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Managing Community Knowledge to Build a Better World

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Abstract

Our planet faces many impending crises as a consequence of growing populations and rising affluence. Governmental bodies at any level seem unable to provide the leadership to mitigate these. It seems to be up to those in the community who are most directly affected to take the leadership. Yet, without access to knowledge and understanding, individuals and communities are powerless against administrative juggernauts that are all too often beholden to a few powerful individuals rather than the communities they are supposed to represent and support. However, the Internet and newly invented social and cloud computing technologies provide individuals with fingertip access to humanity's knowledge base; tools for extracting, evaluating, and sharing knowledge that is relevant to local needs; as well as tools for socially coordinating that action to promote and guide action. This paper reviews some of these tools and discusses how they can be applied for good or ill.

Keywords

Community action, cloud computing, socio-technical systems, governance, knowledge management.

INTRODUCTION

The daily news, any number of television documentaries, and mountains of scientific papers tell us that we face a number of looming human generated global crises that will inevitably have detrimental effects on our lives if they are not mitigated. These include such important and controversial issues as the depletion of non-renewable natural resources, unsustainable use of potentially renewable natural resources, and global warming and its consequences – climate change and the possible complete destruction of the ecosystem. Humanity must change tack where exploitation of our planet's limited resources is concerned if our civilizations are to have a future.

Governments around the world are aware of the problems, but irrespective of whether they are authoritarian or "democratic", they are often reluctant to act because of sensitivities to vested interests. These include limited-issue voting blocks and the interests such as those of super-wealthy miners, oil barons, military industrial complex, and land developers able to buy votes, control pressure groups or even buy politicians in order to prevent any restrictions on their exploitation (Brody 2005; Baker 2008). The influence of media barons is also not new, but the situation is exacerbated with the rise of propaganda organs such as the pan-Anglophone Murdoch press that uses its power to influence politicians and to bias and even invent "news" in apparent support of vested interests (Boaz 2011; Wright 2011). If we accept that this situation is likely to continue forward into the future the outlook for humanity would seem bleak.

The concepts we explore here are based on a fundamentally optimistic view of the future: that people are fundamentally rational (the alternative view offers little hope). When faced with a problem people will act rationally if they have the time and knowledge to make considered decisions. Unprecedented developments in information technology over the last couple of decades can empower grassroots people who will be most directly affected by deteriorating environments to combine and rationally work to mitigate impending changes. Individual and local communities can now access reliable knowledge and tools to influence governing decisions. The remainder of this paper explores the problem space where these tools may be most useful, developing an understanding of how access to computer-based cognitive tools changes the nature of individual humans and their social constructions. It also discusses some examples of existing uses, and some preliminary thoughts as to how individuals and groups can use the new technological assists to confront the big issues outlined above.

THE PROBLEM SPACE

We assume that if individuals fully understand what resources they and their society actually need for their continued healthy existence, they would try to change things within their power to mitigate adverse impacts. Thus we are concerned to understand how individuals and local community groups can gain the necessary knowledge to understand and control the environments and resources they need for survival. The new internet technologies are dramatically changing how single individuals and local community groups can gain and apply knowledge. Some of the ideas presented are still speculative; however, they do suggest ways ahead.

