Neocartography: Opportunities, Issues and Prospects

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Abstract

The general re-thinking about how to create and distribute information in a Web 2.0 communications world has changed how the general community thinks about information discovery, access and provision. They can now use consumer electronic devices to record, photograph, locate and map information without the need to consult a professional surveyor, geospatial analyst or cartographer.

The traditional model of formal - mainly governmental - collection, storage and publishing of information is now complemented by a less formal and more personal data collection and publishing model. This includes geospatial information.

This type of mapping has been called the 'GeoWeb', 'Volunteered Geographic Information' (VGI) and 'crowdsourcing'. From a cartographic perspective this type of mapping can be termed 'neocartography'. Neocartography facilitates data capture, processing and publishing using social software, available via Web 2.0. It empowers individuals – everyday citizens – to map their community, contribute to national and international mapping activities and to build and make freely available geospatial databases and publish their maps in a collaborative manner.

This paper addresses how neocartography, and the use of social software on everyday consumer electronic devices might be integrated with mainstream surveying and mapping practices to provide products that might be otherwise impossible to deliver due to economic and logistic situations. Neocartography is not about further developing or improving existing approaches, but about looking altogether differently at how data is collected, assembled, analysed and presented. It first provides an overview about how those involved in neocartography collect, store and generate cartographic products that supplement or complement their more conventional counterparts. It then addresses the opportunities, issues and challenges for the cartography and giscience community that neocartrography poses.

1. Introduction

The maps we rely upon, use and draw are now not just produced on paper. They are also produced on other media that complements printed paper maps. In the relatively recent move from paper to digital media for map publishing, maps were not just 'moved' from the paper medium to the digital, but a whole paradigm shift occurred. Cartography embraced New Media or integrated media – CD-ROM, the Web and other computer-generated and delivered resources to deliver innovative (and interactive) multi-media packages as well as individual maps that were produced using digital methods and delivered via contemporary communication systems.

Recently there has been another paradigm shift, this time leveraging on the powerful possibilities of Web 2.0 (O'Reilly, 2004), social software and relatively inexpensive consumer electronics-delivered tools that can be geo-enabled, mobile and incorporating media capture and generating tools. This has meant that the consumer can now be the data collector and map producer as well. This has changed the definition about what happens in cartographic production and information dissemination.

The advent of re-thinking how to create and distribute information in a Web 2.0 communications world has changed how the community thinks about information access and provision. The old model of formal - mainly governmental - collection, storage and publishing of geospatial information has changed into a less formal and more personal model, for some instances of geospatial information provision and map publishing.

Whilst Web 2.0, social software and consumer devices now provide a plethora of (geo)information exploration, measurement and recording devices, there are a number of issues that need to be addressed if maps are to be produced with currency, accuracy and integrity.

2. Neocartography

Relatively recently, maps have been published on the Web by user/producers using a process called 'mash-ups' with Web 2.0 and Social Software. Web 2.0 is the use of the Web by individuals and groups of individuals to provide and share information, including geographical information. It provides a new model for collaborating and publishing. Users are able to develop their own 'marked-up' maps by appending their overlay information as an additional layer of information, usually using the default symbology provided (and usually map pins are employed), to self-publish their maps via the Web. This has been given many names, including 'Neocartography'.

Maps produced through the process of mash-ups include the amateur map producer. This map producer has access to powerful Web 2.0 delivered software and resources, empowering them with the ability to produce and deliver maps that are both professional and current. Geographical information and base maps can be sourced from conventional providers – for example the Ordnance Survey (OS) of the United Kingdom has developed an API called Openspace which provides free data for non-commercial experimentation (http://openspace.ordnancesurvey.co.uk/openspace/) - and from non-conventional sources – for example Nokia Maps (http://europe.nokia.com/maps) or from OpenStreetmap (http://www.openstreetmap.org/), the organisation providing free data and maps that are produced by individuals who collaborate to provide a free geospatial resource.

Web 2.0 can be used to geo-code and access other resources, like photographs. For example, the *Flickr* personal image repository Web site (www.flickr.com) provides the ability for searches of images according to their location. Where image contributors have uploaded geo-tagged images, users are able to search for images based in not just content, but also the location of where the photograph was taken. These geo-tags can be just a placename or the actual latitude and longitude of the location of the image. These images can also be liked to *Google Maps*© or *Bing*©, and the location of the maps viewed as icons on the map.

