Who Contrives the "Real" in GIS?
Geographic Information, Planning and Critical Theory

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ABSTRACT: We are troubled by the way that GIS researchers currently define and constitute their work within the planning process. Definitions which place people solely within the confines of a GIS and establish planning as a form of rational strategic production miss the important social, cultural, and political contexts of technology and management. If we begin, however, with the alternative premise that GIS and planning are social constructions then we are better placed to understand their role in societal processes. Clearly, certain communicative and authoritative conventions underwrite the roles of GIS practitioners as each player assumes the position of "expert" in relation to the people whom they intend to serve. Yet it is not clear how the communication and power structures that develop between the academic, the practitioner, and the clients served affect those whose everyday lives are impacted by GIS research and implementation. This paper suggests ways in which all actors involved in the production and consumption of GIS could have some ownership in the creation of knowledge. As such, it encompasses a post-positivist ethic which merges the academic and professional world with the world of everyday experience.

KEYWORDS: GIS, planning, communicative action, cognitive mapping, post-positivism

Introduction

Many have argued that geographic information system (GIS) technology has become a powerful force in planning practice, and some suggest that it may become an important determinant of planning theory. We find much of the discussion around these issues unsettling because of the way in which GIS is currently defined and constituted within the planning process. This paper reflects our position with regard to the conjoining of GIS research, planning theory and practice, and the everyday lives of those who are affected by the communicative and power structures which result.

We believe that all actors involved in the production and consumption of GIS should have some *ownership* in the creation of GIS knowledge. The distinction between "ownership of a process" and "participation in a process" is important. *Participation* ensures a certain level of involvement for those affected by GIS-informed decisions and, as such, it may allay concerns over concepts such as "implementation" or "application" which imply that someone, presumably a planner or GIS prac-

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titioner, is in control of the process. Yet, participation in the creation of GIS knowledge does not necessarily give any power to those involved in, and affected by, the decision-making. This is particularly true for those citizens who may become overwhelmed or intimidated by complex technical processes and rhetoric.

We pose that moving beyond participation to ownership encompasses a post-positivist ethic for a "strong democracy" or advocacy form of planning which both reduces the salience of the technocratization of public policy and political decision-making in planning (Lake 1994, 425) and merges the academic and professional world with the world of everyday experience (Aitken and Rushton 1993).

We begin by asserting that geographic information systems should be viewed as social constructions. Like all technologies, they encompass ideologies which reify certain ways of thinking and doing over others. From our reading of contemporary discussions of how GIS practitioners see their work as being situated within planning, we suggest why GIS produces an illusion of autonomy which transcends social contexts. Much of this discussion relates to the power of GIS to bolster a rational-instrumental discourse in planning. We then elaborate on Habermas' theory of communicative action and the critique of an instrumental rationality in planning by critical theorists such as John Forester, Patsy Healey and Fredric

Jameson. Within this context, we discuss the ways in which GIS may disenfranchise certain groups or discipline voices of other groups, and we explore the possibilities and pitfalls of proposing GIS as a hypermedia panacea for the ills of planning.[1]

The Social Construction of GIS

In one of the leading GIS texts, David Maguire (1991, 16) notes that "...GIS comprise four basic elements which operate in an institutional context: computer hardware, computer software, data and liveware. " Liveware is defined as "...the people responsible for designing, implementing and using GIS..." and is lauded as the most significant part of a GIS. Other writers on this point emphasize "orgware" (the institutional framework within which GIS is situated) as being more important than the other "wares" with regard to how GIS will influence the planning process (Archer and Croswell 1989; Batty 1993; Bromley and Selman 1993). Weller (1993), for example, endorses a "synergistic" alliance between geographic information systems and public administration systems whereby the categorization of orgware, liveware, software and hardware perpetuates a systems approach to planning with its component parts "... proceeding in common cause" (Weller 1993, 201).

From another perspective, that of social theory, the implications of these kinds of definitions are quite staggering because they imply an artificial separation of people, society and technology. By placing people solely within the confines of GIS production, Maguire and others miss the important social, cultural, economic, and political contexts that influence the technology and the people who develop and use this technology. If we begin with the alternative premise that geographic information systems are social constructions, we are better placed to understand their role in society.

In short, a GIS cannot be divorced from the social context of its creation. Political, economic and social motivations transform all levels of GIS production, from data creation and analysis to the construction of a graphic interface to visualize "the finished product."

We would like to suggest that certain communicative and authoritative conventions underwrite the roles of persons who fall under the rubric "liveware," because each player assumes the position of "expert" in relation to the people whom they intend to serve. What is not clear is how the communicative and power structures which develop between the GIS creator and user affect the people whose everyday lives become metrics and data within the system, and whether indeed these people's voices are heard at all.

We find it disturbing that geographic information systems are perceived as knowledge-based systems which may accurately reflect reality, let alone approximate and predict human behavior. These premises can serve to reinforce the authority of the producer of knowledge over those who consume knowledge. Certain GIS practitioners/researchers would dismiss our concerns because contemporary geographic information systems are purportedly "applied" (Openshaw 1993, 451) systems which help us to understand "real" world, practical problems. But the perspective of these practitioners reflects the presumption that knowledge is generated in one sphere (academia or a planning office), to be used subsequently in the "real" world by potential consumers of research results. Clearly, geographic information systems are more than a collection of coverages that analyze, display and thus communicate spatial "realities" as an aid to understanding the world. In a socially structured context, geographic information systems are part of a communicative discourse that politically shapes policies related to such issues as geodemographics, real estate, utilities, and land use. In essence, they contribute to the social construction of place.

How GIS Researchers View Planning

Within recent geographic literature, researchers portray GIS as an integral part of planning discourse. According to Nijkamp and Scholten (1993, 85), "[i]nformation systems and planning have in the past decade become twins." Although geographic information systems may ultimately be integrated fairly fully within the urban and regional planning process, our concern lies in how GIS specialists construe the planning process or, to be more specific, how GIS specialists emphasize one particular style of planning.