An anonymous reviewer reminds us that "Knowledge" is a problematic concept. Here, we are concerned with effective action. To be effective, action must be based on reliable knowledge. To be judged reliable, claims to know must be demonstrably connected to external reality. Our concept of knowledge comes from Karl Popper's (1972) evolutionary epistemology. He argues that no claim to know can be proved to be "true", but that a well tested claim is more likely to be close to the truth, or be more reliable than claims that are simply asserted. Our constructed knowledge can be improved through trial and error (Campbell 1960, 1974; Hall 2005, 2006, Hall et al. 2005, 2007). Reliability is best achieved in an *iterated* cyclic process of observing a problem of existence, proposing tentative solutions or theories, and criticising or testing the tentative solutions against the real world to eliminate those failing to give the expected results (see Hall 2005: Fig. 2). The result is a change to the overall problem situation, due to the fact that working solution(s) have been demonstrated for past situations that caused problems. Having reliable knowledge of the world confers the possessor with a certain amount of strategic power over the world, in that the knowledge can be used to inform effective action (Boyd 1996; Hall 2003; Hall et al. 2007; Osinga 2005). Popper also recognizes three ontological domains: world 1 (abbreviated here as "W1") that comprises the physical world of uninterpreted dynamics, world 2 ("W2") that comprises cognition and the subjective and dispositional knowledge of living things, and world 3 ("W3) that contains inertly persistent physical artefacts of knowledge (e.g., as codified in DNA, printing on paper, or bits and bytes stored on magnetic disks). In this framework "knowledge" is solutions or claims to solutions to problems in W1. Such knowledge may exist either in living entities in "subjective", "dispositional" or tacit forms (i.e., W2); or be codified into inertly persistent "objective" or explicit forms that may be understood at other times and places (W3).

Herbert Simon (1962, 1973) observed that complex systems are often hierarchically organized, such that they may be resolved into self-defining modules at several scales – what Simon called "nearly decomposable". Modules at the same (i.e., "horizontal") level of complexity are recognisable by lower frequencies of dynamic interactions between modules than within them. "Vertically", along a scale of increasing complexity, the dynamic interactions within smaller scale, smaller sized components take place more rapidly such that when seen from the viewpoint at a larger scale the dynamics appears to represent a steady-state. Conversely, the dynamics of a larger scale, larger sized entity are so slow that they provide a relatively constant environment. Thus a single unit at a focal level (a "holon") may be seen to consist of several smaller scale modules, or conversely, the single module at a focal level may interact with several other modules to form a larger scale module (Koestler 1978). Stanley Salthe (1985, 1993, 2004) extended the theory of hierarchical complexity. Systems are comprised of causally interacting components whose limits may be arbitrarily defined by an observer or may be to some degree recognizable by boundaries determined by their internal dynamics as described by Simon. It is these self-defining systems that interest us here. Human social systems are hierarchically complex. Identifiable, autonomous entities emerge at different levels of organization: e.g., community action group/community of practice < enterprise/ company < city < state < country < economy/society. Many have properties to define them as "living" entities in their own rights (Hall 2006; Hall and Nousala 2010; Maturana and Varela 1980; Nousala and Hall 2008; Urrestarazu 2011; Varela et al. 1974). Individual people form the lowest level components of social systems.

People, comprised of living cells, are living systems in their own rights, and work together socially to form larger scale social living organizations. We follow Simon's (1997) definition of organization as:

> the pattern of communications and relations among a group of human beings, including the processes for making and implementing decisions [i.e., the "structure" of the organization]. This pattern provides to organization members much of the information and many of the assumptions, goals, and attitudes that enter into their decisions, and provides also a set of stable and comprehensible expectations as to what the other members of the group are doing and how they will react to what one says and does [p. 18-19].

Large enterprises and government organizations serve as centres of power over many aspects of environmental concern, where decisions to apply that power are often bureaucratized and centralized in a few people who may be far removed from the problem areas. As Simon (1955, 1957, 1979, 1997) noted, organizational decisions are rarely completely rational, i.e., decision maker(s) rarely have access to all relevant knowledge and the necessary time to consider all possible courses of action to pick the best. Thus, the rationality of organizational decisions are bounded by what knowledge and time is available when they are made (Else 2004; Hall et al. 2007). This leads to what Simon called "satisficing" - a decision-making strategy that attempts to meet criteria for adequacy within the bounds of time, knowledge and cognitive capacity, rather than to identify an optimal solution.