In terms of mapping and the provision of data in a different manner, Google's Ed Parsons had this to say:

> *"we should not forget that they are simple and cheap approaches to providing greater levels of information to the citizen by allowing the citizen to carry out the analysis themselves.*
>
> *Another key point I made was that the next generation of citizens, "Generation Y"? if you like, are in many ways more open to sharing data, having grown up defining they characters on-line on mySpace and Bebo than today's. However this willingness to share data with others, even government, comes from the fact that as authors their "own"? their own data and are free to modify, correct and update it.*
>
> *For anyone delivering the citizen services of the future here is an important lesson - it is NOT your data, it is the citizens' and they must feel true ownership of it."* (Parsons, quoted in The Guardian, 2007).

3. Opportunities and potential of neocartography

Making and publishing maps and annotated imagery allows the general public and small organizations able to disseminate information more effectively than before (Cartwright, 2009). *Google Earth*® and *Google Maps*® have been used to publish maps by authors that range from individuals and to small environmental organizations. Environmental organisations that may have a relatively small voice have found that publishing in this manner is a most effective conduit for their information transmission. A spokesman for one such organization in Australia said:

> *"Google Earth allowed the group to more effectively convey the impact of logging, which had been difficult to do previously as many Tasmanian forest areas were closed off to the public". ... "For those people who don't go out to the forest a lot, it basically unlocks the gates," ... (Moses, 2006).*

By using data and information from the general public and by making digital information freely accessible via the Web outcomes that would otherwise not happen can result. This concept of making data freely available for problem-solving or by 'harvesting' information from Web users has been termed 'crowdsourcing'. In an article in *Wired* magazine Howe (2006) outlined this phenomenon. He commented about how the Web had changed where companies now outsource their contract work and how contract workers for certain work can be physically located anywhere, as long as they are connected to the Internet. He also noted how even outsourcing via the Internet had also changed – from outsourcing to crowdsourcing.

There has been much interest in using humans as sensors, and maps produced from these data sources provide can provide immediate and pertinent information (Goodchild, 2007a; 2007b; 2008). Maps produced from crowdsourcing data have been developed by formal scientific institutes and by novice geographers. An example of the first type of map is the MIT *Real Time Rome* project, developed at the SENSEable City Lab. It was heralded by MIT as a product that "promises to usher in a new era of urban mapmaking" … "The goal of *Real Time Rome* is to use this connectivity to map the city in real time, which may ultimately lead to a deeper understanding of how modern cities function" (MIT, 2006). The product had its worldwide debut at the Venice Biennale in 2006.

The latter type of product is exemplified by the map developed by Paul Butler, a *Facebook* intern. Butler developed a self-generated map package using data from the social network site. It shows the connections between 'friends' and, in so doing, a map of the world (via *Facebook* connected friends's vectors) was generated. About the results he said …"Not only were continents visible, certain international borders were apparent as well". The visualisation illustrates the lack of presence in central Africa and China. (BBC News, 2010). This particular map had no designer/cartographer input whatsoever, but it was generated automatically from *Facebook* connections data. Butler's visualisation is shown in Figure 1.

Figure 1. "Visualising Friendships", by Paul Butler. Source: http://sphotos.ak.fbcdn.net/hphotos-ak-snc4/hs1382.snc4/163413_479288597199_9445547199_5658562_14158417_n.jpg.

Crowdsourcing is not just related to collecting data. It is also employed for collaborative problem-solving. This has been called "The wisdom of the crowds" by James Surowiecki (2004). He says: "Ask a crowd, rather than a pair, and the average is quite close to the truth". Crowdsourcing was previously used in business a decade ago by companies like Eli Lilly Boeing, DuPont, and Procter & Gamble, who put their research questions to 'the crowd' (Dean, 2008; Lakhani and Jepperson, 2007). Lakhani and Panetta (2007) link this method of problem solving to sociologist Mark Granovetter's "strength of weak ties" (Granovetter, 1973), where "efficient networks are those that link to the broadest range of information, knowledge, and experience".

One example from the mapping and surveying community is a recent project by the Royal Institution of Chartered Surveyors (RICS) (GIM, 2011). RICS and the company Know Edge is assessing the usefulness of using crowdsourcing to improve land tenure security in poor communities. The research project focuses on removing the 'security-of-tenure' gap.

4. Issues

The use of Web2.0 as a means for providing geographical information presents different problems for cartography. There are issues to be dealt with that include:

- Design of map mashups;
- Equitable access;

- Choice of technology and communications;
- Privacy;
- Access to reliable data source;
- Ownership of geospatial data;
- The integrity of data - quality or integrity with non-cartographers map production;
- Maintenance;
- Data protection;
- Working with volunteer mapping organizations;
- Privacy intrusions and mobile mapping services; and
- Protection against unwanted individual citizen inclusion of their property or personal identity in image products.