Our literature review of GIS and planning, for the most part, reveals that GIS researchers favor

[1] Of late, the term discourse has been used in a variety of ways. Many consider it in terms of oral and written communications, referring to "...all ways in which we communicate with one another, to that vast network of signs, symbols, and practices through which we make our world(s) meaningful to ourselves and others" (Gregory 1994, 11). We prefer a broader definition which includes as a discourse the sets of rules which permit certain communications and "...allow the construction of a map, model or classificatory system..." which leads to "...a system of possibility for knowledge." (Philip 1985, 69).

the rational instrumentalist perspective. This perspective is based on a modernist discourse which adheres to the premise that through the application of rational-scientific methods and technology it is possible to build better communities (Friedmann 1987; Cosgrove 1990; Lake 1992). The rational instrumental perspective assumes that human spatial patterns and behavior can be modeled and predicted within the confines of mathematics and computer-based logic. Further, the perspective is allied to rational choice theory which portrays society as a set of goal-oriented individuals who seek to maximize wealth or efficiency through rational choices from alternative courses of actions (Friedmann 1987; Barnes and Sheppard 1992; Michel 1994). We suggest that GIS researchers have placed too much emphasis on this kind of rationality, with scant attention paid to alternative planning strategies such as the recent "communicative and contextual turn" in planning (Forester 1989; Healey 1992; Lake 1994).

Communicative rationality differs from instrumental rationality because it recognizes the importance of dialogue and the day-to-day processes through which understandings are reached and collective identities constructed (Miller 1992, 24). Instrumental rationality, on the other hand, privileges the application of scientific knowledge and reason as the most appropriate basis for human progress.

Friedmann (1987) and Batty (1993) note that a model-building rational instrumentalist perspective on planning originated in the 1960s and evolved during the 1970s. This perspective was pioneered by theorists such as Chadwick (1971) and Faludi (1973a, 1973b) and was consolidated into standard texts such as those edited by Krueckeberg and Silvers (1974) and Oppenheim (1980).

Model-building promised a level of certainty, which in turn meant predictable, rational solutions to often uncertain planning scenarios. Under the auspices of instrumental rationality, planning presented itself as a progressive force which could model both economic and social processes in order to understand, control and plan for appropriate spatial outcomes (Friedmann 1987).

Models derived from the Chicago school of urban ecology, for example, contributed to the development of regular "laws" which purportedly revealed the processes shaping urban structure. Biological metaphors such as invasion, succession, and infilling were the basis of powerful models for simplifying neighborhood population change and ensuant changes in the urban "ecosystem." At the same time, although in work not directly linked to the urban ecology studies, the Chicago school of economics established systematic, specialized social science techniques as normative criteria for rational decision-making and evaluation. These theories and techniques worked their way into major planning traditions, and eventually led to contemporary social science approaches such as econometrics and operations research (Friedmann 1987).

The general structure of control and optimization theory became a paradigm for rational decision modeling: goals would be set, constraints identified and the optimum plan computed in terms of a "solution space" (Batty 1985).

At present, the process of rational planning is simplified by its advocates into three interdependent "phases." The first is a "comprehensive" planning process which involves highly formalized, strategic decision theory with an emphasis on rational decision-making towards an explicit goal or set of goals. This is what Batty (1993, 59) calls the "synthetic phase" in which a singular solution, or set of solutions, is devised or generated. This phase assumes the existence of pertinent information and relies on technically informed protocols. Resolution of the problem involves "structured intuition...supported by various formal design and modeling techniques." A second, yet complementary, stage of this process relates to the contextual rationality—or the "normatively secured" forms—of actions which are constituted with regard to a conventional, taken-for-granted consensus about socially correct values, means and ends. Planners, to offer one example, might subscribe to some shared conceptions about how best to implement a strategic plan and developers, in turn, may subscribe to some commonly held notions concerning private land rights or the determination of who would be financially responsible for providing community infrastructure. The result is tacit agreement on what constitutes an appropriate "deal" between all actors in the planning process. The third stage—negotiation and bargaining for an appropriate "deal"—is completed by employing control mechanisms, such as objectifiable value statements, choice theory and weighted priorities, to keep a strategic plan on course (Boyer 1983).

According to Batty (1993), GIS is important at each of these three phases because the process is recursive, i.e., each preceding component influences the next. Most GIS and planning papers we have read reflect this objective, rational instrumental view of planning which essentially divorces the planning process from any communicative considerations within planning except when "ne-

gotiation and bargaining" are required to keep the plan on course (see, for example, Geertman and Toppen 1990; van der Meulen 1992; Batty 1985, 1993; Niemeier and Beard 1993; Shaw 1993; Haynes and Qiangsheng 1993; Nijkamp and Scholten 1993). Before detailing more fully the ways in which GIS relates to planning, we turn to some contemporary criticisms of instrumental rationality in planning.

Who is Afraid of Formal Reasoning?

By the early 1970s, it was clear that the over-emphasis on instrumental rationality in modern planning bureaucracies was causing considerable harm to those whose welfare and happiness were at stake.

An analytic, model-based calculus that attempted brave new designs for social equality and racial integration created the disaster of high-rise social projects for the poor, such as the Pruitt-Igoe housing development in St. Louis.

The decimation of old inner-city neighborhoods for freeway expansion was justified by government bureaucrats as an economically efficient strategy designed to produce overall economic health and progress of the city.

Many critics pointed out that the procedures developed within the modern, rational instrumental planning perspective were being harnessed for particular class interests. This kind of planning, it was argued, put the needs of capital before citizens and the environment (Healey 1992, 145). Batty (1985, 106) argues that this occurred because planners disassociated themselves both from the citizens for whom they were planning, and from the political process which implemented their plans. The notion of a separation of plan-making, the urban system and decision-making, he suggests, was largely one of convenience, historical accident and professional bias. Although this may be true, we feel that this separation reflects not only a professional bias but also an epistemological basis rendered by instrumental rationalism wherein practical day-to-day planning, based on negotiation and compromise, is devalued as inferior to modeling and abstract mathematical theory.

John Forester (1985b, 58-59) notes that treating rationality purely as a form of strategic or instrumental calculation runs into several interconnected problems. First, strategic and instrumental rationality are overly abstract and impractical because the day-to-day contexts of planners faced with subjective, practical judgments and collective negotiation may be ignored.