In conventional governance, where decision-makers are separated by geography and hierarchy from the lives of people affected by their decisions, many decisions will prove to be sub-optimal or even catastrophic for those people, even though the decision makers may be acting with the best intentions. Even worse, in hierarchical governance structures where there are at best weak connections between affected groups and bureaucracy, vested media interests often have far more capacity to influence decisions than do the people most directly affected.

In the past, most people neither had access to appropriate information and knowledge, nor the capacity to strongly influence decisions – hence the centralization and bureaucratization of environmental and urban management. However, in the last decade or so, changes relating to the invention and explosive evolution of Internet technology can radically alter the relationships between local issues and centralized decision and action. Moore's law (Schaller 1997) suggests that the number of transistors that can be placed on a computer chip double every two years. The consequence is an exponentially growing power of personal technologies that is amplifying and extending the cognitive abilities of individual humans (Hall 2006a; Hayles 1999; Yakhlef 2008) that also extends the potential capabilities of local interest and action groups in relationship to the administrative juggernauts. The significance of these extensions will be explored in the next section.

REVOLUTIONARY TECHNOLOGIES REVOLUTIONIZE HUMAN ABILITIES

Building the Human Knowledge Base

In an organizational sense, knowledge may be tested and formalised or authorised for use by various institutional process (Hall and Nousala 2010a; Vines et al. 2007; 2010). To understand knowledge construction we need to understand how cognitive processes detect and eliminate errors. The external world impinges on the system boundary to create propagating disturbances within it (sense data or "observations"). Cognitive processes relate these to previous observations to form a view of changes (i.e., "information") that can be compared to what the entity anticipates from its prior knowledge of the world, i.e., to *test* that information and determine what it means (i.e., "knowledge"). This provides a cognitive basis for the well known Data – Information - Knowledge pyramid indicating the relationships between unconnected (sense) data, relationally based information, and tested solutions to problems (Ackoff 1989; Hall 2003; Bernstein 2009; Rowley 2007; see also critique by Frické 2009).

To see how our minds construct our own personal/ private know-ledge requires careful introspection that can suffer many biases of self-observation (Luhmann 1995). Following Popper (1972) self-criticism of knowledge claims is facilitated by objectifying the claims through moving them to W3 where they can be examined as external objects (Fig. 1). Also, once claims have been objectified, they can be criticised socially.

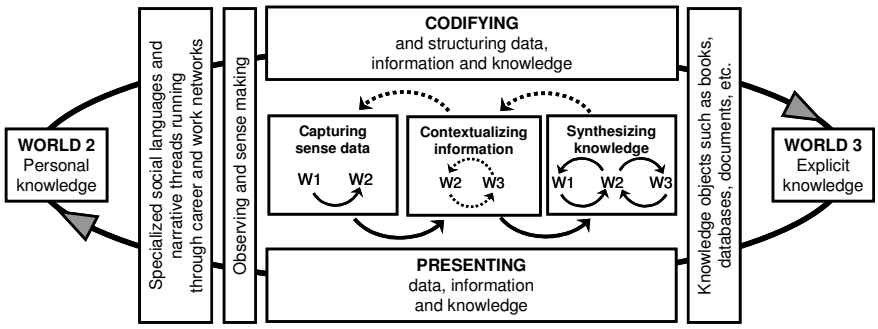

Figure 1. Knowledge processing at the personal level (after Vines et al. 2007, 2010)

Individuals create knowledge and make it explicit, where initially it has no more claim to authority than any other claim by an individual. However, in an organizational framework, social criticism provides further important steps in establishing the reliability of knowledge claims. Vines et al. (2007, 2010) identified three stages in the process (Fig. 2). As a claim to knowledge is circulated and shared within an organizational network (that may be virtual) at a higher level in the hierarchy, and other people become familiar with it, it can be called "Common" knowledge. The open source software movement is an exemplar notable for such social criticism and testing. Many organizations have established processes to further criticize and review documents towards determining their reliability and formalizing and authorizing them as organizational policy. Such cycles may be iterated many times for new versions of existing documents and the creation of new ones from what is already known.