These issues are elaborated upon in the following sections of this paper.

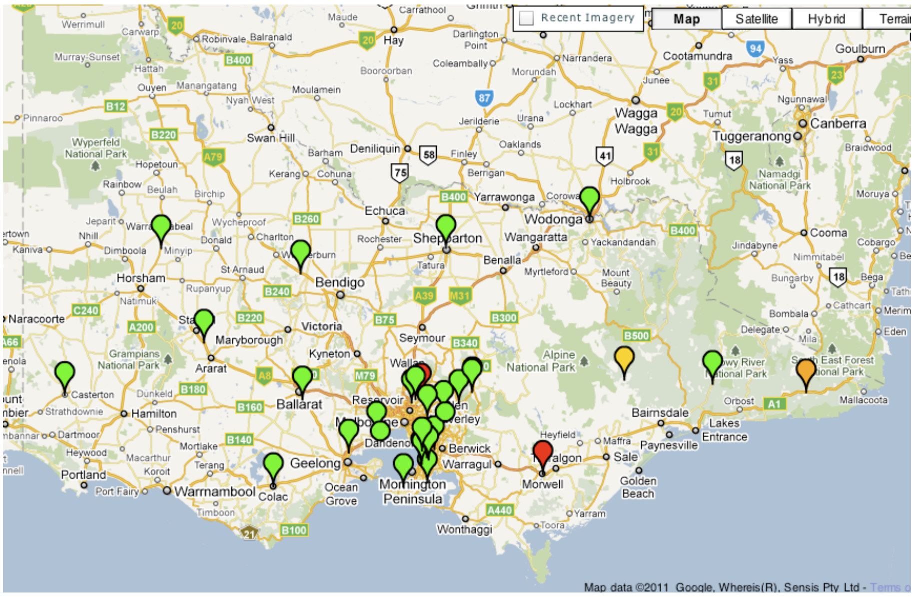
4.1 Design and map mashups

There are really no published specifications for producing maps using APIs (Applications Programming Interface). However, if 'good design' practices, and therefore, subsequently, good map design ensues, the possibility of producing usable and accessible maps can be addressed. Developing maps with (generally free) APIs is relatively straight-forward and applications are easy to implement. Interfaces are well designed, intuitive and methods are already known to many users. Using *Bing*® or *Google Maps*® has proven to be most useful for thematic map 'underlay' provision, upon which specific thematic information can be represented.

Maps produced in a matter of minutes using a *Google Maps*© - provisioned map base allows the user to become the producer. However, there is a proviso that must be noted - without real cartographic expertise awful, and in many cases, unusable maps can result. As with any mapping product good design is essential and form should not follow function. Good design is essential.

In a mash-up mapping world, maps generated and published via the Web are, in many cases, produced atop of *Bing*®, *Google Maps*® *et al.* and, therefore, are 'pre-designed'. By that, what is meant is that each map is similar, the same, ersatz maps substituting for unique, well-designed and focussed products. They are somewhat different from maps produced pre-Internet that provided a unique design solution for representing geography. Looking at three random applications of *Google Maps*® API applications, some basic errors can be identified.

The first example is the Australian State of Victoria Fires application that maps bushfire status. The site (figure 2) used the default *Google Maps*® symbology – map pins to show the location of fires. The design error here is obvious: fires do not just occur at a point, so the use of a point symbol is inappropriate. By considering just an elementary design rule: 'use area symbols for depicting area information" the map could have been improved.



■ SAFE ■ CONTROLLED ■ CONTAINED ■GOING

Figure 2. Victorian Fires application. Source: Broughall, 2009.

The second example is the Metropolitan Police Crime mapping site from the United Kingdom, which maps crime in the UK down to Sub-Ward level. This is an example of linking GIS with a *Google Maps*® API to generate a publically-accessible resource. At a small-scale (figure 3) the areas experiencing 'High', 'Average' and 'Below average' crime incidents are represented.