Second, by ignoring the limits of rational action, instrumental calculation may ignore questions of justice and legitimacy altogether but still hold to "rational" welfare economics or egalitarianism. It follows that, by ignoring the social and institutional context of planning, rational instrumentalism ignores the ideological basis within which decisions are made. Finally, instrumental calculation reduces rationality and questions of rational action to technical problems from which "solution spaces" may be derived.

Building on this kind of critique, Patsy Healey (1992) poses the form that planning might take if it is rendered without privileging the unifying conceptions of systems and structures, scientific knowledge and instrumental rationality. A broader perspective, she suggests, focuses on "substantive issues, moving from material analyses of options for local economies exposed to global capitalism, to concerns with culture, consciousness, community and 'placeness.'" (1992, 144). This position is probably best articulated by the move in planning (particularly in the United Kingdom) towards locality studies (Massey 1984, 1991; Cooke 1990) which do not ignore the roles of place and community in collective action. It may be thought of as a contextual position.

Another position has been to examine the planning "process," exploring the communicative dimensions of collective debating and decision-making (Healey 1992, 144). This broader conception does not define rationality solely in terms of detached instrumental calculation. It includes, also, a consideration of communicative conduct and practice.

Communicative rationality does not privilege instrumental or strategic action over communicative action, but is based instead on recognizing and debating the validity claims of all the actors in a planning context. Proponents of this are not necessarily interested in supplanting other forms of rationality, nor are they suggesting that communicative rationality is a panacea for the ills of planning. Nonetheless, by emphasizing a form of rationality which recognizes the importance of dialogue and understanding, communicative rationality acknow- ledges an aspect of day-to-day planning which is neglected by instrumental rationality. Communicative action is an ongoing process of interpretation which focuses on reaching an understanding rather than a strategic manipulation. All actions, whether defined as rational or irrational, are understood as a subset of more general actions of communication and speech (Miller 1992, 26).

We will return to Forester's and Healey's notions of the kind of rationality that underlies the

Type of user	Information demand	User demand	Type of GIS	Development
Information specialist	Raw data	Analysis Flexibility	Large Flexible	Links to other packages
Preparer of policy	Raw data and pre-treated data (information)	Analysis Good accessibility	Compact Manageable	Macro languages Interfaces to other packages
Policy decision-maker	Strategic information	Good accessibility to users Weighting and optimization models	"Small and beautiful"	User-friendly interface Key information
Interested citizen	Information	Good accessibility to users	"Small and beautiful"	User-friendly interface
Source: Nikjamp and Scholten 1989, 89				

Table 1. A rational strategic planning definition of GIS users.

"communicative and contextual turn," but it is important to note at this point that, although many GIS researchers recognize this turn in planning, few are comfortable with it.

Batty (1985, 113) feels that the retreat from formal rationality (defined by instrumental and strategic action) constitutes a "collapse of consensus representing a further twist to the growing complexity of modern society." He becomes uncharacteristically polemic in suggesting that the "synthetic (art)" view of the world is an "insidious force...at work in the reaction against formal rationality" as constituted by "analysis" and science. Moreover, because scientific rationality purportedly is no longer central to planning, Batty asserts that an intellectual vacuum has developed between planning practice and theory.

More recently, Batty (1993) and other GIS researchers have put theory aside to focus on the hegemonic rise of GIS in planning and industry.

The Dubious Rationale for GIS Hegemony in Planning

GIS researchers and practitioners are not alone in wishing to establish their discipline within the confines of a rational strategic and instrumental planning. Nonetheless, we feel that this notion is particularly pressing within the GIS field for a number of interconnected reasons.

First, projections for the growth of GIS are reaching dizzying heights. Second, the power of GIS is established around the pervasiveness of images. Third, GIS software vendors are beginning to market the universal applicability of their products. Finally, a dangerous "hyperpower" struggle is developing around the practical implementation of GIS.

The precipitous growth of GIS. Recent reviews note the increasing adoption of geographic information systems in the planning contexts of the U.K. (Campbell 1992), the U.S. (Gordon and

Soubra 1992) and continental Europe (Nijkamp and Scholten 1993).

By the end of the century, Dangermond (1990) estimates that one million people will be working with GIS and Rhind (1991) predicts nearly 600,000 geographic information systems in use with a global market worth over six billion dollars (cited in Openshaw 1993, 451). As a technology-driven set of sophisticated applications, GIS software has increasingly incorporated menu-driven, user-friendly, default dependencies and a precarious surfeit of algorithm-driven decision-making (e.g., spatial decision support systems).

It is clear that many of those GIS researchers who are excited about these developments also assume the continuance of instrumental rationality in planning, wherein policy issues are problematized in raster or vector form with an eye towards contriving a suitable metric for human existence.

For example, Nijkamp and Scholten (1993, 6) assert that "scientific progress in statistical and econometric modeling has led to a clear need for more adequate data and information monitoring." Does this imply that the instrumental rationality of geographic information systems should determine the ways that people's lives are observed so that a suitable database may be formed?

A less extreme, but equally insidious, problem is that certain proponents of instrumental rationality in planning assume that those for whom plans are made need not be given full and equal access to the data and models which comprise the bases of decision-making. The "interested citizen" does not get "strategic" or even "key" information but rather information which has been filtered through "preparers of policy" and "policy decision-makers" (see Table 1).

The power of images. The end product of a GIS to which concerned citizens may eventually have access is, of course, a visual representation.

Batty's (1993, 62) post-industrial society has GIS at the forefront of a visually-oriented para-

digm in planning. The pervasiveness of images, not just in planning but in all aspects of society, poses important questions regarding the representation of environments, places and people within these images (Aitken and Zonn 1994). Of late, maps have been fairly successfully deconstructed to reveal the ways in which they are contrived and manipulated to constitute a form of authority (Harley 1989). Pickles (1992, 200) demonstrates how cartography is conflated with increasingly sophisticated techniques of propaganda and, further, how this undermines notions of a democratic society.

If we agree that static maps can be pervasive illusions (or, at the very least, representations of just one form of reality), then we must be particularly skeptical of the dynamic map-like displays of spatial information which constitute the output of a GIS.

