

Towards a Civil Commons of Open Access information technology for transportation analysis and planning

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Abstract: How does society make decisions about highly complex policy domains such as transport, and what role should advanced information technology play in these processes? And in particular, how do we try to *change* policy directions in light of new concerns, contingencies and exigencies – among them that when viewed from a Sustainable Development perspective, societal approaches to transport in societies such as Australia are highly problematic, especially in terms of impacts on our global climate and demands placed on non-renewable resources? To develop these concerns into a focused enquiry feasible to complete within a single PhD timeframe, the following paper outlines my research focusing on the role of Civil Society Organisations (CSOs) in the city of Melbourne's metropolitan-scale transport public policy debates, and their efforts in developing and advocating for alternative policy paradigms. In particular, I focus on the role and potential of Open Source Geographic Information Systems for Transport Informatics (GIS-TIs) as a knowledge technology in these organisations' work. I discuss the Action Research methodology employed, and the interpretive research paradigm utilised, which is at the early stages of fieldwork with partner organisations.

Keywords: transport, informatics, policy paradigms, Open Source, Open Data, GIS, civil society, info-socialisation, deliberative democracy

Contextualising research project in relevant literature and developing a theoretical framework

Transport Policy Paradigms

To situate the work of Civil Society Organisations (CSOs) engaged in transport debates, I will utilise the concept of **Transport Policy Paradigms** (Curtis & Low, 2012). The key point of a paradigm of transport policy is that transport planning decisions are not made on an independent basis, but always in reference to a larger organising body of ideas, methods and practices. The policy paradigms theoretical framework puts a focus on actors, institutions and (expert) knowledge that support an existing paradigm – and the dynamics that either reinforce the existing paradigm or open up the possibility for change.

In countries such as Australia in the Anglosphere¹, throughout the 20th century critical transport researchers argue that we have increasingly followed a paradigm of 'automobility' or more pejoratively, 'Automobile Dependence' (Newman & Kenworthy, 1999). An appreciating of policy paradigms means that attempting to significantly change transport policies towards environmental sustainability means not just advocating for adjustments to current policies, but supporting efforts to develop, advance, and later institutionalise an *alternative policy paradigm*.

Stone & Legacy (2012) have provided a review of case-study cities where a significant transport policy paradigm change did occur, which drew out aspects of how change-agents

1 I use this term in the sense of countries where English is the historically dominant language, generally understood as the United Kingdom, the United States, Canada, Australia and New Zealand.

used representative democratic processes to push transport professionals to question established approaches and adopt new techniques in response. However, their review did not include a significant focus on the potentially powerful role of information systems in transport policy debates, which is addressed in the following section.

Computer models and GISs as social knowledge technologies in policy development and debate

Mathematical models, and more recently, Geographical Information Systems (GISs), have a long history of playing an important role in transport planning policy making. Whilst this is both necessary and appropriate, an appreciation of policy paradigms means it is important to be aware of the relationship between such technology and the paradigmatic assumptions that are enmeshed in its development, deployment and application (Beimborn, Kennedy, & Schaefer, 1998; Næss, 2011). Thus for this inter-disciplinary research project, I will draw from an emergent literature aiming to understand such advanced ICTs as socio-technical 'knowledge technologies' (Gudmundsson, 2011).

My review of the relevant literature suggests a particularly relevant reflexive theoretical framework concerning the role models and GISs play in spatial decision-making is that provided by Sterk, Leeuwis, & Van Ittersum (2009).

Through multiple interpretive case studies of models' use in environmental decision-making, these authors propose models play the following three socio-technical roles:

- *Heuristic*: Helping make sense of a complex world through the models' simplifications and selection of key elements for inclusion, and thus contributing to a group understanding of the nature of a problem and possible effective actions;
- *Symbolic*: Acting as a tool to make key selected aspects of an issue visible to other stakeholders, especially politically influential actors with decision-making responsibility in the domain of interest;
- *Relational*: An artifact that a network of people with common interests in the problem framing of interest can discuss and collectively work on or at least respond to, even if there is some level of divergent views within the group.