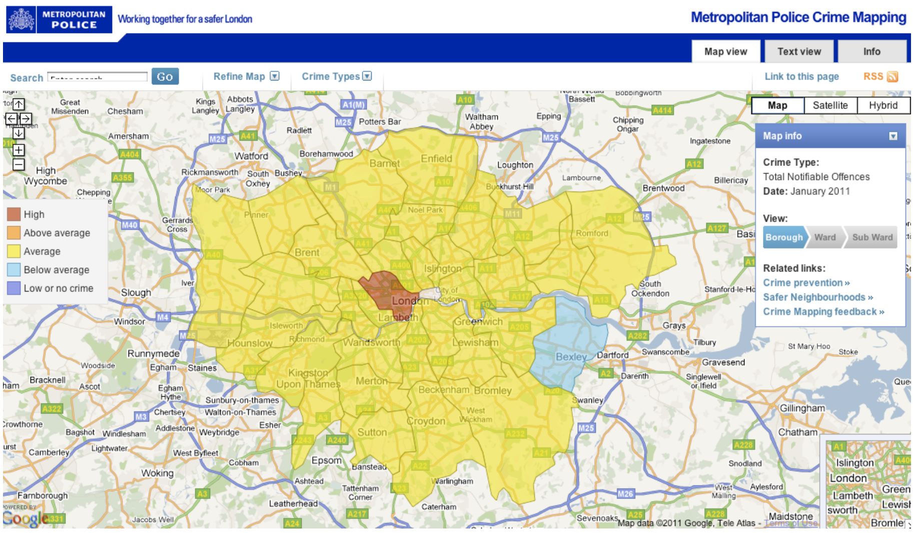


Figure 3. Metropolitan Police (UK) Crime Mapping – small scale. http://maps.met.police.uk/

However, when the map is made larger, by zooming into an area in London, the differences between crime data generated as polygons and the *Google Maps*® base map can be seen. In the larger scale map in figure 4, the area near the intersection of the A30 and the Thames River shows a hiatus in data depiction. A resident in this area is not able to visualise data for this area. The GIS polygons and the *Google Maps*® base maps cannot be aligned. For some types of data, especially when generated from a different mapping system and database may display a hiatus or overlap, providing the tool for user confusion. The use of *Google Maps®* base maps for all applications is not the panacea for all mapping solutions.

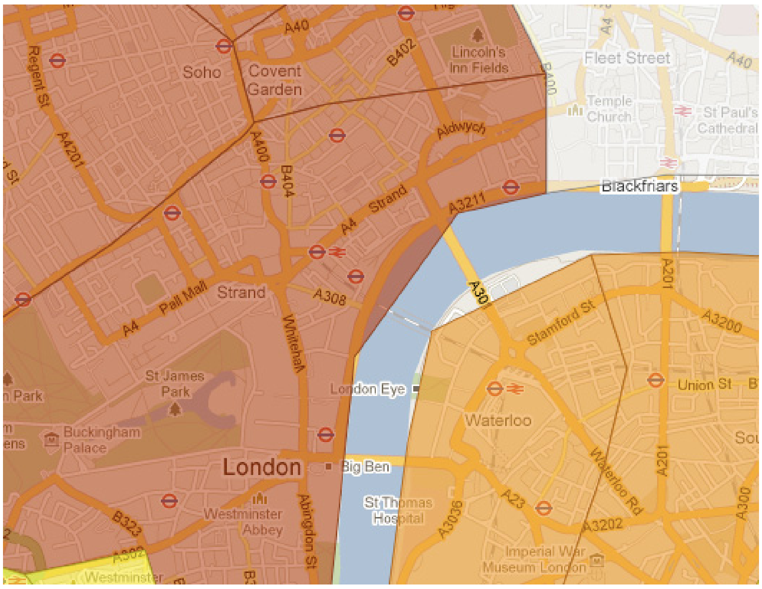


Figure 4. Metropolitan Police (UK) Crime Mapping – zoom to large scale.

The #uksnow Map application searches *Twitter* for real-time snow reports and maps composite locations. Users tweet with the hashtag #uksnow and add their location - a postcode, suburb or town name. The tweet can be geotagged. Included in the tweet message is a snow rating – from 0/10 for nothing - 10/10 for a blizzard, plus depth of snow and an attached image, if so desired. What results is a simple map mash-up using *Google Maps®* base maps (at left in figure 5) or *Google Earth®* imagery (at right in figure 5) showing a point location. The design issue here is the location of the point data and the default symbology used – the map pin. Some additional design input would improve the representation of snow in the UK.

Figure 5. #uksnow Map. http://uksnowmap.com/

The last example shows the problem of inability to scale information if the database and the *Google Maps*® base maps are not synchronized. The Rabbit Scan Web 2.0 site allows users to upload where rabbits are sighted. This is an excellent example of how everyday citizens (the crowd) can provide input into and build a database (via crowdsourcing) that would otherwise be impossible to generate economically or in a timely manner using conventional methods. At small scales (figure 6 (Australia-wide) and 7 (the Australian State of Victoria)) the application effectively uses the *Google Maps*® base maps. However, if the user continues to zoom into the maps (figure 8) to see exactly where the rabbit sighting was reported locally, the information disappears altogether. The application would be improved if users were only able to zoom to scales where information is available, reducing user uncertainty.