The universal GIS. In attempts to capture more of the market, GIS vendors such as ESRI and SPANS are attempting to make their software more flexible and universal. As such, these vendors often endorse a "catch all" solution to most land use conflicts. Is it possible to have one large, modular GIS encompass all today's planning contexts in all urban and rural regions? Such a notion belies much contemporary planning practice that is more concerned with "locality studies" which preserve the diversity of neighborhoods and the uniqueness of local area problems. The last decade has witnessed a move in planning away from grand totalizing schemes, and large scale comprehensive models and development plans to micro-scale (if not grass-roots) advocacy.

A universal GIS would purportedly be flexible enough to accommodate the demands of locally based, micro-scale uses. In support of this kind of GIS software, researchers such as Batty (1993, 61) note a trend towards partial planning-support models with highly modularized components. Although Batty envisages the development of an appropriate system for any particular problem involving the piecing together of local components, he notes that it is unlikely that we will see the design of any single GIS with the capability of supporting all spatial planning tasks in the near future. We would question whether the systems are becoming more diverse in order to accommodate unique planning contexts or whether the GIS practitioners are seeking out ways of making data from the real world conform more fully to GIS structures.

Hyperpower struggles. Certain organizational difficulties arise with the possibility of geographic information systems becoming user-friendly systems that may be accessed simultaneously by all actors in a decision-making context.

An emphasis on user-friendly hypermedia technologies which is not matched with institutional change can result not only in a less effective use of GIS, but also an upset in power balances. Openshaw's (1993, 454) concern rests with GIS becoming a pawn in "some hyperpower struggle which takes place out of sight."

We take a different view. We are not concerned that the status of GIS will suffer in these power-plays, but that the controllers of the technology may obfuscate decision-making processes by encouraging the illusion that, through rational science and technology, GIS can "solve" political planning problems. Currently, geographic information systems are not user-friendly, equal access, hypermedia and their organizational framework is quite different from what these GIS practitioners envisage. Nonetheless, the fundamental problem of a "hyperpower struggle" remains.

GIS research and its public application and practice are institutionally separated in space and time. As a result the researcher's role is distinct from, and often considered superior to, the role of the practitioner (planner, social worker, environmental consultant, city/state manager, and so forth). This form of discourse may lead to the belief that GIS research is objective and value free, with the consequence that its research results could be used in practice to validate action without attending to the values inherent in the social constructions of knowledge (Aitken and Rushton 1993, 363).

Equally problematic is the contractual relationship between the professional practitioner and the academic wherein the parameters of (academic /expert) knowledge may be manipulated in such a way that resulting public policies favor politically and/or economically dominant parties.

Can GIS contribute to some form of discursive democracy by augmenting and empowering the voices of all those who are involved in real life planning contexts? We agree with Batty's (1993) assertion that the post-industrial landscape will not be homogeneous but more likely anarchic with many types of data and information, and competing (perhaps contradictory) methods and models.

Moreover, the geographic information systems, models and planning processes will need to be grounded contextually in space and time. Although Batty does not elaborate on the post-positivist implications of these conclusions, we think that recognition of this direction is crucial.

A post-positivist perspective would establish GIS researchers as "reflexive practitioners" who are not dependent upon universal theories and models, or the insidious "default button" of some

GIS applications, but who develop theory, method and practice through interactive interpretations of their own lifeworlds and the lifeworlds of those affected by research. This expectation draws heavily from Habermas' communicative theory of society. The balance of this paper highlights the implications of the work of Habermas and other critical theorists for planning and GIS.

The Communicative and Contextual Turn: Critical Theory, Planning and GIS

As we have demonstrated in the previous sections, the literature on GIS and planning portrays the planning process as one disciplined by the perspective of instrumental rationality. Yet, according to certain planning theorists, planning is not governed solely by instrumental rationality; planning is a process of communicative interactions (Forester 1989). Planning systems such as GIS represent only one of many ways through which humans communicate and construct their natural and social environments. These assertions stem from the recent works of planning theorists and geographers who apply Habermas' communicative theory of society to studies of how people use language or communicative actions to convey different images and realities of planned space (Hillier 1993).

Habermas (1984, 1987a) calls for a "paradigm shift" from a philosophy of consciousness and self to a philosophy of language and communication. The philosophy of consciousness operates with the methodologies of instrumental and strategic rationality that we have already described. The philosophy of language operates with the methodology of communicative rationality which raises the validity claims of individuals in the drive for inter-subjectivity (Miller 1992, 26-27). Habermas distinguishes instrumental and strategic action from communicative action. The former relates means to ends and techniques to goals without reflection on the rationality or justness of the goals themselves. It is rooted in a self-oriented, subjective goal to dominate and control nature and other people. Communicative action is oriented towards understanding, agreement and uncoerced consensus.

Central to Habermas' (1984, 1987a, 1989) communicative theory of society is the analysis of how individuals and/or organizations systematically manipulate communications in order to conceal possible problems and solutions, manipulate consent and trust, and misrepresent facts and

expectations. Any form of knowledge is a product of both human wishes, including the will to power, and the human practices of negotiation and communication. The validity inherent in the practice of communication is based on the speaker's claims of truthfulness, correctness (when compared with social norms) and sincerity.

Communicative action is a move by two or more parties to reach an understanding concerning a particular context. This focus de-centers the individualistic and self-interested philosophies inherent in instrumental and strategic rationality by acknowledging that the real-world operates through consensus and negotiation between collective identities.

A Habermassian critical project of planning focuses on how people use language or communicative actions to convey different images and realities of planned space (Forester 1989; Hillier 1993). This theory purports that participants in the planning process not only simply transmit information, but also persuade, criticize, debate and mitigate (Forester 1983). In other words, they manipulate communications to impose political agendas which may control the social construction of place.

Habermas would argue that participants in the planning process should communicate to achieve a mutual understanding and consensus, rather than seeking a resolution through domination of discourse (Forester 1985a; Calhoun 1992). Communicative processes and their respective responsibilities can be oriented either towards manipulation (world disclosing) or towards reaching understanding to coordinate action in the world (Habermas 1987b). In the planning process, lack of consensus often occurs when participants are more concerned with disclosing their political identities and agendas and seeking results that support these, rather than with working to obtain a mutual understanding among all parties involved. When participants enter the planning arena with the goal to "win" or to impose their goals on others, these participants employ a subject-object concept of rationality which in turn can result in a dualistic "our position versus your position" discourse that precludes any agreement between negotiating coalitions.

