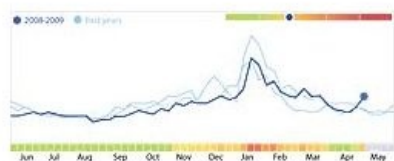


THE CONCEPT OF CROWDSOURCING AND ITS APPLICATIONS

Citizen Mapping and Charting (Part 1)



Since the dawn of time people have been making maps. Such mapping was initially done by anyone and everyone. Eventually mapping became the domain of skilled map makers. Then technology changed the game. GPS, digital cameras and broadband internet arrived, and now many successful environmental mapping projects are largely carried out by volunteers, a variation of the phenomenon now known as crowdsourcing. The pace of volunteered geographical information (also known as Citizen Mapping) goes on with or without the involvement of mapping agencies. But what about Citizen Charting? And how may hydrographic organisations be enticed to get involved and help steer efforts?

Mapping and charting agencies might find it useful to investigate alternative methods

for getting good map and chart data out to users. If citizens are willing to help, perhaps we should give them the tools they need such as protocols, standards and a means to do this.

Revolutionary Changes

Over the past three decades the world of mapping and charting has undergone multiple revolutionary changes. Nautical charting in particular has undergone industry-changing epochs. The switch to digital sensors, for example, opened up data processing to far more efficient computerised data production. It also opened the door for extensive and effective use of built-for-purpose GIS to prepare manuscripts ready for chart printing and then later for the organisation of the underlying data to be used in electronic chart display and information systems and electronic chart systems. GPS in particular led to a fundamental change in how surveys were conducted and greatly simplified a logistically difficult part of the field survey operation. Much more importantly, it allowed chart users to see the nautical chart in a different paradigm - and continuous situational awareness became routine. Improvements have come in incremental steps and in paradigm-busting leaps such as with GPS and multi-beam sonar. The mapping community has become so used to implementing and adjusting to these changes that several questions are always in the air: What's the next big change? Where will it come from? What will it mean to how we do things now? What traditions will we retain and what will we cast aside?

I believe we are on the cusp of another revolutionary change at the moment and it is coming from a direction that few would have suspected: the untrained but committed nascent amateur mapping community. The change has already been profound on the land mapping side, particularly in the niche market of road networks.

The revolution is being led by a well-educated, committed and cause-driven society of users who have the wherewithal to simply step around large mapping agencies and governments and do things themselves. Furthermore, this work is being done, by and large, by a specific demographic: younger, hipper, more socially aware and concerned and, crucially, the most technology savvy generation - the post-boomers, post-X-Gen, under 25s who live and breathe in their uber-connected universe. They are very active, they are very connected, they are very creative and they like to make things. They are very quick to figure out how to do things - and then share that knowledge with everyone else. And every day they get better and better. And now they have invaded our cosy little world. What to do?

OK, I'm Worried

First off - don't panic. In some ways what is going on is not all that different. It is relatively easy to convince oneself that in fact there is nothing different at all. After all, haven't we always had a committed core of citizens who are very active and like to participate in the management of their society or locale? This is in fact what is now called 'crowdsourcing'. Jeff Howe, the author of the best-selling book *Crowdsourcing - Why The Power Of The Crowd Is Driving The Future of Business*, coined the term 'crowdsourcing' in an article in *Wired Magazine* in June 2006. "Crowdsourcing is a distributed problem-solving and production model. Problems are broadcast to an unknown group of solvers in the form of an open call for solutions. Users - also known as the crowd - typically form into online communities, and the crowd submits solutions. The crowd also sorts through the solutions, finding the best ones." That is the definition offered by Wikipedia on 16 September 2009.

You know, the encyclopaedia created and managed by a crowd of unknown contributors. Wikipedia is an example of the Open Source Movement. The date is important, as Wikipedia is an evolving story, written by a pen that never stops moving. If you don't think that crowdsourcing could affect your business consider Microsoft: for years it was the sterling example of an iron-plated organisation immune to the threats of any upstarts. Then Linux came along: one of the most prominent examples of free and open source software collaboration.

Crowdsourcing

Howe's book goes into great detail about how crowdsourcing has changed certain markets and gives many examples showing how the phenomenon has worked spectacularly well and also some cases where it fell on its face (see text box for a few examples). Some of these examples take advantage of the fact that there is an army of volunteers available for the right cause as long as suitable motivation is provided (a common goal deemed important to a segment of society), along with easy-to-use tools (web access, GPS), suitable feedback and correction mechanisms so the crowd can learn and it can be done in one's spare time. Many of the most profound examples have a strong spatial element.