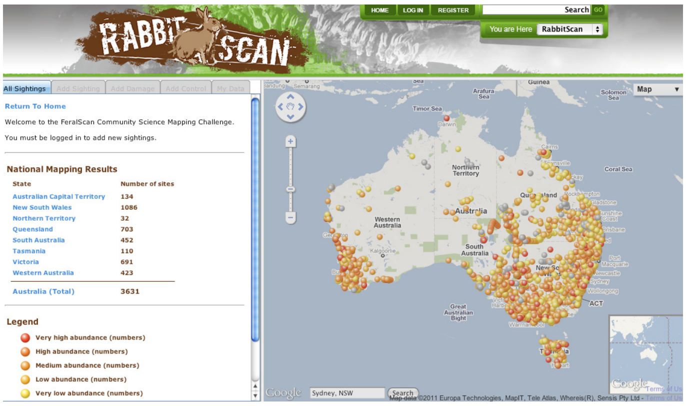


Figure 6. Rabbit Scan – Australia-wide. http://www.feralscan.org.au/rabbitscan/map.aspx

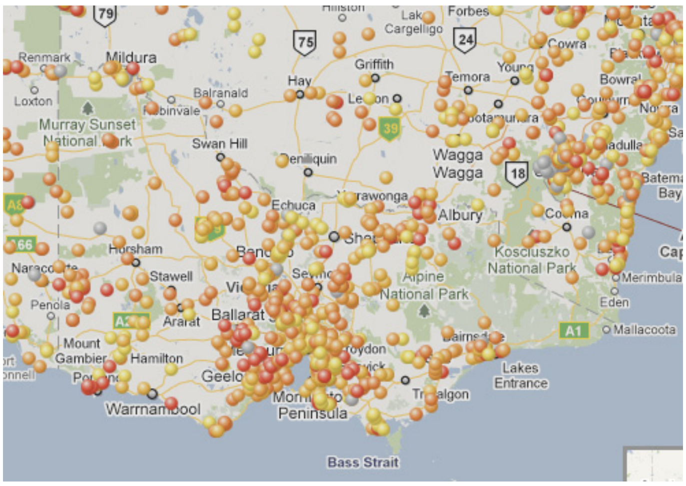


Figure 7. Rabbit Scan – Victoria, whole of State.

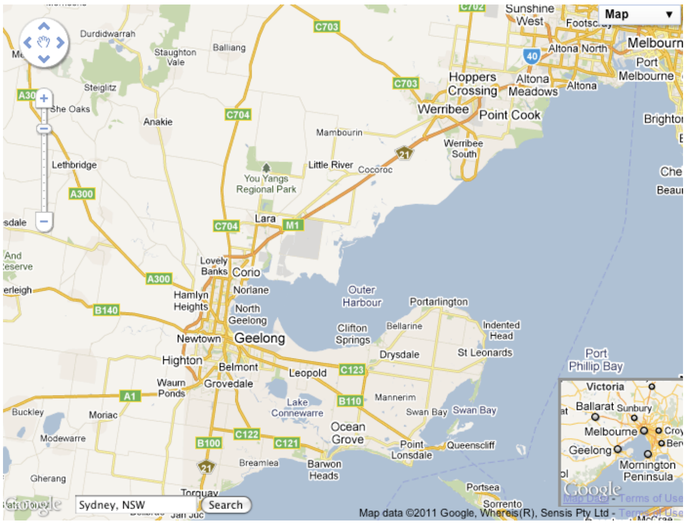


Figure 8. Rabbit Scan – Geelong, Victoria region. Sighting locations are not available.

A relatively small design input would have improved these application examples. The following sections provide general guidelines for improving thematic mapping packages that rely on API-delivered base maps.

4.2 Equitable access

Access to Web pages, and associated mapping components must be assured, regardless of many personal attributes. In the United States, Section 508 of the Rehabilitation Act amendments to the Americans with Disabilities Act (ADA) requires disabled people access to information (Jenny, 2007). Maps must be accessible (and usable), irrespective of age, technological haves and have-nots, social status, remoteness, cultural differences, religion, language; and literacy (including computer literacy).

The following sections of the paper elaborate on these issues.

4.2.1 Age considerations

Users now abound with different skills. Many young, new users, not aware of or attuned to the heritage of maps and mapping (and perhaps not caring about their ignorance) are buying and using maps and map-related services. There is a need to consider this group along with the 'older' generation of mapping product consumers. The way in which they use information delivery devices like computers (including computers that provide geographical information) needs to be appreciated. Also, different ways of access to documentation and package descriptions that support information use in different ways, but still complement established techniques and use, need to be developed, evaluated and tested. Consider the way in which children now have access to inexpensive digital devices and their power of computing and display. These users have different skills that need to be considered for general computer information access design and, from a cartographic perspective, how they might prefer to use maps differently. And, with older there exists the need to ensure access equity, irrespective of age and computer usage skills. This group of users need to be included in Internet map usage and appropriate strategies developed, as a means of empowering them to be able to use contemporary communications systems (particularly the Web) as an information resource.