There are numerous examples of world-disclosing actions in day-to-day planning. An environmental group may refuse any mitigation efforts simply because the group believes that there can never be a compromise when it comes to preserving ecosystems. A landowner may scoff at public negotiation concerning her land, because she believes in self-determination of private land use. A developer may spurn wildlife habitat

considerations because wildlife habitat planning takes time and further investment which, in turn, reduces her profits. A county planning board may impose higher housing density requirements to fulfill a housing density quota, even if the affected community is opposed to further development. There are also numerous examples of instrumental and strategic rationality in day-to-day planning. Intentionally and unintentionally distorted communications (including GIS representations) uphold rationality as the feat of the self-enclosed subject or group attempting to manipulate others and dominate the planning context. An environmental consultant may fail to note that a GIS vegetation or species habitat coverage has been field verified as only 75% or even 50% accurate. A lawyer or technical expert may use legal or technical jargon to confuse, or she may even overwhelm the public with data (Forester 1989; Throgmorton 1993). Equally, a meeting chairperson may focus on an exquisite or statistically complex set of GIS maps, failing to give equal time to a special interest group which chooses to present its concerns via personal narratives. Thus, within a planning context, Habermas' theoretical framework can reveal how individuals and/or power coalitions manipulate communicative actions to:

1. legitimate, protect and perpetuate political-economic agendas,
2. exclude or restrict community members from decision-making processes, and
3. promote the political and moral illusion that science and technology can "solve" political problems (Hillier 1993, 95).

Developing theory, method and application around GIS without consideration of the contexts within which geographic information systems are produced and implemented, introduces the danger of creating or reinforcing dominating discourses. Under the traditional banner of "technical know-how" (a type of authority often assigned to GIS "experts" and the institutions that they serve), powerful political/economic coalitions could confine public policy decision-making to those experts who know best, and thus exclude practical, contextualized questions from public discussion (Lake 1994, 424). This type of manipulation of GIS, and its presumed scientific authority, encourages and reinforces planning through the domination and manipulation of public discourse. Consequently, groups attempting to enter public discourse from alternative political positions, such as those grounded in local contextuality, aesthetics or emotions, may become marginalized and find it exceedingly difficult to establish critical footholds in the planning process (Lake 1994; Michel 1994).

According to Habermas and critical planning theorist Healey (1992), the purpose of planning should not be to impose one's agenda on others, but to move towards understanding each other's position and subsequently acting collectively towards a common goal. When actors strive to understand each other's position in order to coordinate action, planning is transformed into a process of communicative rationality which encompasses "all the ways we come to understand and know things and to use that knowledge in acting together" (Healey 1992, 150).

This focus de-centers the individualistic and subject-oriented philosophies inherent in instrumental and strategic rationality by acknowledging that real-world planning operates through consensus and negotiation between collective identities with political agendas. Emphasis on a form of rationality which recognizes the importance of dialogue and understanding both acknowledges the neglect of day-to-day planning and local contextuality and allows participants to achieve what is right for a community through participatory, critical discussion.

If we accept the premise of GIS as a communications tool, then it enables us better to understand how communicative actions shape power relationships and land use policies in the planning process.

Within this perspective, authoritative knowledge bases (such as those grounded in rational-scientific principles) are not immutable facts nor accepted societal norms (White 1987), but instead they are culturally imbedded systems that can be disassembled and reassembled through communicative action (Haraway 1991). Unlike some postmodern approaches, however, our communicative vision of planning would not reject instrumental rationality in planning, striving instead to "build connections and affinities" (Haraway 1991, 113) between rational instrumental forms of reasoning and those discourses grounded in such areas as aesthetics, emotions, local contextuality, feminism, Marxism, and deep ecology.

Although we agree fundamentally that planning needs to move beyond strategic and instrumental rationality, we have some concerns with Habermas' unyielding focus on communication and consensus. We believe that in some contexts it is best to engage in dissensus, to challenge authority, and to preserve differences (even differences in points of view), while in other contexts it is necessary to reach consensus over what constitutes political and ethical goals. The value of a particular group's views are often highlighted

through its dissent. While Habermas would probably agree with this practical and contextual position, a reading of his works suggests an overwhelming emphasis on reaching a consensus; he rarely points to the value of dissensus and preserving difference. The value of communication, for us, is not just coming to an agreement, but also being able to hear (and really listen to) the voices of others, particularly those who are marginalized because they do not relate to the white, male, heterosexual, middle-class, capitalist, Eurocentric discourse which dominates both science and planning.

Cognitively Mapping a Basis for the Reformulation of Rational Action

We think that it is necessary to understand that the rational instrumental planning process not only tends to disregard, and thus marginalize, the voices of those who do not conform to the dominant discourse of planning and science, but that planning also muddies its own representation with relatively impenetrable language systems and bureaucracy. As such, we agree with Nijkamp and Scholten (1993, 86) that "our complex society needs insights into the mechanisms and structures determining intertwined socio-economic, spatial and environmental processes." Some insights may come from rational strategic planning but, as we have already argued, this kind of planning not only establishes an abstract model of reality that bears little resemblance to the lives of those who are being planned, but also may undermine effective communication within the planning process.

Planning, science and technology are most often couched in a discourse which suggests that the three have some internally consistent legitimacy. However, they are, in substantial measure, legitimate only as interdependent discussions in language, images and other representations.

There is, in nearly all of us, a practical understanding of society and culture. We would be unable to function, otherwise. At some level, we all have an understanding of how the system works—from local land-use management to the machinations of the global political economy. Jameson calls this the *political unconscious* and suggests that it can be raised through a *cognitive mapping* of society (1984, 89-92). In an attempt to reconstruct Kevin Lynch's (1960) well-worn concept so that it might be reflexively applied to understanding our political economy, Jameson identifies cognitive mapping as an appropriate tool through which we can represent to ourselves "that vaster and properly unrepresentable total-

ity" which comprises the socio-economic, cultural and political realm. It is also a metaphor for the processes of the politically unconscious (established through personal experience) and a model for how we might articulate the local with the global (Jameson 1992, xiv).