Citizen Sensor

The internet, mobile phones and GPS - all can be used to make a number of useful applications that utilise spatial data in innovative ways. They have been adopted by the new generation and harnessed to accomplish tasks that have previously been the domain of government institutions. A cadre of well-educated and knowledgeable citizens is now developing its own sensors, conducting its own surveys, analysing its own data and publishing it online, usually in real time to an open-access website that anyone can view. Not only is this being done but it is also being done with breathtaking innovation and creativity.

For example, a group in California developed GPS-enabled air sensors so small they are fitted to the backs of carrier pigeons who are released at key points to travel across suspected 'hot' sites. The data are transmitted wirelessly in real time to a website where they are displayed instantaneously (see Figure 2, website 1). Do this every day for a month and you have compiled a serious and credible environmental impact profile of virtually any region you care about.

Do you think that the dumpster you pass on the street may contain lead, asbestos or some other toxic substance? Then simply plunk your cell phone/sensor into the pile and the toxicity, time and location are transmitted automatically to a public website. Sensors such as this are under development at various research institutions around the world (website 2).

This movement is known as Citizen Sensor and we will see more and more examples of it. Such developments place serious challenges to public institutions charged with providing credible arms-length environmental monitoring.

Sharing Information

Citizen activists love to share information. They know that's how you can build a crowd and then a consensus for action. The internet provides the perfect forum; everybody has access and one can dip in at any time of day or night to make a contribution to the debate.

Countless websites let people know what to do in their city, what's good or not so good. Nokia makes an experimental cell phone that transmits the location of crowds of vehicles containing these phones travelling in traffic. The system monitors the average traffic speed and feeds this information back to the vehicles allowing drivers the option of selecting a different route. The system is completely transparent but takes advantage of a crowd of drivers passively supplying traffic density data in real time to a central site for processing.

Clever use of different websites can create a 'mash-up' - and young people love mash-ups. For example, if you're in Berlin and have your friends listed on some social network site then one application (see Figure 3, website 3 and 4) will look at where you are (cell phone location) and where your friends are (ditto) and tell you if you are within walking distance of a friend. If so, you can send them a text and have coffee together.

Examples of the Crowdsourcing Phenomenon

Mob4Hire.com and uTest.com provide a crowd of testers for companies wanting to test software and mobile applications. They are all commerce-driven and make payments to volunteers. The crowd in these cases is being paid but the call for volunteers is made via a general call for anyone interested - no matter where you reside. ShareYourBrain.com asks the crowd to provide creative solutions to problems posted by specific customers.

Google.com employs crowdsourcing methods in most of its endeavours. The heart of PageRank, its indexing algorithm, simply looks at what other people think is useful. Based on the same principle used in evaluating the scientific merit of a published article, i.e. how many times has it been cited, the value of a web site is ranked by the number of other web sites that cite it (link to it). The more people that link to a site the more important it must be. Google also employs clever passive crowdsourcing techniques. That is, simply track the nature and trends in searching and use this information for marketing and pricing information. An interesting, but non-commercial example of this kind of passive crowdsourcing is that Google has demonstrated its ability to detect an outbreak of influenza before national disease control agencies have tracked it, as they found a close relationship between how many people search for flu-related topics and how many people actually have flu symptoms (see Figure 1).

NASA used the skill sets of thousands of amateur planetary geographers to classify features on the Martian landscape; again a task largely undoable in-house due to its scale. NASA simply posted the [Martian imagery](#) on its website, provided some tools and guidelines for how to classify specific features and then let the crowd roll on.

The [US Geological Survey \(USGS\) National Map Corps programme](#) invites members of the public to review map sheets they are familiar with and locate items of interest to add. USGS provides an easy-to-use web service so that volunteers can add features they have geolocated with their GPS. The programme provides USGS with thousands of amateur map updating volunteers whose only wish is to improve the quality and up-to-datedness of their favourite map sheets.

More Information

- Crampton, J., 2008. Mapping Without a Net: Neogeography in the 21st Century. Global GIS Academy. Virtual seminar session: Neogeography (8 4).
- Goodchild, M.F., 2007: Proceedings of the Workshop on Volunteered Geographic Information, 13-14 December. University of California, Santa Barbara. [Available online](#)
- Howe, J., 2008: Crowdsourcing: Why The Power Of The Crowd Is Driving The Future Of Business. New York: Crown Business Group.

In [Part II 'Citizen Mapping and Charting'](#) you can discover how crowdsourcing is helping to revolutionise mapping and charting.

<https://www.hydro-international.com/content/article/citizen-mapping-and-charting-part-1>