4.2.2 Social status

New product design must assure access regardless of age, income, social status, remoteness, cultural realities, religion (especially where some Web-delivered materials must accord to regional or national religious dictates), language and literacy (including computer literacy). Many governments are courting technology and communication, and communication system-enhanced technology, as harbingers of a new information-provision era, one that requires little, or no, human input or interaction. In an age of 'The New Economy' governments have embraced such information-provision collages as means for providing an information-rich resource requiring resource-poor inputs (from the public coffers).

4.2.3 Technological haves and have-nots

Here, the focus is on ensuring that use of Web applications does not exclude anyone due to their access to technology or their social status. This has been referred to as the *digital divide* by Simon Moores (2005). In South Africa the percentage of the population with Internet access was 10.8%, or 5,300,000 in 2009 (Internet World Stats, 2009). A 2010 study by World Wide Worx and Cisco determined that wireless broadband was growing much faster than fixed Internet connections by a factor of 4 in the twelve months to 2010 (Benjamin, 2010). By comparison, in Australia 2009-09 72% of Australian households had home Internet access. This percentage increased dramatically from 1998 to 2008-09, where household access to the Internet quadrupled from 16% to 72% (Australian Bureau of Statistics, 2009).

The availability of access to suitable equipment and connections needs to be ascertained before designing a mapping application. Maps must be deliverable irrespective of whether users only have use of low-performance computers or low quality connections. As well, users must be assured that the use of the system does not require high-priced connections.

4.2.4 Remoteness

The assumption that Internet access is universally available cannot be made. In many countries Internet access is available in large cities, but this can disappear once the city limits are left. In planning for geographic information delivery or digital representation publishing an alternative medium should be provided in case no Internet access is available at all. Ensuring that access to information is also available on discrete media (CD-ROM, D-VD) or as a paper product to complement Internet-delivered digital publications is seen as good cartographic practice. As well, the differences between Web access in rural vs. urban areas needs to be considered in application design. In rural areas Internet access may only be available via dial-up communications systems and, if available, broadband data transmission might not be up to transmitting large mapping files.

4.2.5 Cultural differences (languages, icons, gestures, etc.)

Since the Internet is designed to provide 'access for all' information delivered must be free of any cultural bias. This can occur in the design of symbols and the language used in Internet publications. For example, the design of symbols should be made so that they are culturally independent. A source for considerations that should be made to ensure culturally independent symbols was proposed by Korpi and Ahonen-Rainio (2010).

4.3 Choice of technology and communications

A consideration regarding the delivery of maps via the Web is the decision about whether to have map image processing undertaken on the client-side (the browser) or the provider side (the server). For example, the *Google Maps®* API moves the bulk of processing to the browser, so as to produce a scalable solution (Gibin *et al.,* 2008). Whilst this is an effective way to manage processing, the reality is that the large datasets that need to be employed to generate thematic map overlays will not, in most cases, be able to be processed on the client's computer. Approximately 100 data points or about 1000 points making up polylines or areas can be processed adequately using the browser-side solution. However, this possibility does not come near the millions of data points that would have to be processed on the fly to generate a typical thematic may layer. As well, client-side processing would entail making available the entire this data set to the user, which may not be wanted if data security is an issue.

A solution can be to provide a high-end server solution, which may necessitate few simultaneous users. This may pose a problem for multi-user access. Pre-rendering of the data may need to be considered.

4.4 Privacy

When maps were only available as paper products the issue of privacy rarely was a topic of discussion in mapping agencies. However, now that users go 'on-line' or 'mobile on-line' to retrieve mapping products, privacy becomes an issue that map providers and publishers need to consider. If some personal information is requested from a user to access a mapping Web site, or if a user's location needs to be tracked for the delivery of a mobile mapping application 'at location', then privacy and security of the user becomes a responsibility of the map provider/publisher. For mapping, users do need to be aware what the limitations are when they use a site and what possible consequences might result.

There are numerous privacy issues related to the use of new electronic devices for capturing storing, processing and representing information, including geospatial information. There are issues that we must address to ensure that we protect the users of what we provide.

