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Volunteered geographical information, crowdsourcing, citizen science and neogeography are not the same

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Abstract: The terms user-generated content, volunteered geographical information, crowdsourcing, citizen science and neogeography are elucidated. The purpose is to expose the range of meanings associated with these terms, and to promote consensus as to their scope and meaning, thereby enhancing the clarity with which discourse around these phenomena may occur, both in the research and popular context.

Keywords: Citizen science, Crowdsource, Neogeography, User-generated content, UGC, Volunteered geographical information, VGI

1. Introduction

The concepts of volunteered geographical information (or user-generated content), crowdsourcing, citizen science and neogeography are sometimes confused with one another. For example, in the conclusions of the opening chapter to their handbook, Capineri et al. (2016) imply that crowdsourced geographical information and volunteered geographical information are the same. In the next chapter, Capineri (2016) is explicit, stating "crowdsourced information, namely volunteered geographic information (VGI)". We show here that volunteered geographical information, crowdsourcing, citizen science and neogeography are not the same, providing examples of the differences.

While they can overlap, each of these concepts has its unique characteristics. The following definitions are primarily from Oxford Dictionaries (probably the premier dictionary for English).

- New media: "content available on-demand through the Internet, accessible on any digital device, usually containing interactive user feedback and creative participation" (Wikimedia 2016); or "developing forms of media, usually electronic, regarded as being experimental" (Dictionary.com 2016).
- User-generated content: "denoting or relating to material on a website that is voluntarily contributed by members of the public who use the site" (Oxford 2016). This definition is rather limited when compared to that of Wunsch-Vincent and Vickery (2007), as discussed in Section 2.
- Crowdsource: "obtain (information or input into a particular task or project) by enlisting the services of a large number of people, either paid or unpaid, typically via the Internet" (Oxford 2016).
- Citizen science: "the collection and analysis of data relating to the natural world by members of the general public, typically as part of a collaborative project with professional scientists" (Oxford 2016).
- Geospatial: "relating to or denoting data that is associated with a particular location" (Oxford 2016).

Oxford (2016) does not define neogeography, but defines neo- as "a new or revived form of" and geography as "the study of the physical features of the earth and its atmosphere, and of human activity as it affects and is affected by these, including the distribution of populations and resources and political and economic activities" (Oxford 2016). The term neogeography has been dated back to 1922, when it appeared to refer to a field that was new and emerging (Haden 2008), which is really the literal meaning of the term.

Oxford (2016) also does not define volunteered geographical information (VGI), or geographical information, but defines volunteer as "offer (help) freely" and ISO 19101 (2002) defines geographic(al) information as "information concerning phenomena implicitly or explicitly associated with a location relative to the Earth". Hence, VGI could be considered to be user-generated geospatial content, or user-generated content with geospatial components.

2. User-generated content

There is no widely accepted definition of user-generated content (UGC), and maybe there never will be. As with many concepts in information technology, UGC is interpreted in different ways, and one woman's user generated content could be another man's professionally generated content (Cooper et al. 2010). The Organisation for Economic Cooperation and Development (OECD)

defined user-created content (UCC) (their term for UGC) as:

1. content made publicly available over the Internet,
2. that reflects a "certain amount of creative effort", and
3. that is "created outside of professional routines and practices" (Wunsch-Vincent and Vickery 2007).

Their second criterion could be considered controversial, as the public frequently contributes content without any creative effort, such as depositing material on file sharing sites. Gervais (2009), who built on the OECD report, considers such content to be peer-to-peer as UGC. The third criterion of Wunsch-Vincent and Vickery (2007) is nominally useful for differentiating user-created from professionally-generated content, though they acknowledge it is getting harder to maintain this distinction as some amateur content providers obtain sufficient status to then get paid for providing the same content for a media Web site, and some professional journalists also have their own 'informal' blogs. Further, the professional media often use and solicit UGC.