More broadly, similar hierarchically structured knowledge constructing and testing cycles can be found in the world at large, where they have been elucidated for the develop-ment of the scientific and technical literature (Hall and Nousala 2010a; Vines et al. 2010) and community action (Hall et al. 2010). As shown in Fig. 3, knowledge can be im-proved through knowledge development cycles work-ing in at least three hierarchical levels before it is released into the "Noosphere" (Figure 3). Knowledge is problem solutions relating to particular contexts in W1. Individual humans are immersed in W1 contexts and construct knowledge via Popperian cycles and refer to knowledge in the Noosphere in order to meet their survival imperatives.

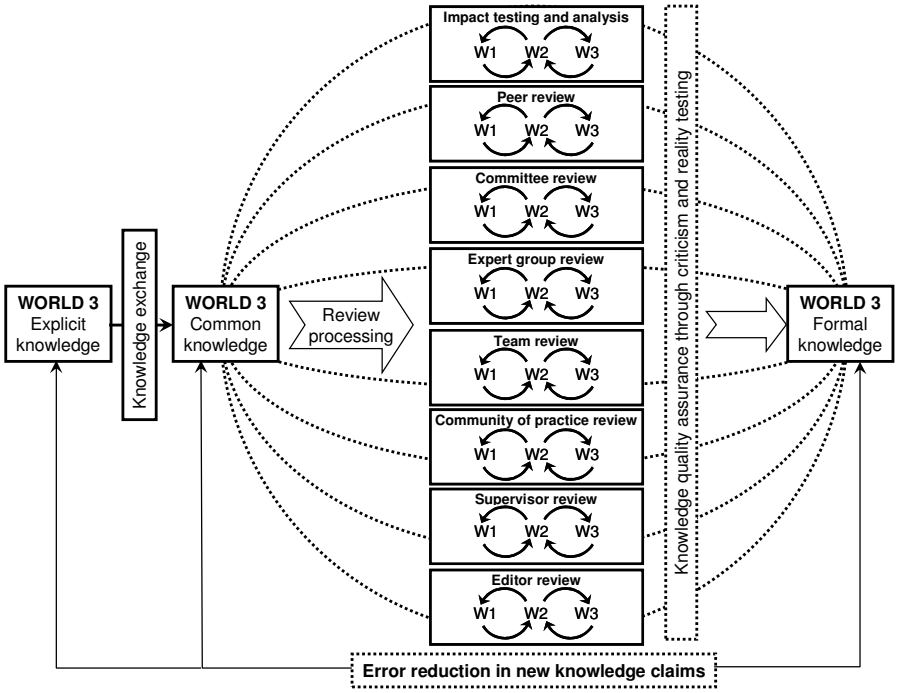

Figure 2. Formation of "authorised" or "formal" knowledge (after Vines et al. 2007, 2010).