4.5 Access to reliable data sources

Governmental influences can affect the availability of Web 2.0-delivered information. In early 2007 the Government of China blocked photo sharing on *Flickr*, the photo sharing Web site, after photographs of Tiananmen Square were uploaded to the site. And, in 2009 *Twitter*, *Flickr* and *Hotmail* were blocked on the 20th anniversary of the Tiananmen Square event (Branigan, 2009). If uninterrupted delivery of thematic maps relied on the availability of Web-provisioned base maps to function, then similar 'blockages' would render them useless. Therefore, if the delivery of a mapping application depends upon a number of different sites to 'populate' a composite Web 2.0 product, certainty of data provision must be assured.

4.6 Ownership of geospatial data

There has been a movement of data repositories from just government resources to private industry with companies like Google and MicroSoft purchasing massive amounts of geospatial information. The model of data collection, storage and distribution has changed. Non-public organisations now control massive amounts of data and provide it, in many instances for free. But, will this continue to be the case that information is freely accessible and made available for no cost? And, are users being provided for data now, with future access perhaps attracting a fee? Some uncertainty does exist with this private sector data model.

4.7 The integrity of data - quality or integrity when non-cartographers make and distribute maps

When accessing geospatial information from public sector repositories users were assured that the data had been properly collected, maintained and updated by responsible authorities. This is an area of major concern, and much debate. For example, Mary Spence was interviewed on the BBC in 2008 (when she held the position of President of the British Cartographic Society) about Internet maps (BBC, 2008) and she criticised the lack of content in some Internet-delivered maps. This caused much talk on Blog sites that focus on Web mapping, like Google Earth Design (http://googleearthdesign.blogspot.com/2008/09/gis.html) If users do not trust maps and geographical data delivered via the Web *per se*, then they may not trust data delivered by from any source, including reputable traditional information providers.

For example the Ordnance Survey states "We make an average of 5,000 changes every working day to our large-scale map data of Great Britain" (The Guardian, 200?). These government or quasi-government sources of information have been trusted as custodians of geographical information and the actual payment for this service comes from the public purse and from user payments and royalties. But how is the quality or integrity of data assured by commercial or collaborative data provision resources.

The OpenStreetMap organisation (www.openstreetmap.org) incorporates a number of quality checks in its data collection to delivery system. It actively encourages data collectors and mark-up collaborators and users to check the quality of their data and to make changes if necessary (CloudMade, 2009).

One Blog site that looks at mapping provision via the Web and its application to local search had this to say about map accuracy and Web-delivered products:

> *"Geocoding errors and data quality seem to plague most mapping applications, but are especially pernicious in Local Search, store finders, brand finders and other systems that pretend to deliver consumers to buying opportunities. Open almost any Internet mapping application and look at some areas you know, and you will find map errors, geocoding errors and other data quality errors. How can it be so bad?"* (Dobson, 2009).

4.8 Maintenance

Linked closely to the previous topic is the issue of data maintenance. We assume that traditional custodians of geographical data maintain their data to acceptable standards. But, do the 'new players' in geospatial information provision also maintain their data to the same standards that the users of 'traditional' data repositories expect? This issue also relates to map data user and map user's confidence in the data supplied or the map generated from non-traditional data repositories.

4.9 Data protection

When data is placed on a server and made accessible through the Internet, or able to be rendered via a Web browser the data is placed in the public arena. Many mapping and geographic data provision sites are protected in some way, by password, computer location interrogation, etc. However, in many cases the database is unprotected and open to computer scientist 'mischief'. This might take the form of copying a map image, downloading data files illegally or without payment or through the theft of the data 'behind' a Web image presented.

One example of the theft of data through the last example is data 'scraping'. It is the process whereby a Web page source code is interrogated automatically and data intended to generate screen or printer output is extracted and a new data file created. This bypasses completely the need to access databases directly and subsequent payment or authorisation by the data owner. Data is scraped from general Web sites of from search engines.

This obviously is of great concern to organisations and individuals who generate Web maps and do not wish to have their data copied in this way. For repositories where free access and use of data is possible, but for organisations that sell or licence data this should be of great concern. Added to this problem is that of attribution. If data can be scraped and another mapping product generated from this data, it would be possible for another product to be generated and published with no reference whatsoever to the original data source or provider.

4.10 Privacy intrusions and mobile mapping services

With the massive growth of information that is geotagged and the ability to transmit and receive maps and geographical information via the mobile Internet, through the use of mobile telephones and wireless devices, the consumer electronics industry has developed enormously. The general public are now offered a plethora of devices and associated applications that are geo-located or referenced. Location-Based Services (LBS) and 'at location' mapping, where maps are delivered where and when needed using wireless technology, have now become ubiquitous. But, there is a trade-off of information accessibility for privacy (Cartwright, 2007). As these devices, in many cases, are always on a service provider can continually track the user. This issue is perhaps one of the sleeping problems of mobile geographical information services that might cause problems in the future and limit the success of maps delivered via this medium.