Pervasive, cheap (or free), easy-to-use and intelligent Web services empower users to develop, rate, combine (eg: mashups) and distribute content on the Internet; collaborate with peers (known and unknown, with common interests or not); and customise Internet applications. This is the basis of the participative Web (Wunsch-Vincent and Vickery 2007). Gervais (2009) feels that even as a mere conceptual cloud, the term UGC is useful for considering the societal shifts in content creation due to the participative Web. For example, Freeman (2009) suggests that news of celebrity deaths is now invariably broken by gossip and news Web sites, "though these Web sites communicate in a tone evocatively described as 'snark'", that is, belittling the late celebrities.

Of course, UGC is neither confined to the Internet nor was invented on the Internet – though the Internet brings UGC to a much wider audience and much more quickly than would otherwise be the case. People generate content whenever they document something or tell someone something. Much content is ephemeral (discarded quickly), because the other person was not listening or the document (eg: scrap of paper with a shopping list) is used and thrown away. Charivari (noisy, mock serenades, such as for couples considered to be living in sin) and gossip are also forms of UGC and have important functions in society, such as "maintaining relationships and group coherence, relieving tensions, gaining influence and policing social norms ... linked to neighbourhood, community, street culture and power" (Hofman 2014). Hofman (2014) was referring specifically to gossip, but we would suggest that charivari fulfils the same functions.

There are no minimum criteria for value, availability or use for considering if content can be deemed UGC (Cooper et al. 2011). Of particular interest here is the UGC made widely available, such as through the Internet, public-access television, public debate or display in public places. The credibility and legitimacy of the UGC depends on various factors, such as the context of the contribution, the reputation of the contributor and the reader.

3. Volunteered geographical information

The term volunteered geographical information (VGI) was introduced by Goodchild (2007), but without a specific definition. He suggested it combined elements of Web 2.0 (where the user becomes a creator of resources), collective intelligence (or the wisdom of the crowd: aiming for a better answer by involving more people in understanding the problem and deriving the solution – or the madness of mobs (Priem 2013)!) and neogeography (new geography, going beyond the traditional scope of professionals – but see Section 5 for a discussion of why this is an unfortunate perspective).

There are billions of humans with ready access to portable sensors such as global navigation satellite systems (GNSS) receivers and digital cameras, and with local geographical knowledge – we routinely trust driving directions given by locals, for example, effectively treating them as professionals (Goodchild 2007). These humans are sensors in themselves (because of their knowledge, observational skills, pattern-matching abilities, etc) and with or without other sensors, can contribute VGI. This raises the question: can VGI be framed within the larger domain of sensor networks, in which inert and static sensors are replaced by, or combined with, intelligent and mobile humans? Research on VGI is multifaceted, considering industry, technology, disciplinary, social, political and other aspects (Elwood 2008). Capineri (2016) suggests that VGI comprises technological, cultural and scientific innovation.

There are also various interpretations of what VGI actually is. For example, with Tracks4Africa, the data are contributed voluntarily, directly and on their own initiative by individuals (Tracks4Africa 2016). Similarly, in a citizen-science project such as the 2nd South African Bird Atlas Project (SABAP2), the data are gathered by pentad (areas 5' by 5') by individual, amateur birders and contributed directly to SABAP2, according to the published protocol (Harrison et al. 2008; Underhill and Brooks 2016).

However, De Longueville et al. (2010) consider VGI to be data collected, synthesized and posted to the Internet by the research team from interviews with stakeholders. Expressions used by interviewees relating to a location (ie: geographical identifiers) were extracted from transcribed interviews to geocode the environmental phenomena described. Many of these stakeholders could be considered to be professionals or experts in their respective fields, though not necessarily geographical information science (GISc) professionals.

Further, the term VGI itself has been criticized, such as by van Exel et al. (2011), who point out that as "social information with spatial dimension", VGI can often be neither volunteered (such as the unconscious contributions of social traffic data), nor geographical (such as extracting location data from blogs and micro-blogs) nor information.

Their argument is weakest here: it questions whether nominally transient messages should be regarded as information. They propose considering 'VGI' on the scales of spatiality ranging from explicit to implicit, and intent, ranging from casual to intentional (van Exel et al. 2011).