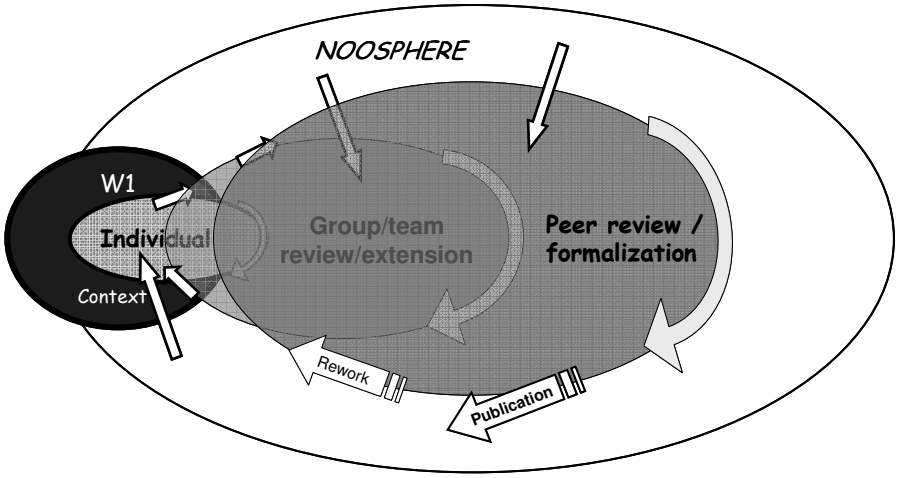

Figure 3. Knowledge cycles in governance (derived from Vines et al. 2010). Noosphere is the sum of human knowledge. Individuals, groups and councils all draw from and add to this store of knowledge as consequences of their activities. Curved arrows represent cyclically iterated knowledge building processes within the hierarchical level. Small straight arrows indicate knowledge flows between hierarchical levels of organization. Long straight arrows indicate knowledge flows from the Noosphere into the organizational hierarchy.

Where people are immersed in local knowledge-based organizations/ communities (i.e., community groups, CoPs) and share this knowledge *explicitly*, the knowledge is able to be subjected to additional criticism and testing where it can be considered to be "*Common*" in the community. For authorization that the knowledge can be considered to be reliable, it may be circulated to a larger scale organization, institution or professional body for formal peer review, before release to the Noosphere as "*Authorized*" or "*Formal*" knowledge. At any level in this knowledge building hierarchy, actors can compare the claims at hand with published knowledge already existing in the Noosphere. Scholarly and scientific publishing communities and *ethical* journalism all follow such reviewing practices to minimise errors in what is formally published.

When publishing was only done to paper, the content accumulated primarily in the world's libraries, but even major research libraries had limited physical capacities and could hold only fractions of what was published. Few people could readily access research libraries, and even then, they could physically hold for ready reference only a tiny fraction of what they could access. Most people, even though they knew their local contexts quite well, were condemned to remain more-or-less ignorant of what someone in the world already knew about the kinds of problems they faced.

In the last twenty years this situation has changed radically. Much of the world's formally published documentation has been scanned and is now available electronically on the Web to anyone with a personal computer. By July 25, 2008 Google claimed (Alpert & Hajaj 2008) to have registered over 1 trillion (1×10^9) web pages (after removing duplicate URLs!). They have also scanned and indexed most books in several of the world's major libraries. Probably most importantly, the major fraction of the world's current academic, scientific and technical literature is indexed via Google Scholar (both by content and by citations), with similar services being provided for journalism by Google News. Thanks to Open Access publishing and individual authors posting copies of their works to various open-access archives and repositories, probably around 50% of what is

indexed can be freely retrieved (based on our personal experience searching for knowledge in a variety of domains).

Today anyone with a computer, and able to ask the right questions, can in a few minutes determine from the Noosphere what is known about any problem under consideration. With an understanding of how to assess the reliability of any particular claims (as discussed above), the person can be armed to confront governing bureaucracies or see where gaps need to be filled. *This is an absolutely revolutionary "phase shift" in human history.*

Interconnecting Actors and Knowledge

Even when armed with access to the Noosphere via a personal computer, isolated individuals have little power to influence or change governing bureaucracies. Nousala and Hall (2008) note that the power of knowledge can be developed through emergent organizations of individuals having common interests, where the emergence may often be crystallized by a single motivated individual. To do this involves mastering tool sets and technologies relating to three additional phase shifts. Exemplary tools are listed below with a few comments. Details for all may be found using Wikipedia (http://www.wikipedia.org/). All these tools are freely available via a browser.

