relationships among different stakeholders affecting the definition of the priorities, constraints and applications of information technologies in urban settings.

This disconnection concerns:

- a) the **model of the user** of such technologies, still focused on a customer-centred framing, ignoring the multiplicity of social structures, norms, relationships regulating city life
- b) the **model of the city** as a physical background or a mosaic of activities instead than a system of systems working ecologically
- c) the **roles and forms of support provided by technology** as an instrument, intermediary, or enabler of local actions, beyond its use as a communication amplifier.

This work addresses the problem of realigning the models of users, city and technology to city dynamics for exploring **how to design web-based technologies that could support city stakeholders in the orchestration of local development actions**. I focused on web-based technologies because of their potential to instantiate post-smartness city visions and the gulf between their technological readiness and socio-political readiness. I considered as city stakeholders: local governments, public agencies, business sector, non-profit organisations, knowledge cluster, and capital holders. I used the concept of orchestration to unite the forms of technological support to coordinative, cooperative or collaborative practices at intra and inter-level among different stakeholders into the city context.

Specifically, this work investigates the aspects to be considered for pursuing the **“political soundness”** of technology, intended as the technology capability of defining a pluralistic and fluid virtual space for different stakeholders. For this reason, the work focuses on the **collective experience** of cities and technology in local development actions. The research had been oriented by the design proposal of the **“City Mirror”**, as a meta-model for city-oriented web-based technologies recomposing the three disconnection issues mentioned above. This work analyses and discusses:

- the **factors to be considered in the design of city technologies that could facilitate the coexistence of different local stakeholders** with divergent or conflicting goals, and different practices, constraints, discourses in a shared virtual environment, as they actually do in urban environments and in local development processes
- how **city stakeholders could interact with/in/through this digital shared environment**, overcoming part of the limitations of current web-based technologies applied in urban activities
- the **implications of design choices and solutions for web-based technologies intended to support local development processes in a multi-purpose, multi-stakeholder, and multi-scalar environment** mirroring the interdependence among city systems, social structures and local actions.

The research had been developed within a **transdisciplinary research framework** in which design-driven explorations and analytic activities are intertwined to construct a better understanding of city dynamics by intervening in the context through prototypes and concepts instantiating alternative models of users' representations and relationships, connections among city activities, applications and purposes of web platforms. Within this research framework, a subset of urban and informatics disciplines had been used as disciplinary roots for the study by leveraging on their complementarity. They include **Urban Planning, Urban Design, and Urban Studies** on the one hand, **Computer-Supported Cooperative Work, Human-Computer Interaction Design, and Information Systems** on the other hand. The bridge among these disciplines had been built through the:

1. **hybridisation of concepts and theories**, used for developing the core models of the user, city systems, and forms of technology support to local actions, holistically reflecting the dynamics of urban environments
2. **hybridisation of methods and techniques**, implemented by considering and readapting approaches and tools to design and research activities recurring in both sets of disciplines
3. **production of technological artefacts** designed as negotiated digital urban infrastructures and used as boundary objects in research explorations.

The analysis and progressive conceptualisation of the pre-conditions for having a platform shared among multiple stakeholders, the technical characteristics to support local development actions and the implications of design choices intended to pursue this aim had been elaborated throughout three years of field activities. **Three case studies** covered the design process of three examples of web platforms intended to be multi-stakeholder, multi-purpose, and multi-scale, according to the design proposal of the City Mirror. The three case studies present, analyse and critically reflect on the potentialities, applications, and constraints of a **civic social network, a cooperative urban governance platform, and a city data open portal** as instantiations of the City Mirror proposal. Within this operational framework, Action Research methods combined with Participatory Design or Co-Design techniques have been applied in each case study to highlight the contextual and social constraints of real working environments in different domains of urban activities, as well as for elaborating a rich set of **applicative scenarios** for city technologies covering various types of local development processes. These experiences guided and informed the preliminary definition of a set of functional and non-functional **requirements** for implementing a meaningful, acceptable, and useful shared digital space under the perspective of the different classes of stakeholders involved into the design process of the three prototypes. In parallel, intervening in several different urban settings and local activities with prototypes of technologies built on logics contrasting the ones of the existing tools provided the opportunity to **reflect on the effects and implications of specific design choices** to enable city stakeholders in understanding better the complex context of their actions, making better decisions on the use of local resources, and activating synergies among urban initiatives. The insights and lessons learned across the three case studies had been progressively systematised, stratified, and consolidated by using procedures informed by Grounded Theory Methods and expressed in the form of a set of testable propositions.

The **output of the research process is a design theory of the capabilities of web-based technologies mirroring the city**, built by reintegrating and connecting the three core models of users, city, and role of technology under the light of the findings emerged from the empirical and applied research activities. The design theory presented along the entire thesis includes: the definition of the purpose and scope of city mirror technologies as design and research objects (Chapters 1 to 4); the conceptual constructs organising the underlying knowledge for their development (Chapter 5); the implementation principles and examples of instantiation of the theory corresponding to the three case studies (Chapters 6 to 9); and a set of testable propositions transferable to other settings through new technological artefacts informed by the models associated with the City Mirror proposal (Chapter 10).