Harvey (2013) proposes using the term contributed geographical information (CGI). Cinnamon (2015) considers a binary view of geospatial data production inappropriate (VGI vs non-VGI), because of the "vast, shifting, and heterogeneous landscape" constituting the ways of producing such data. He proposes a spatial data production cube, with the axes ranging from authoritative to asserted, top-down to bottom-up and expert to amateur. He also proposes a continuum between VGI and the CGI of Harvey (2013). To this, McConchie (2015) would add autonomy vs parasitism and individualism vs collectivism, and the notion of hacker cartography, which he defines as "geoweb-based practices of collaboratively creating and curating crowdsourced geographic data and representations, using a mixture of open software and repurposed tools and data". However, hacker cartography does not necessarily need the geoweb (eg: annotating paper maps in the field) and is not only crowdsourced. The term wikification has been used for adding markup to text for a wiki, such as Wikipedia (Wikimedia 2016). The term has been usurped by the likes of Sui (2008) to describe the processes around VGI – ie: as the wikification of GIS.

4. Citizen science

There are four broad aspects to the interaction between science and ordinary citizens: making science accessible to the public at large, or science communication; educating the public-at-large to understand science; basing legislation, regulations, policies, oversight, decisions, actions, funding and pronouncements on sound science; and contributions by the public-at-large to science.

4.1 Making science accessible to the public at large, or science communication

Unfortunately, it is very common for scientists to use technical terms (because of their precision), that to the lay public are merely obscure jargon. As Irwin (2001) points out, scientists and scientific advisers need to consider the framework and institutional location (such as the responsible government department) for their consultations with the public; whether or not they are addressing the correct audience; including qualitative responses as well as quantitative data; balancing the need to educate and inform the public to be able to listen them, with retaining their trust; and hence the need for technical objectivity, accuracy and neutrality of any briefing materials.

A problem is balancing the need to keep the public informed with not releasing results prematurely: unfortunately, premature release is rather tempting to do, given how researchers are measured. Schwartz et al. (2002) reviewed news stories following five major medical science conferences in 1998, finding 252 news stories based on abstracts (not refereed full papers) – yet five years later, about a quarter of those abstracts had not resulted in peer-reviewed papers. Woloshin and Schwartz (2006) found the news stories from the 2002/3 editions of those five conferences generally omitted the basic study facts and cautions of the research, such as sample sizes. "It is not clear that the best science is the science that gets known best" (Norton 2013). Popular reporting of science can have a strong nationalistic flavour, highlighting local successes, and focus on sensationalism and "whizz-bang" science rather than less glamorous or more complicated results. Social media can encourage quick and superficial engagement with such reporting (eg: not going beyond the headline) and the media can be biased in what they select to report and how the results are perceived by their usual audiences (Norton 2013). Further, confronting an invalid belief system with facts and logic can sometimes reinforce adherence to those false ideas through motivated reasoning. That is, the adherents rationalize rather than reason, picking selectively what they will accept (Mooney 2011).

4.2 Educating the public-at-large to understand science

On the other hand, the onus is also on the lay public to educate themselves to be able to function effectively in the modern world, with one key aspect being basic scientific literacy – as well as basic political, legal, economic and financial literacy; communication skills; hygiene; etc. It is even more essential for politicians, journalists and other public figures to be scientifically literate, because of the influence they have over the public. For example, by taking responsibility for a court case with a scientific component, a judge is declaring explicitly and unambiguously that they are competent to make decisions on the case – which was not the case with the judgement concerning the earthquakes in L'Aquila, Italy, in April 2009, which held scientists responsible for inadequate warnings of the earthquake (Nature 2012). Astonishingly, the likes of Ropeik (2012) blame science communication, and not the judges for over-reaching themselves. Unsurprisingly, the judgement was overturned (BBC 2014). Collectively, these two aspects (communication and education) are often called the public understanding of science and technology (PUST).

Such ignorance can be reinforced by one's on- and off-line social networks and by filter bubbles, whereby one thinks that one is being exposed to the facts and diverse opinions on the Web, but one's previous activities on the Web are used by a search-engine's algorithms to show "us what it thinks we want to see, but not necessarily what we need to see" [Pariser 2012]. A consequence of this is adherence to truthiness, "the quality of seeming or being felt to be true, even if not necessarily true" (Oxford 2016), rather than to facts, which can be inconvenient.