- *Social computing tools* to find people with similar interests, build groups and coordinate actions:
    - Facebook (http://www.facebook.com) allows individuals to advertise interests and ideas to the world; searching and networking functions allow like-minded people to make connections, communicate, share photos, etc.
    - Linkedin (http://www.linkedin.com) is a professional networking tool, allowing users to advertise their qualifications, make connections, communicate and share news within professional and disciplinary groups. Being based on professional and academic connections and referrals, Linkedin provides a more trusted platform for exchanges than does Facebook.
    - Meetup (http://www.meetup.com). Compared to the global extents of Facebook and Linkedin, Meetup helps people assemble *local* groups of people with common interests for face to face meetings, and provide them with on-line shared calendars, communications and news.
    - Twitter (http://twitter.com) provides people with a near real-time tool for breaking news and personal activities.
- *Cloud-based tools* are applications and services that can be accessed by users with little more than a web-browser. These provide individuals and groups with highly capable tools for authoring and collecting content, and constructively managing "eye-witness" observational data and assembled knowledge that can be built combining their own observations with what can be retrieved from the Noosphere.
    - Blogs (http://en.wikipedia.org/wiki/Blog). Some of the earliest cloud applications provided individuals with web-log or diary facilities to present their thoughts, graphical observations, and knowledge to the world. Facilities for outside commentaries and group authoring were soon added (e.g., see WordPress - http://en.wordpress.com/features/).
    - Wikis. MediaWiki (http://www.mediawiki.org/wiki/MediaWiki), initially developed for Wikipedia – a tool for collaboratively building knowledge bases. Google Sites combines blogging and wiki functions (http://www.google.com/sites/overview.html - see also Hall and Best 2010).
    - Google Docs (http://www.google.com/google-d-s/tour1.html) provides a gigabyte of cloud-based file storage for free (additional storage is available at very low cost), plus HTML–based text document, spreadsheet, and presentation authoring applications, and a variety of Apps & widgets that can be embedded in these. Enables group authoring with versioning and tracking functions.
    - Dropbox (http://www.dropbox.com) is repository system providing 2 GB free storage that can be increased to a free bonus of 8 GB by inviting other users to join the system (50 GB additional storage is available at $100/year). Provides versioning and tracking of modifications and mirrors copies of all shared content to all local computers involved in the sharing.
    - Zotero (http://www.zotero.org) is designed for shared access to formal documentation supported by the maximum amount of bibliographic metadata to assist indexing and searching functions. Currently offers only 100 MB free storage for documents (10 GB additional storage costs $100/yr).
    - Flikr (http://flikr.com) is one of several photo sites enabling the collection, sharing and publishing of a photographic record of the world together with associated textual comments. Provides 300 MB free storage (unlimited additional storage is available for $25/year).

  - YouTube (http://www.youtube.com/) is one of several sites for sharing video and aural records of the world, being used for everything from personal, news and educational videos.

- *Geospatial tools*: Thanks to global positioning technology the newer portable and hand held devices know exactly where they are in the world to determine exact locations of the people carrying them and to associate "eye witness" observations with precise geographical coordinates. Freely available mapping systems are then able to link from the geographic location back to the photographs, videos or other observations made at that location, e.g., as at 23 July 2011 Flikr's catalogue listed more than 153,000,000 geotagged items.
  - Global positioning (http://en.wikipedia.org/wiki/Global_Positioning_System)
  - Laptop computers, Smartphones (e.g., Apple iPhone - http://en.wikipedia.org/wiki/Iphone) and tablets (e.g., Apple iPad - http://en.wikipedia.org/wiki/IPad).
  - Digital photography (http://en.wikipedia.org/wiki/Digital_photography)
  - Geomapping applications (e.g., Google Maps – http://maps.google.com; Google Earth - http://www.google.com/earth/index.html).

Decision makers and actors with reliable knowledge of the world and access to appropriate resources can change the world (Hall et al. 2007, 2010) – for better or for worse.

SOCIO-TECHNOLOGICAL FRAMEWORK FOR COMMUNITY ACTION

As mentioned above, human social systems are hierarchically complex, where discriminable entities self-defined by their organizational knowledge can emerge at different levels of hierarchical organization. The revolutionary tools discussed above provide the basis for rapidly forming robust and powerful groups able to recursively accumulate and assess situational, theoretical and practical knowledge, and turn this all into decisive action.