As a tool for communication, cognitive mapping provides a societal map which may be recognizable to anyone who lives within it, removing what Jameson calls an "anti-speculative bias" from how we construct our world. An anti-speculative bias is introduced whenever there is an "emphasis on the individual fact or item at the expense of the network of relationships in which that item may be imbedded" (Jameson 1981, x). Strategic and instrumental rational planning contributes to this bias. Such strategic plans have an "anti-speculative bias" because they are derived from an epistemological basis which does not accommodate anything but its own rationality. In short, strategic and instrumental planning does not facilitate communication because its authoritative bases (such as science) do not give any validity to the claims of those who speak from outside of its dominant discourse.

Jameson (1992, 128) applauds the prodigious rise of Habermas' notion of communicative rationality in our "contemporary post-natural society." For Jameson and Habermas, rationality is not something separate from our own consciousness but, rather, it is *something we can understand or argue for*. Understanding rationality in this way makes the traditional oppositions of rationality and irrationality increasingly implausible or, at the very least, dysfunctional. Rather than rationality being the feat of the institutionally-enclosed planner attempting to dominate nature, it becomes the result of undistorted communication. The planner, then, does not establish the efficacy of a particular plan by using instrumental devices and precise, numeric definitions of rationality which assume anything else to be irrational. Instead, this reformulation of rationality enables the planner to incorporate and debate the validity of the personal narrative as well as the GIS analysis.

Habermas' and Jameson's challenge for planners, then, is to avoid producing closed narratives with "anti-speculative bias" from the planning process. Unfortunately, proponents of "the communicative turn," such as Forester and Healey, argue that the planner needs only to become an agent of communicative rationality, making claims for those affected persons whose voices remain unheard. We feel that this would perpetuate a system whereby the planner is merely a filter for other authoritative figures (see Table 1). As a facilitator of communicative action (a reflexive

practitioner), the planner must provide ways in which all affected persons can speak for themselves.

What remains to be considered here, then, is not only the situated character of geographic information systems as tools for communication, but also how GIS might empower voices at the margins.

We believe that geographic information systems can be thought of as "cognitive maps" only if they are contextualized; removing anti-speculative bias in an attempt to raise what Jameson calls the political unconscious.

To Boldly Go...Without Getting Lost in Hyperspace

In this section, we consider how the GIS community might enable those affected by planning contexts to speak for themselves. In so doing, we find some utility in the claims of those who advocate a reconstitution of GIS within hypermedia (Tomlin 1990; Ervin 1992) although we are concerned that the possibility of all actors having ownership in any particular GIS may be more apparent than real.

Hypermedia are communicative tools that enable user-friendly interface with data and information as well as communication between users. The idea relates to a non-sequential construction of media built up from nodes of text (and graphics, video, sound, analyses, and so forth) from which the user can choose a variety of entry points. Hyperspace is simply the allegorical space that is occupied by a hypermedia system.

The concept of hypermedia requires a flexible system which can link data, information, maps and graphics. In one sense, geographic information systems conform to this definition but we would offer that hypermedia (in theory) offers a more flexible definition which enables an important interaction between users and the GIS. In theory, our geographic information systems are hypermedia, but in practice they fall short of a flexible, empathic, empowering discourse. A non-linear, discursive use of GIS would enable all actors to interact with all aspects of the system (including data creation). Ideally, hypermedia systems would permit the individual user to choose his or her own center of investigation. The user could choose where and how to enter into a truly interactive hypermedia GIS.

In essence, this would shift attention from the linear constitution of "GIS practitioner ► data creation ► analysis ► decision-maker ► implementation" to a non-linear combination of

reflexive-practitioner and discourse through a "GIS/empathetic decision compromise" much more akin to Habermas' communicative action. The most salient effect of this strategic change would be to free planning through GIS from power-based determinisms, opening it up to an apparently infinite play of relationships which reflect more critically the everyday experiences of the people whose lives are being structured. Moreover, such a system may remove the problem of ownership of data and GIS system implementation. The result might be a discursive, dialogic, polyphonic, multi-vocal GIS which is constructed not as the whole (of a single user or company) absorbing all other satellite information into itself, but as a whole formed by the transactions of all participants in an empathetic style, none of whom is subverted, or constituted, by the other.

A true hypermedia GIS would not permit a tyrannical, univocal voice. Rather the voice of the GIS would be distilled from the combined experience of all those affected by a particular planning context.

Christiansson's (1991) assertion that the old programmer needs to become a *toolmaker* seems to resonate in part with the our notion of the reflexive practitioner. He envisages (1991, 50) a near future when there will be less technology-driven development of new tools and greater emphasis on styles of communication, and knowledge representation and acquisition requiring loosely linked models and a high degree of data-base integration. He suggests (1991, 42) that software and hardware developers should strive to facilitate or improve our capabilities to map not only our local environments but the complex sociopolitical forces which transform our environment through:

clearer and more obvious connection between application and computer stored models; integration of advanced software tools, such as Hypercard; knowledge-based systems and relational databases; ...change and validation models; use of different knowledge representations and search strategies; provision of generic tools for problem solving (decision support, information browsing and search, model building); design of powerful man-machine [sic] interfaces; computerized models supported by real-life pictures and sound as well as computer-generated pictures, drawing, animations, and sound; integration of optical distribution and storage media to support different computer-stored models...; powerful tools for knowledge transfer (training, education, and transfer of information)...

To use Jameson's metaphor in a slightly different context, the GIS user's empowerment emanates from an ability to cognitively map a hyperspace environment which represents a particular planning scenario. This kind of strategy might remove the "anti-speculative bias" from GIS coverages because, at the very least, it would enable affected persons to examine all aspects of the coverage critically, including data creation and transformation.

Clearly, there is a need to demystify the specialized speech and practice of GIS. This clarification would include not only a deconstruction of the images, maps and graphic products that constitute GIS output, but also the ways in which the data are created and the outputs are produced.

