

**Collaborative Urban Information Systems:  
A Web Services approach**

*by*

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**Submitted to the Department of Urban Studies and Planning  
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## Abstract

This thesis examines systemic problems with the way information is managed and processed in planning support systems. We find evidence of these problems when we attempt to: develop an analysis without spending most of the time gathering and organizing data sets; or build an analysis that can be re-run at low cost; or implement systems that interact collaboratively with those of other experts. This research starts with the hypothesis that these problems are related and systemic, and that a new paradigm of information management is needed if we can hope to address them effectively.

The research is divided into two main sections. First, we develop a theory about how information flows within and across planning organizations, and use the MassGIS buildout analysis to understand how physical planning is done in a cross-jurisdictional, real-world setting. We find that modern organizations do are good at creating and disseminating information, but find it difficult to keep users' copies of published information up-to-date. Furthermore, the technology for building interactive front-ends to analytic models is poorly matched to user needs, and the technology for enabling cross-organization collaborative analysis is non-existent.

In the second part of the thesis, we re-architect the information framework, guided by our new theoretical foundation and findings from practice. This new framework is based on Web services, an emerging technology for connecting information systems across organizations. It is called the Planning Analysis and Modeling Markup Language framework, or PAMML, consisting of an information processing vocabulary expressed in XML Schema, Web services based on the schema, and guidance on how to best use the framework to encourage the interconnection of planning and mainstream information technology.

We find that the PAMML framework can lower costs by leveraging mainstream technology, simplify the most basic data sharing activities, yet still allow organizations with different levels of technical sophistication to collaborate. PAMML captures the semantics of spatial planning problems, allowing them to be decomposed into fundamental information processing operations. Regarding user interfaces, we show that PAMML's structure allows multiple end user applications aimed towards different audiences to be easily built from the same core PAMML document.

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## Table of contents

Chapter 1. Introduction .....	7
Motivation and Background.....	9
Leveraging important technology trends.....	10
Reflecting on the science of GIS.....	13
An Organizational Theory of Planning Support Systems.....	14
Dominant information management paradigms .....	14
Geographic information sharing research.....	16
Positioning PSS in the Theory of the Firm.....	17
Framing the Issues from a Firm's Perspective.....	26
Research Question & Methods.....	30
Thesis Organization.....	31
Chapter 2: Technology Frameworks for Information Sharing .....	35
An introduction to distributed computing.....	37
Web Services.....	40
XML and XML Schema defined.....	41
Web services defined.....	43
Some alternative frameworks.....	45
UML.....	46
Web Ontology Language .....	47
Chapter 3: A Study of Regional Growth Planning: the MassGIS CPI buildout analysis .....	49
Policy Background.....	50
Process.....	52
The maximum buildout envelope—Zoning (step 1).....	53
Current buildout—Land use and Subdivisions (step 2) .....	54
Absolute constraints to development (step 3) .....	55
Partial constraints to development (step 4).....	56
Buildout computation (step 5) .....	57
The results.....	58
Key Concepts & Systemic Problems .....	63
Simple math .....	64
Extensive data requirements, from multiple agencies .....	65
Zombie data.....	66
Stakeholder participation .....	67
Interactive end-product.....	68
Next steps .....	70
Chapter 4. Sharing Data through Web Services.....	73
WSDL.....	74
Basic Data Sharing: one Shapefile .....	75
Professional Data Sharing.....	78
Metadata .....	79
Object inheritance, and sharing multiple files through a single service.....	81
Sharing data in multiple formats.....	87
Some practical considerations.....	88

Spatial data typing issues .....	89
Performance issues .....	93
<b>Chapter 5. Web Services for Collaborative Modeling and Decision Making .....</b>	<b>97</b>
Computing design patterns for distributed Web services.....	97
Supporting legacy, or “black box” systems.....	104
Collaborative planning: linking models with decision makers .....	105
<b>Chapter 6. Prototyping the Buildout Analysis .....</b>	<b>109</b>
Zombie data.....	109
Stakeholder participation.....	116
Collaborative Planning.....	118
Machine-to-machine interaction.....	126
Interactive End Products.....	128
Visual modeling.....	130
Non-technical user interfaces.....	134
<b>Chapter 7. Reflections, Critiques, and Future Directions .....</b>	<b>141</b>
Critiquing the PAMML vocabulary.....	143
Exploring the nature of Web services as contracts.....	147
Further implications for the planning profession .....	149
Democratizing urban design.....	149
Enabling community statistical systems.....	151
<b>Appendix A. Planning Analysis and Modeling Markup Language XML Schema .....</b>	<b>155</b>
<b>Appendix B. Glossary.....</b>	<b>178</b>
<b>Appendix C. Bibliography.....</b>	<b>181</b>