- *Situational awareness* and the identification of problems is based on individuals' immersion in W1 and cognitive responses to it in W2. Subjective cognitive responses can be distilled into text (W3) supported by geotagged observations (W3 – i.e., photos, sound recordings, videos, remote sensing measurements).
- *Formation of special interest groups* ("communities of interest" - Nousala 2006, Nousala and Hall 2008, Nousala et al. 2005) sharing common interests and knowledge relating to similar kinds of problems can be greatly speeded by social networking tools like Twitter and Facebook, facilitated by tools such as Linkedin and Meetup, and formalized via membership-based tools like Meetup, discussion groups, and Google Sites (e.g., see demonstration by Hall and Best 2010).
- *Building understanding*: A lot we need to know is expressed in technical and foreign languages. The dictionary site, OneLook - www.onelook.com accesses a wide variety of general and technical dictionaries for quick lookup. Wikipedia provides extensive explanatory discussions on almost any topic. We have found Google Translate has made sites in Spanish, Dutch, and Japanese intelligible; and its Translator Toolkit (http://translate.google.com/toolkit) includes powerful tools for honing translations through live dialogues.
- *Building knowledge*: Rapid knowledge building can be facilitated by cloud-based tools. With tools like Google's Web, Scholar, and News, within hours of seeing a problem a person can assemble can assemble into a cloud-based repository (e.g., DropBox) what the Noosphere knows about the problem. With formation of an interest group individual findings can be virtually instantaneously "shared" with others via the cloud repository. Collaborative authoring tools offering controlled access such as wikis and Google Docs facilitate the collective assembly, construction and criticism of intersubjectively shareable documentation about problem situations and proposed solutions before fully developed ideas are released to the public.
- *Building influence*: Easily constructed websites or blogs can be used to advertise issues and solutions (e.g., see http://itsgettinghotinhere.org/), and direct access to more detailed websites and collections of documentation. Such sites can be advertised via Facebook, Twitter and web forums.
- *Enabling and supporting decisions*: Collective action is more effective than the uncoordinated activities of single people. Applications supporting group decision include such tools as SurveyMonkey (http://www.surveymonkey.com/TakeATour.aspx) that can quickly assess what the group thinks about particular subjects.
- *Applying actions*: How social technologies are used will depend on the kinds of actions contemplated. These can range from using social networking to organise rallies and get out the votes to support favourable politicians (e.g., Miller 2008) to overthrowing governments as in the Arab Spring (ref. Wikipedia - http://en.wikipedia.org/wiki/Arab_Spring) and perhaps integrating local action groups into governing bodies for observation, decision and action (Iramoo@VU - http://www.iramoo.org/ begins to approach this ideal).

SOME EXAMPLES

Following are three examples known to our own research community. Even though they are tentative steps, they illustrate a number of revolutionary functions working together.

- Riddells Creek Landcare's web site (http://www.riddellscreeklandcare.org.au/) built using Google Site's technology illustrates many of the possibilities discussed above, ranging from online solicitation and registration of members (.../join) and event calendar (.../calendar) to weed eradication (.../projects/weed-eradication/community-weed-mapping-project) and solar neighbourhoods (.../projects/solar-neighbourhood).
- Natureshare (http://natureshare.org.au/; https://sites.google.com/site/natureshareshelp/) illustrates the use of geotagged natural history observations to build distribution maps for flora and fauna. This is done in cooperation with the Victorian Department of Sustainability and Natural Resources and as data are accumulated over a period of time the site will provide a genuine resource for wildlife and conservation biologists working to protect natural diversity.
- Crowd sourced infrastructure monitoring – NeatStreets (http://www.neatstreets.com.au/; http://www.neatstreets.com.au/FAQ). NeatStreets shows the potential for interest groups to monitor aspects of infrastructure and the environment in close association with government organizations or authorities responsible for maintenance, but has not yet been adopted by particular interest groups.