It is beyond the scope of our discussion to elaborate on how training and access to GIS could be provided to all people affected by a planning context. Nor is it possible for us to delineate fully the myriad of ways that the institutional structure would have to be changed in order to accommodate equal access to GIS. Of late, Habermas (1989; and see Calhoun 1992) has discussed ways in which the "public sphere" could be transformed so as to foster communicative action. He believes that the creation of "free public spaces" requires, at the very least, the establishment of certain universal rights, equal access to information, freedom of communication, rule by law, and democratic participation. Unfortunately, these are lofty ideals which may miss some of the more co-opting and coercive power structures and status relations hidden within and behind technologies such as GIS.

Foucault (1972, 23) points out in *The Archeology of Knowledge* that "the frontiers of a book are never clear...it is caught up in a system of references to other books, other texts, other sentences: it is a node within a network." The hidden power structures and status relations embedded within text which Foucault articulates may also be found within GIS. In an ideal hypermedia GIS, these power systems would be de-centered because all users would have access to a system which would provide them with search, navigation and tracking tools. Of course, the system is only as good as the data from which it is derived and these data are always somebody's construction. Herein lies a critical problem for GIS as hypermedia. Archer and Croswell (1989) argue that neither corporate control, nor free availability of spatial information establishes a good policy basis for providing the greatest access of information to the most people. The problem of free electronic geographic information is that certain corporate interests would probably still control the creation and packaging of raw data, and thus the production of information. Because of their reliance on GIS software, GIS data are still valorized and used as part of a power-play (without free access) amongst those who profit from the control of information.

Conclusion

In closing, we return to a somewhat pessimistic view of the oligarchic system within which GIS is currently embedded. The changes in organization (orgware) suggested by Batty, Openshaw and others as a prerequisite for the GIS industry's continued influence in planning are troubling because they reify a hegemonic form of planning which discourages speculation, questioning and understanding-oriented communicative rationality. It is also troubling to think that GIS may be merely another technique in a line of tools which ensure the continuation of instrumental and strategic rationality in planning. While Habermas' notion of communicative rationality tends to be somewhat abstract, we do think that its principles are appropriate for contemporary day-to-day planning and GIS research. We would stress also that values such as human rights, freedom and democracy are invaluable discursive tools in the struggle for emancipation. Technologies such as GIS, when thought of in the context of discursive communication rather than as linear, univocal instruments, offer some possibilities for that struggle.

Thankfully, empirical studies of technological innovation reveal a complex, messy, and nonlinear process. We have no assurances that GIS will drive organizational and institutional change along the lines of the rational strategic and instrumental planning model. Like other technological innovations, GIS is socially constructed. At present, geographic information systems are ambiguous because many groups, including planners, geographers and social theorists, compete to define their purposes, and technicians design GIS for different contexts and objectives.

Innes and Simpson (1993, 231) note that the GIS literature lacks any kind of framework for understanding substantive issues such as the incentives for implementing GIS in planning, or the ways GIS could disrupt power relationships and understandings about the role of planners and planning in state and local government. Nor does it explore the opportunities afforded by GIS for rethinking planning theory and practice. These issues are compelling and we believe that they all relate, fundamentally, to the communicative and contextual turn in planning. GIS researchers have

been blind to a growing literature which essentially documents what planners actually do in their daily activities.

Ultimately, GIS will be useful only if it can use a language of practice, rather than the specialized speech of the strategic rational planning and instrumental calculation community. The creation of a multi-user, hypermedia GIS that can empower both the planning process and the multiple voices of those affected by the plans will require dissolving intellectual boundaries between theory and application, art and science, instrumental rationalism and rational action, and planners and their erstwhile subjects.

REFERENCES

Aitken, S. C., and G. Rushton. 1993. Perceptual and behavioral theories in practice. *Progress in Human Geography* 17(3): 362-72.

Aitken, S. C., and L. E. Zonn. 1994. Representing the place pastiche. In Aitken, S. C., and L.E. Zonn, eds. *Place, power, situation and spectacle: A geography of film*, 3-25. Lanham, Md.: Rowman and Littlefield.

Archer, H., and P. L. Croswell. 1989. Public access to geographic information systems: An emerging legal issue. *Photogrammetric Engineering and Remote Sensing* 55(11): 1571-81.

Barnes, T., and E. Sheppard. 1992. Is there a place for the rational actor? A geographical critique of the rational choice paradigm. *Economic Geography* 68:1-21.

Batty, M. 1985. Formal reasoning in urban planning: Computers, complexity, and mathematical modeling. In Breheny, M., and A, Hooper, eds. *Rationality in planning: Critical essays on the role of rationality in urban and regional planning*, 98-119. London: Pion Ltd.

Batty, M. 1993. Using geographic information systems in urban planning and policy-making. In Fischer, M., and P. Nijkamp, eds. *Geographic information systems, spatial modelling and policy evaluation*, 51-69. New York: Springer-Verlag.

Boyer, M. C. 1983. *Dreaming the rational city*. Cambridge: MIT Press.

Bromley, R. D. F., and J. M. Selman. 1993. Geographic information usage in a local authority: The human environment of GIS. *Area* 25(3): 228-36.

Calhoun, C. 1992. Introduction: Habermas and the public sphere. In Calhoun C., ed. *Habermas and the public sphere*, 1-48. Cambridge: MIT Press.

Campbell, H. 1992. The impact of geographic information systems on British local government. *Computer Environments and Urban Systems* 16:531-41.

Chadwick. 1971. *A systems view of planning: Towards a theory of the urban and regional planning process*. Oxford: Pergamon.

Christiansson, P. 1991. Building a city advisor in a "hypermedia" environment. *Environment and Planning B: Planning and Design*, 18:39-50.

Cooke, P. N. 1990. *Back to the future*. London: Unwin Hyman.

Cosgrove, D. 1990. Environmental thought and action: Premodern and post-modern. *Transactions of the Institute of British Geographers* 15:344-358.

Dangermond, J. 1990. The future of GIS technology. *The 1990 GIS sourcebook*, 7-12. Fort Collins, Colo.: GIS World.

Ervin, S.M. 1992. A hypermedia GIS: The Massachusetts Turnpike study. *Computer Environments and Urban Systems* 16:375-83.

Faludi, A. 1973a. *Planning theory*. Oxford: Pergamon.

Faludi, A. 1973b. *A reader in planning theory*. Oxford: Pergamon.