If we are concerned with increasing the ability of actors and institutions throughout society to meaningfully engage in technical policy domains such as transport, then we need to necessarily be concerned about the access to advanced GIS-Ts by different groups in society (King & Kraemer, 1993). Within the Public Participation GIS (PPGIS) research tradition that has developed since the 1990s, this has included efforts to understand how such access can be effectively extended to community groups (Ghose, 2002, Leitner, McMaster, Elwood, McMaster, & Sheppard, 2002). In the next section I will link such concerns with an emerging new mode of information system production, Open Source.

Open Source as a networked mode of production and appropriation of Information and Community Technologies

The core of what makes a software project, such as a GIS-T system, Open Source is an inversion of proprietary intellectual property rules. Instead of providing only compiled final software and restricting the users' rights to a pre-specified purpose, Open Source projects by definition must make available the full source code of a program, and institutionalise a right to further reproduction as part of its terms of distribution².

A developing literature suggests that Open Source is actually a case of a new 'mode of information systems production', in which networked individuals or groups can draw from or contribute to a (global) *software commons* (Bauwens, 2006; Benkler, 2006). There is

2 A definition of the "Open Source" concept including software licensing terms is available at <http://opensource.org/docs/osd>.

admittedly still a lively academic and public debate about Open Source's efficacy on both empirical and philosophical grounds (Bezroukov, 2011; Camara & Onsrud, 2004) and sufficient empirical data to support firmer conclusions is still being collected (Lerner & Schankerman, 2010).

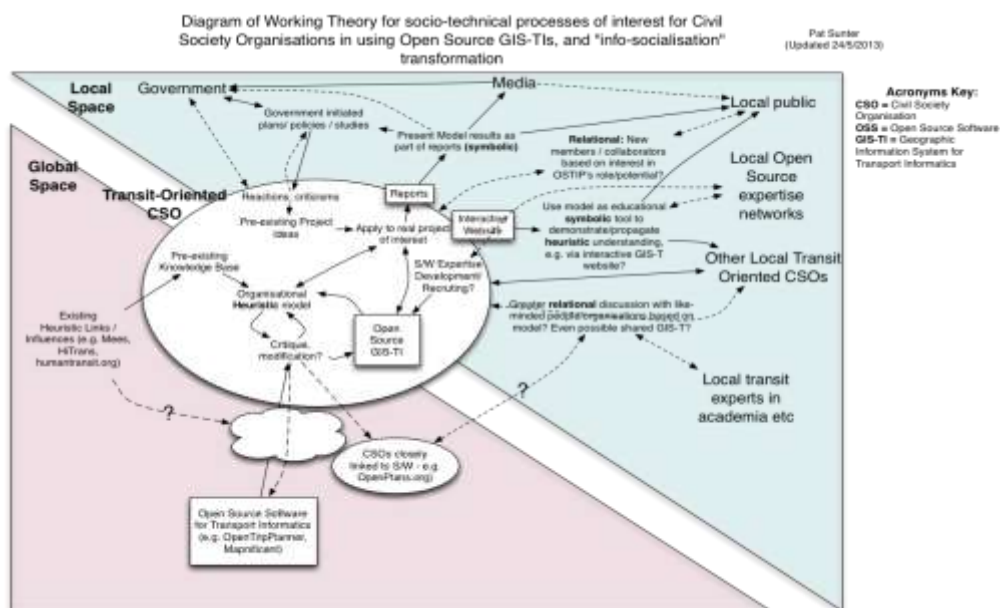
In the field of transport specifically, there are several recent examples of transport network analyses being performed using entirely Open Source tools that produced valuable informatics in quite limited timeframes (McGurrin & Greczner, 2011). There are also several recent historical examples of “for-purpose” technology CSOs being founded internationally such as OpenPlans³, which in the words of its founder was set up specifically with the aim of linking the production of Open Source software for transport modelling and GIS with enlarging possibilities for transport policy reform (Buskirk, 2009).