WHAT COULD BE

The examples listed above show some integration of revolutionary social, cloud and geospatial technologies to support community involvement in mitigating impending environmental crises. However, these examples are only early steps towards building knowledgeable and capable sociotechnical systems for sustainably managing our planet's life support systems. We list here just a few of many areas where we think these kinds of socio-technical organizations could be effective:

- "Keeping the bastards honest" political monitoring and advising – making sure politicians genuinely represent their communities. Organized groups armed with reliable knowledge and understanding of what is at stake can counter misinformation and bias presented by politicians or media with vested interests.
- Hall et al. (2010) suggested that the new internet technologies provided the means for integrating local observation and action within higher level governing and administering organizations to move decision points closer to problem situations, minimising the problems of bounded rationality.
- Resource monitoring & management: NatureShare and NeatStreets provide models for the kinds of sociotechnical structures that could be used to closely monitor resource usage and misuse.
- Intelligent Transport Systems: In 2008, the transport sector accounted for 13.9% of Australia's total greenhouse gas emissions (ParlLibrary 2010), with road transport representing 86.9% of that (ParlLibrary 2010a); and in turn much of that is involved with moving people. Revolutionary internet technologies can substantially reduce the need to move people (1) by minimizing the need to commute at all by implementing sociotechnical systems allowing people to work from home, (2) by using social technologies to facilitate and coordinate car pooling and delivery services, (3) by making it easier for people to use bicycles, etc. Additional savings will come from reducing the number of new vehicles required to be produced.
- The preservation of community knowledge: Shaw and McGregor (2010) describe a methodology for surveying, collecting and preserving otherwise ephemeral personal knowledge of a local community about its history and experiences. Such approaches are being facilitated by such tools as YouTube and Flikr that support the collection of visual artefacts to support narratives.

DISCUSSION AND CONCLUSIONS

The revolutionarily new internet technologies can be used to enhance the formation and power of knowledge based organizations at the community level. Potentially, such community organizations should be able to work in new ways within the hierarchy of governance to effectively minimise existing bounds to rational decision making. Such community organizations can work to maximise the extent and quality of knowledge available to existing decision makers. Alternatively, or also, bureaucracies may be able to confidently delegate decisions and actions to community groups closer to the problem situations.

Sociotechnically empowered community organizations can potentially be used for ill (such as pressure groups led by vested interests or fanatics) or good. This is evidenced by the fact that such demagogues' achieve their persuasive powers through twisting, misrepresenting or even denying the real situation of the world. The Internet

offers access to what is now close to the sum total of human knowledge, and if people understand how reliable knowledge of the world is built, they can compare and falsify the demagogues'' claims with this.

It is true that we now have the tools to form powerful sociotechnical systems for monitoring, moderating and mitigating human impacts on the planetary life-support systems that sustain us. 30.2 percent of the world's population access the Internet (IWS 2011). Technologically literate high consumers having the most impact on world resources will be Internet users. What is signally lacking is public understanding of these new and tremendously powerful capabilities and how they can provide awareness of looming problems and the knowledge and means to mitigate them. This is an issue that the IT community needs to address with some urgency at all levels of society, from schools through secondary and tertiary education to community groups, agencies and governments. The knowledge to do this is "out there". We need to collect, advertise, and apply that knowledge.

Towards this end we are participating in an organization, the Kororoit Institute Proponents and Supporters Association, Inc. (http://kororoit.org) that has recently been formed to establish a cross disciplinary research and outreach organization focusing on the design and construction of sociotechnical systems able to manage and mitigate complex problem situations. The name of the proposed institute reflects our location in Australia's most rapidly growing outer urban area – where human impacts on the environment can most easily be seen.

ACKNOWLEDGEMENTS

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Note: this paper is intended to be read as an hypertext. All URLs have been checked as valid as at 6 October 2011.

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