# Chapter XVII
# Collaborative Geographic Information Systems:
## Origins, Boundaries, and Structures

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*It is the theory that decides what can be observed.*

*Albert Einstein (1879-1955)*

*The scientists of today think deeply instead of clearly.*

*Nikola Tesla (1857-1943)*

## ABSTRACT

*This chapter describes the origins, boundaries, and structures of collaborative geographic information systems (CGIS). A working definition is proposed, together with a discussion about the subtle collaborative vs. cooperative distinction, and culminating in a philosophical description of the research area. The literatures on planning and policy analysis, decision support systems, and geographic information systems (GIS) and science (GIScience) are used to construct a historical footprint. The conceptual linkages between GIScience, public participation GIS (PPGIS), participatory GIS (PGIS), and CGIS are also outlined. The conclusion is that collaborative GIS is centrally positioned on a participation spectrum that ranges from the individual to the general public, and that an important goal is to use argumentation, deliberation, and maps to clearly structure and reconcile differences between representative interest groups. Hence, collaborative GIS must give consideration to integrating experts with the general public in synchronous and asynchronous space-time interactions. Collaborative GIS provides*

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*a theoretical and application foundation to conceptualize a* distributive turn *to planning, problem solving, and decision making.*

## INTRODUCTION

Definitions within a community of practice have multiple benefits. Definitions reduce differences in semantics, and focus a community of practice towards goals that reinforce individual and collective efforts, make knowledge accessible to those at the edges of the community, and expand a study area by integrating related external concepts (Sager, 2000). Moreover, clearly defined concepts in a knowledge domain can better facilitate theory building. There are five types of definitions, and we have chosen to specify a *theoretical definition* for collaborative GIS since this type of definition aims to capture a commonality in the research area, and to relate that commonality to a broader intellectual framework (Sager, 2000). This chapter is organized as follows: firstly, a theoretical definition of collaborative GIS is presented; secondly, a historical footprint is established to reinforce the theoretical definition; and thirdly, the linkages between collaborative GIS and its broader conceptual framework are outlined.

### What is Collaborative GIS?

There is a mutual influence between geographic information science and collaborative geographic information systems. GIScience is the rationale or science (axioms, theories, methods) that justifies the design and application of geographic information systems (Goodchild, 1992). Geographic information systems on the other hand are the physical designs and processes that integrate people and computer technology to manage, transform, and analyze spatially referenced data to solve ill-defined problems (Wright, Goodchild, & Proctor, 1997). Collaborative GIS are influenced by both GIS and GIScience. Hence, the name collaborative GIS will be used as systems, science, or both, depending on the context.

Collaborative GIS can be defined as *an eclectic integration of theories, tools, and technologies focusing on, but not limited to structuring human participation in group spatial decision processes*. In particular, the aim is to probe at the participant-technology-data nexus, and to describe, model, and simulate effects on the consensual process outcomes. The participants are typically a mixture of technical experts and the public, the technological tools being computers that are networked or distributed, and the data being spatially referenced maps and attributes. The outcomes do not result from implementing a task-oriented approach, but rather they emerge from a joint and structured exploration of ill-defined problems to benefit planning, problem solving, and decision making. In planning, the intention is to develop steps to achieve a desired outcome, while problem solving deals with the formulation of plans in new contexts. Decision making is the process of choosing among a set of alternatives.

Structuring is defined in the Webster Online Dictionary (http://www.m-w.com) as "the act of building, arrangement of parts, or relationship between parts of a construction." In this regard, structuring in collaborative GIS deals with the creation of process designs, how those designs enable the participant-technology-data interactions, and the relationships between the component parts of the designs. Hence, collaborative GIS is situated within the enhanced adaptive structuration theory 2 (EAST2) framework (Jankowski & Nyerges, 2001a). The framework outlines a detailed set of concepts and relationships linking the content, process, and outcome of collaborative spatial decision making. The content constructs

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