Synthesised theoretical framework for research project: info-socialisation of Open Source GIS-Ts by CSOs

To synthesise these concerns for this research project, I will draw upon the framework of civil organisations undergoing an *info-socialisation* process as they engage with, appropriate, and re-purpose, information technologies. This concept was developed by Sadoway (2012) during a constructivist and qualitative case study of several civil society organisations engaging in urban planning debates in Hong Kong.

In Figure 1 below, I have applied the info-socialisation concept to frame CSOs work in developing and contesting transport policy paradigms, the role of GIS-Ts in this process, and Open Source software as a mode of information-system production. It incorporates the earlier-introduced Heuristic, Symbolic and Relational framework of Sterk et al. (2009) to focus on processes of how CSOs could use GIS-Ts in relation to their work and organisational capacity, both internally and in relation to other key actors.

Sadoway (2012) emphasised that info-socialisation concept is still a developing “normative framework”, needing exploration and further critique and development based on the work of CSOs in a particular spatial, social and political context. This makes it well-suited to the Interpretive Action-Research methodology outlined in the following section.



3 See <http://www.openplans.org>

Figure 1: Working theoretical framework for understanding key processes in CSOs use of GIS-TIs for transport policy development, advocacy and communication

Research Questions

Based on the above inter-disciplinary framing of the research problem, my overarching research question is:

Is there a valuable role for the global commons of Open Source transport informatics software to support Civil Society Organisations in their efforts to develop, communicate and advocate for alternative transport policies at the metropolitan scale?

Three subsidiary research questions are:

1. Can supported access to Open Source GIS-TIs increase the capacity of CSOs to develop and communicate transportation reform proposals?
2. Does the level of resources needed to apply and utilise Open Source GIS-TIs suggest they could be managed and run primarily by CSOs long-term?
3. To what extent will CSOs who utilise Open Source GIS-TIs modify their practices as a result?

Acronyms Restatement:

- CSOs: Civil Society Organisations;
- GIS-TIs: Geographic Information Systems for Transport Informatics.

Research methodology and methods

Action Research methodology and research roadmap

To investigate the research questions, I am conducting collaborative Action Research with two CSOs active within Melbourne, who have a stated public concern of advancing an alternative transport policy paradigm that is a significant break from current practice.

The tradition of Action Research that I will draw from most directly is that developed within the Information Systems discipline. I believe this is appropriate since while my area of wider concern is Urban and Transportation Planning, the deep focus of the research is the role information systems play in organisations engaging in such policy development and decision-making.

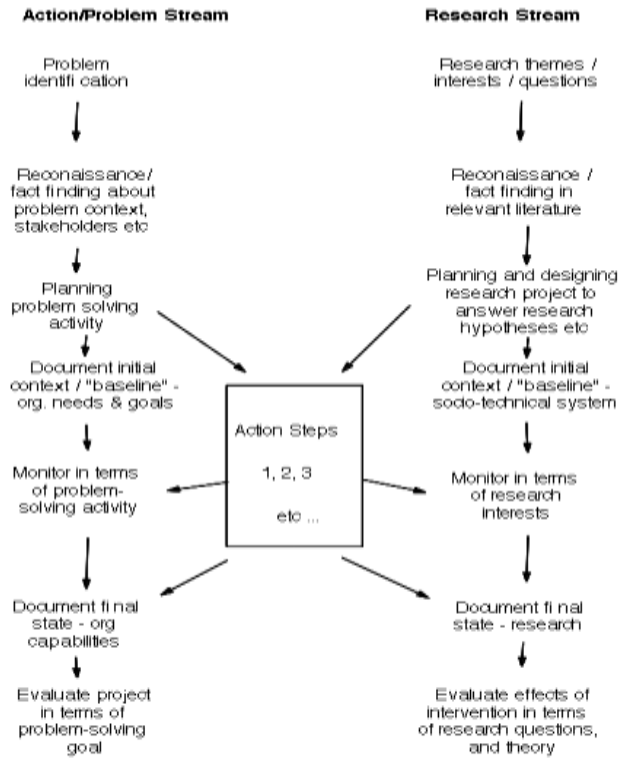
The particular approach to Action Research that I am using a guide for the research design is the “dual cycles” framework of McKay and Marshall (2001), which augments the earlier work of Checkland (1991). Figure 2 below displays the key steps of this framework – while McKay and Marshall conceive of this as a cyclical process, for communicational simplicity this has been “linearised” into a single cycle.