4.11 Protection against unwanted individual citizen inclusion of their property or personal identity in image products

Another privacy problem has arisen with data capture for *Google StreetView©*. When collecting imagery not only inanimate objects like buildings are captured, but also people in the street are also photographed. This has led to concerns about privacy and the unauthorised photographing of individuals (Barnett, 2009; Kang, 2010). . Contributors to the Blog site *Boing Boing* asked whether they would be concerned if the CIA were collecting such information in pubic places, rather than Google, would the public accept it? (*Boing Boing*, 2007). Whilst the technology works for capturing and presenting streetscape images, the acceptance of the product depends upon the public's perception of the security elements that are included to protect their personal space.

In some instances individuals have contacted Google to request that their image or property be removed from the site. In response to the public's concerns about privacy, *Google StreetView©* has blurred the faces or people captured in its imagery, as well as other identifying items.

One interesting sideline is that some street signage, like Kentucky Fried Chicken's (KFC) advertising that includes an image of Col. Sanders (the founder of the company), has had this facial feature blurred as well. *Google Street View©* said that this was done because he is 'a real person' (*The Telegraph*, 2009).

These considerations covered in Section 4 of this paper are by no means exhaustive. However, they are indicative of the range of issues that need to be addressed if neocartography products are to be monitored for quality and subsequently improved.

5. Prospects

When one thinks of visualising a space one thinks of maps. They work, but 'conventional' maps may not always the most appropriate artefact. However, there are now new players in geospatial information provision whereby consumer electronics companies like Nokia have purchased mapping companies. As well as Google wanting to enhance its advertising potential and MicroSoft its profile in computer software through a Web presence, other players are now also part of the geospatial industry. For example, TomTom purchased TeleAtlas and Nokia acquired Navteq. The potential of enhancing consumer electronics with geographical information is now evident in advertising about what these devices can now do. The existence of base maps and freely available (and free) software now means that anyone with reasonable skills and access to Web 2.0-delivered tools can be a map publisher. Professional cartography still exists, but neocartography provides a different route to data access, map production and map publishing.

Neocartography offers the professional mapping and surveying community alternative methods for data capture and map publishing. The methods are different, and they complement what is done by professionals in the geospatial sciences. The world of 'neocartography', that loosely-linked and organised community of collaborative cartographer - individuals that volunteer geographic information – and social software, delivered via Web 2.0, might be a prospective partner for 'mainstream' surveying and mapping.

Different methods of mapping are producing the analysis and mapping of not just physical geographies, but also human landscapes. For example, a mapping application developed at University College London's Centre for Advanced Spatial Analysis (CASA) undertook a project that used crowdsourcing to map Anti-Social Behaviour in East Anglia, UK (Crooks et al., 2009). They wanted to map things like "peoples perceptions on: fear of household burglary, quality of local schools, who would you vote for?" (CASA, 2009). They developed an application called *MapTube,* which combined the idea of *YouTube* and their software *GMap Creator* to produce thematic maps. A pilot study was undertaken to generate a "mood map" of the credit crunch for the United Kingdom. This was done with the UK's BBC Radio 4 iPM show (Hudson-Smith et al., forthcoming).

Finally, things have changed with how traditional map data providers make available their data. The Ordnance Survey (OS) has recognised that "… it will face increasing competition from commercial rivals to deliver geographical information services to the public sector and others" (Ordnance Survey, 2009). The OS has developed a new Business Strategy" and one of the five key areas that has been addressed is to "Promote innovation for economic benefit and social engagement" (Goal 1). Here the OS will provide additional data and usage rights for "publicly accessible applications" by providing free data at scales from 1:10,000 to 1:1,000,000 million, as well as official boundaries information (Ordnance Survey, 2009).

6. Conclusion

Neocartography, where products are produced and delivered using Web 2.0, offers the potential for providing geographical information in a collaborative, shared manner. Already the impact of maps via Web 2.0 has been felt by the ever-growing number of maps being published as collaborative products via mash-ups.

For the cartographic community this provides both opportunities and issues that need to be addressed. The opportunities include the ability to include the amateur cartographer in the map production equation, so as to benefit from these members of the cartographic community who can contribute greatly to mapping endeavours. By sharing resources more effective procedures can result and the amount of geographical information available can be increased. But, there are a number of issues that need to be addressed if the potential of neocartography is to be responsibly exploited. Some of these issues have been covered in this paper. It is hoped that they might be further explored.

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