Forester, J. 1983. The geography of planning practice. *Environment and Planning D: Society and Space* 1:163-80.

Forester, J. 1985a. Critical theory and planning practice. In J. Forester, ed. *Critical theory and public life*, 202-27. Cambridge: MIT Press.

Forester, J. 1985b. Practical rationality in planmaking. In Breheny, M., and A. Hooper, eds. *Rationality in planning: Critical essays on the role of rationality in urban and regional planning*, 48-59. London: Pion Ltd.

Forester, J. 1989. *Planning in the face of power*. Berkeley: University of California Press.

Foucault, J. 1972. *The archeology of knowledge and the discourse on language*. Trans. Rupert Swyer. New York: Tavistock.

Friedmann, J. 1987. *Planning in the public domain: From knowledge to action*. Princeton, N.J.: Princeton University Press.

Geertman, S. C. M. and F. I. Toppen. 1990. Regional planning for new housing. In Scholten, H. J., and J. C. H. Stillwell, eds. *Geographical information systems for urban and regional planning*, 95-107. Dordrecht, Netherlands: Kluwer.

Gordon, W. R., and N. M. Soubra. 1992. Geographical information systems and planning in the U.S.A.: Selected municipal adoption trends and educational concerns. *International Journal of Geographical Information Systems* 6(4): 267-78.

Gregory, D. 1994. *Geographical imaginations*. Cambridge, Mass.: Blackwell.

Habermas, J. 1984. *The theory of communicative action: Vol. 1*. Boston: Beacon Press.

Habermas, J. 1987a. *The theory of communicative action: Vol. 2*. Boston: Beacon Press.

Habermas, J. 1987b. *The philosophical discourse of modernity: twelve lectures*. Cambridge: MIT Press.

Habermas, J. 1989. *The structural transformation of the public sphere*. Cambridge: MIT Press.

Haraway, D. 1991. *Simians, cyborgs and women: The reinvention of Nature*. New York: Routledge.

Harley, J. B. 1989. Deconstructing the map. *Cartographica* 26:1-20.

Haynes, K. E., and L. Qiangsheng. 1993. Policy analysis and uncertainty: Lessons from the IVHS transportation development process. *Computer Environments and Urban Systems* 17:1-14.

Healey, P. 1992. Planning through debate: The communicative turn in planning theory. *Transportation Planning Research* 63(2): 143-62.

Hillier, J. 1993. To Boldly Go Where No Planners Have Ever... *Environment and Planning D: Society and Space* 11:89-113.

Innes, J. E. and D. M. Simpson. 1993. Implementing GIS for planning: Lessons from the history of technological innovation. *Journal of the American Planning Association* 59(2): 230-36.

Jameson, F. 1981. *The political unconscious*. London: Methuen.

Jameson, F. 1984. Postmodernism, or the cultural logic of late capitalism. *New Left Review* 146:53-92.

Jameson, F. 1992. *The geopolitical aesthetic*. Bloomington: Indiana University Press.

Krueckeberg, D. A., and A. L. Silvers. 1974. *Urban Planning Analysis: Methods and Models*. New York: Wiley.

Lake, R. W. 1992. Planning and applied geography. *Progress in Human Geography* 16: 414-21.

Lake, R. W. 1994. Negotiating local autonomy. *Political Geography* 13: 423-42.

Lynch, K. 1960. *The image of the city*. Cambridge: MIT Press.

Maguire, D. J. 1991. An overview and definition of GIS. In Maguire, D., M. Goodchild, and D. Rhind, eds. *Geographic information systems: Principles and applications*, 9-18. New York: Longman.

Massey, D. 1984. *Spatial divisions of labour: Social structures and the geography of production*. Basingstoke, U.K.: Macmillan.

Massey, D. 1991. The political place of locality studies. *Environment and Planning A* 23: 267-81.

Michel, S. M. 1994. Raptors and rhetoric: How communicative actions shape golden eagle habitat in Ramona, Calif. Master's thesis, Department of Geography, San Diego State University.

Miller, B. 1992. Collective action and rational choice: Place, community, and the limits to individual self-interest. *Economic Geography* 69(1): 22-42.

Niemeier, D. A., and M. K. Beard. 1993. GIS and transportation planning: A case study. *Computer Environments and Urban Systems* 17:31-43.

Nijkamp, P., and H. J. Scholten. 1993. Spatial information systems: Design, modelling, and use in planning. *International Journal of Geographical Information Systems* 7(1): 85-96.

Openshaw, M. 1993. GIS "crime" and GIS "criminality." *Environment and Planning A* 25(4): 451-600.

Oppenheim, N. 1980. *Applied Models in Urban and Regional Analysis*. Englewood Cliffs, N.J.: Prentice Hall.

Philip, M. 1985. Michel Foucault. In Skinner, Q., ed. *The return of grand theory in the human sciences*, 65-82. Cambridge: Cambridge University Press.

Pickles, J. 1992. Texts, hermeneutics and propaganda maps. In Barnes, T. J., and J. S. Duncan, eds. *Writing worlds: Discourse, text and metaphor in the representation of landscape*, 193-230. New York: Routledge.

Rhind, D. 1991. The next generation of GIS and its operational context. In *Workshop on European research in GIS, 24-26 January 1991* (Davos, Switzerland: European Science Foundation), 31-56.

Shaw, S. 1993. GIS for urban travel demand analysis: requirements and alternatives. *Computer Environments and Urban Systems* 17:15-29.

Throgmorton J. 1993. Planning as a rhetorical activity: Survey research as a trope in arguments about electric power planning in Chicago. *Journal of the American Planning Association Journal* 59:334-46.

Tomlin, C. D. 1990. *Geographic information systems and cartographic modelling*. Englewood Cliffs, N.J.: Prentice Hall.

van der Meulen, G. G. 1992. Geographical information and decision support systems. *Computer Environments and Urban Systems* 16:187-93.

Weller, B. 1993. Key institutional and organizational factors affecting GIS/LIS strategies and applications. *Computer Environments and Urban Systems* 17:211-12.

White, S. 1987. *The recent works of Jürgen Habermas: Reason, justice and modernity*. Cambridge: Cambridge University Press. ■