I believe this fits well with the framing of improving access to GIS-Ts by CSOs as a *problem* to be addressed, and exploring, through co-operative practice, the *possibility* that the Open Source mode of production could support this goal. Thus, the plan for the research contains both software system selection, design, integration and evaluation activities – and also specific research data-gathering activities built-in throughout the phases.

Selection of research partners and software to trial

The selection of which organisations to approach was based on a survey of published reports and media, assisted by documentation from forums such as the 2008 GAMUT-hosted “Transport and Climate Change” conference, as well as criteria of expected organisation “fit” to the theoretical framework.

Similarly, during preliminary planning I have surveyed and identified relevant Open Source GIS-TI software that I consider relevant to the goals and capabilities of these groups, informed by practitioner reports of their use elsewhere (McGurrin & Greczner, 2011). Screenshots of two of these tools in action, displaying “travel time maps” of locations accessible via public transport from a particular location, are shown in the figures below.



(Underlying 'dual cycles' AR framework proposed by McKay, J. & Marshall, P. 2001, 'imperatives of action research', Information Technology & People, 14, 1, 46-59)

Figure 2: Linearised AR Research Project stages diagram



Figure 3: Screenshot: OpenTripPlanner Analyst software, showing travel time map in Washington, D.C. Including impact of planned new transit line.

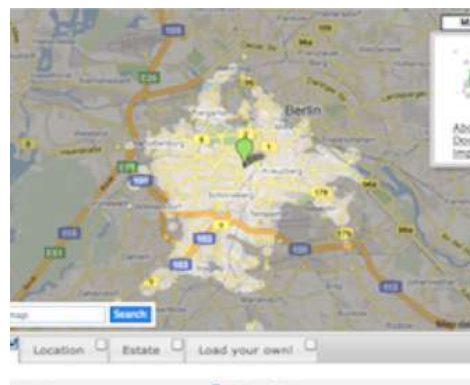


Figure 4: Screenshot: Mapnificent software, showing travel time map from central Canberra via Public Transport

Phases of AR project and data collection methods employed

The following table maps the previous section's outlined research roadmap onto the key Research Methods to be utilised in each phase.

Phase	Description	Data Collection
Reconnaissance / Fact Finding	Research and documentation of overall context of Melbourne transport policy, and different CSOs roles active in the area, both historically and currently. Development of key themes to guide reflection on organisational capacity, goals and change process in terms of theoretical framework.	Concept Maps of key organisational linkages. Analysis of organisational media (eg publications, websites).
Planning the Project with CSOs	Understanding the needs and goals of identified CSOs, including previous use of ICTs in policy devt/communication. Discussions with CSOs, developing a high-level <i>Project Scope</i> and <i>Memorandum of Understanding (MoU)</i> to guide project.	<i>Interviews</i> with key members of CSOs.
Action Taking & Monitoring: Design and Participatory Evaluation	<i>Design</i> of Software Systems based on survey of existing Open Source tools and discussions of CSOs needs and capabilities. <i>Develop</i> a working system with regular feedback and discussions with CSO members and users. Support <i>Application</i> of the system to develop and communicate a transport network proposal of interest to the Organisations involved.	Participant Observations at key Design Workshops. Field Journal of researcher-as-developer reflections. Collection of copies of key Design Artifacts during devt. Solicit written feedback and reflections by CSO members.
Evaluation of Final State	At this stage, the researcher will hold a ½ day workshop with project participants from each organisation to evaluate the project.	Focus Group Interview with participants as part of project workshop. Copies of key Reports / Maps / Online Media that resulted from Project.
Post-Project support	While writing up the results as part of the Thesis, I will also provide advice to both organisations in case they wish to continue developing the project's capabilities.	N / A.

