CITY KNOWLEDGE:

An Emergent Information Infrastructure for Sustainable Urban Maintenance, Management and Planning

by

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I will put more time into thoughtful acknowledgements for each of the personalized copies of this tome that I will donate to unsuspecting friends and colleagues.

I hope everyone will enjoy the reading.

Meanwhile, thank you all indiscriminately. You included. Really.

Thanks.

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Abstract

Recent advances in geo-spatial technologies, together with a steady decline in their cost, have inspired many spontaneous bottom-up municipal GIS initiatives aimed at improving many aspects of urban maintenance, management or planning. Some communities have institutionalized top-down citywide urban information systems with limited results, due to many organizational and institutional factors. Despite some encouraging progress, comprehensive urban information systems are still not commonplace and planners and decision makers still struggle to acquire the rich information that they need to conduct in-depth analyses and to make important decisions.

This dissertation suggests a plausible strategy and several practical, tactical solutions to set municipalities on a trajectory leading to City Knowledge. The concept of City Knowledge is introduced by first presenting numerous case studies ranging from the maintenance of the canals in Venice, Italy, to tree management in Cambridge to planning for Worcester, Massachusetts.

Each of the cases reveals some lessons about City Knowledge, contributing to the identification of fourteen desirable qualities and consequently to the distillation of the six foundations of City Knowledge: (1) the "middle-out" approach; (2) informational jurisdictions; (3) fine-grained, distributed data management; (4) sustainable updates; (5) information sharing and (6) interagency coordination.

The middle-out approach combines the virtues of top-down rigor and reliability with the bottom-up qualities of energy and creativity. Being an emergent system, City Knowledge leverages the dominant plan-demanded mode of data acquisition to gradually and inexpensively accumulate high-return data and to ensure sustainable, low-cost updates. It produces plan-ready information, by exploiting the self-serving and opportunistic pursuit of instant return-on-investment by frontline offices. Thanks to its emergent qualities, City Knowledge engenders unexpected plan-demanding situations, where the ability to conduct second-order analyses leads to deeper knowledge of our cities.

In the end, this dissertation proposes a paradigmatic shift by recommending that information be considered as a *bona fide* infrastructure and be consequently treated with the same attention that cities reserve to other infrastructures such as utilities and roads. It proposes that communicative planners become catalysts of this transformation away from the "hunting-and-gathering" of urban data and toward the "farming" of municipal information.

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Foreword

This document represents the synthesis of over fifteen years of work for the transformation of communities on both sides of the Atlantic. In writing this treatise, I have finally had a chance to be a "reflective practitioner" and look back at the lessons I learnt while trying to save my hometown of Venice, one project at a time.

This thesis proposes a middle-out approach to the accumulation and sustainable upkeep of city knowledge, through a spatially-based, self-organizing framework produced semi-independently by individual municipal departments. This emergent knowledge infrastructure will permit an efficient collection, organization, integration, distribution, use and re-use of urban facts by government agencies and will thus guarantee the constant availability of information for municipal decision-makers.

After identifying what elements of the urban realm are typically the target of knowledge-based interventions by city agencies, this research explores the feasibility and desirability of the creation of a reliable, permanent, updatable, maintainable, reusable and sharable knowledge infrastructure to support municipal operations at all levels, from the ordinary upkeep of basic city properties, to the complex envisioning of alternative futures through sustainable collaborative planning paradigms.

As part of this study, I analyze the technical, institutional and logistical obstacles that complicate the development of such an infrastructure, and I demonstrate a possible path for the gradual accrual of city knowledge. As an alternative to the prevailing top-down and bottom-up approaches to the organization of municipal information, this dissertation explores a "middle-out", parallel, distributed, emergent and self-organizing approach that promises to gradually produce a flexible, multi-purpose knowledge infrastructure on which day-to-day operations as well as long-range planning decisions can be based.

John Quincy Adams once said that he was a soldier so that his son could be a farmer, so that his grandson could be a poet[1]. As soon as civic authorities begin to treat city knowledge as they treat any other infrastructure element of the urban realm, we should witness a shift from the current "plan-demanded" mode of data collection – where we have to "fight" for each piece of data – to a more "plan-ready" approach to information management whereby we slowly grow our place-knowledge. The constant availability of information may then lead to "plan-demanding" situations in which the mere existence of well-organized urban knowledge inspires plans that may have never been envisioned otherwise.

The paradigm shift I am proposing will emancipate city officials – municipal authorities, political decision makers, urban researchers and citizens – from "hunter-gatherers" of urban data to "farmers" of urban information and ultimately to "poets" of city knowledge[2], inventing alternative futures for the transformation of communities.

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1 *" I must study politics and war, that our sons may have liberty to study mathematics and philosophy. Our sons ought to study mathematics and philosophy, geography, natural history and naval architecture, navigation, commerce and agriculture in order to give their children a right to study painting, poetry, music, architecture, statuary, tapestry and porcelain."*. John Quincy Adams, 1780. I am indebted to Prof. Mark Schuster of MIT for this quote.

2 I refer here to the "strong poet" envisioned by Harold Bloom (*The Anxiety of Influence*) as discussed by Richard Rorty in *Contingency, Irony and Solidarity*, p. 24 ff..