Data analysis methods and addressing research quality

As outlined in the previous table, the key data collected through multiple methods at different stages is designed to allow structured reflection on a developing understanding of the potential of Open Source software in Civil Society Organisations engaging in transport policy debates.

The theoretical framework developed above will guide the initial interpretation of the research data. My selection of both data collection and analysis methods is designed to support systematic reflection on how this understanding develops, and also to compare it against the differing constructions of the other research participants, as recommended for socially-engaged research in the Community Informatics tradition (Tacchi, Slater, & Hearn, 2003).

The key components of this will include:

- “Coding” of interviews and focus group transcripts and field journal notes according to both pre-existing specified categories and new categories which emerge during the study;
- In my field journal, deliberately periodically doing structured reflection according to these categories - particularly before and after key Participant Observation sessions such as design workshops.

To assist this process I will digitise all transcripts/journal notes, and utilise computer software such as NVivo and/or Tinderbox⁴ that support annotation of discussion notes, collection of key themes, and structured reflections upon them.

As a researcher doing Action Research I will clearly and deliberately be influencing the research setting along with the participant organisations, and engaging with my own values and pre-conceived ideas during both the fieldwork and later writing phases. This poses and requires different concerns about research quality than positivist research in either social sciences, or software engineering.

The implications of this for judging the quality of IS Action Research were analysed by McKay & Marshall (2000), which draw from but adapt research quality criteria in the constructivist/interpretive tradition of Guba & Lincoln (1989), and I will apply several of the recommended approaches such as Member Checking in this project.

Research ethics

In my previous experience working with CSOs, whilst open to collaboration and new ideas, they are also time and budget constrained and need to have pragmatic goals in mind. Thus, I believe the framing of a reciprocal relationship where I as researcher position the Action-Research in terms of the goals of the organisation, while they simultaneously cooperate in the reflective evaluation as an explorative research project, should serve as an effective basis to manage the researcher-participant relationship throughout the project.

This is discussed in terms of different positionalities of AR as an “Outsider in Collaboration with Insider(s)” (Herr & Anderson, 2005, p38), but in line with the authenticity criteria above may later lead to a “Reciprocal Collaboration of Insider-Outsider Teams” and the development of a 'community-based research culture' (Tacchi et al., 2003, p13).

Since I am unable to offer anonymity at the Organisational level, I have made extra efforts to explain the project to participants and get sign-off through a memorandum of understanding at the organisational level, as well as through individual Plain Language Statements. Further, I have made it explicit and will abide by a commitment to “bound” the AR studies to the organisations' interactions with the developing information systems in relation to their policy development work (Kayrooz & Trevitt, 2005, p315).

4 Tinderbox is a structured content development and analysis tool developed by Eastgate software (<http://www.eastgate.com/Tinderbox>).

Research timetable and progress

At the time of writing (July 2013), I am currently ~22 months through my PhD candidature, and having had both my research proposal confirmed by academic committee and received approval from my University's Human Research Ethics committee, I have begun fieldwork with my two partner CSOs after discussing and scoping out the project with their committees and/or project leaders. The aim is to complete this fieldwork by the end of 2013, and then final post-project evaluation and dissertation writing by August 2014.

While I would have ideally liked to progress the project to this stage more quickly, in hindsight a project that is both interdisciplinary and that adopts an interpretive research paradigm to investigate socio-technical systems, probably inevitably requires significant lead time to nurture and for the researcher to undertake a reflexive development process. In this respect, two key intellectual supports have been the discovery of the existing Community Informatics research tradition, and also undertaking an interdisciplinary Social Research Methods subject within my University's Geography department. The latter supported critical but respectful introspection on the strengths and weaknesses of different research paradigms, including interpretative and critical theory approaches.

So I now look forward to engaging in the fieldwork and working closely with my partner organisations to develop and reflect upon the potential of open source software as part of their work, and organisational planning. In this respect, it is an important time in Melbourne as we debate the merits of several multi-billion dollar proposed transport projects that will affect the lives of the region's citizens and environment for decades to come.

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