4.3 Basing legislation, decisions, pronouncements and the like on sound science

Legislation, regulations, policies, oversight, decisions, actions, funding and pronouncements should be based on sound science. Unfortunately, it is far too common for obsolete scientific theories, pseudo-science and

superstition, or even just advertising, to be used for making decisions. A tragic example is the approach the African National Congress under Thabo Mbeki had towards HIV/AIDS (Cohen 2000; Makgoba 2000). As Makgoba (2000) (then President of the Medical Research Council in South Africa) stated: "South Africa is rapidly becoming a fertile ground for the types of pseudoscience often embraced by politicians" and "to conflate causation with cofactors through a mixture of pseudoscientific statements is scientifically and politically dangerous in societies where denial, chauvinism, fear, and ignorance are rampant".

In the wake of the EU referendum in the United Kingdom and the American presidential election, the Oxford Dictionaries Word of the Year for 2016 is the adjective post-truth, which is defined as "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief" (Oxford 2016). This is obviously concerning, because political and other leaders see the opportunity to exploit brazenly the ignorance and susceptibility to truthiness of many people.

4.4 Contributions by the public-at-large to science

The contributions by the public-at-large to science are often called citizen science or public participation in scientific research (PPSR). It is the interaction of interest here and is discussed below. Scientific research has never been the exclusive domain of professional scientists, of course, with many prominent and successful "amateur" scientists having made significant contributions, including gentleman scientists (independently wealthy and hence self-funded) such as Robert Boyle (1627–1691) and Charles Darwin (1809–1882), or those who had other occupations that gave them the resources and/or time for scientific experimentation, such as the printer, Benjamin Franklin (1706–1790), the patent examiner, Albert Einstein during his annus mirabilis in 1905 (1879-1955), and the priests Nicolaus Copernicus (1473–1543) and Gregor Mendel (1822–1884). Many professional scientists have also made contributions outside of their (nominal) fields of expertise.

Scientific research is not just about discoveries and grand science. Almost all scientific research is actually routine – even mundane – and not innovative: documenting the environment, monitoring things, preparing specimens, conducting experiments, gathering data, analysing results, transcribing old documents, writing reports and interrogating the literature. Hence, almost anyone can make useful contributions to science, if they are careful and follow the appropriate protocols. A citizen scientist does not even have to be literate: the data logging tool Cybertracker was developed to enable trackers to record data using icons on a field computer (Liebenberg et al. 1999).

Capineri (2016) states that when the production of volunteered information "is regulated by shared rules concerning the geocoding, tagging and annotation of the data, VGI becomes part of citizen science". However, the shared rules alone do not make the VGI scientific, because to varying extents they apply to open-source software and to many repositories of user-generated content, such as OpenStreetMap or Wikipedia.

5. Crowdsourcing

Essentially, the services in an organisation are provided by the organisation's workforce (ie: in-house) or by other organisations or external people, normally on contract (ie: outsourced). Outsourcing is controversial because many companies in developed countries outsource (or off-shore) to developing countries where the rates are cheaper, but where environmental, labour, safety and health protection could be much worse. Friedland (2005) suggests that while off-shoring might be justifiable on utilitarian grounds (it increases the global domestic product and hence creates more jobs in total), it is "irrational and unjust" according to Rawlsian social-contract theory, "because of the utilitarian assumption that the only way everyone's moral judgments can be brought into agreement is through our natural capacity for sympathy" (Friedland 2005).

As developing countries become more expensive, though, the jobs can return to the developed countries, such as Chinese textile mills being set up in the southern USA (Tabuchi 2015). Conventionally, outsourced services are procured from a supplier known to the organisation, or through tender (be it open or closed) or some similar process. In any case, the contractual relationship would invariably be initiated, if not actually completed, before any of the services are provided. However, a growing trend is to solicit completed services rather than just offers to provide services. Often, these are solicited piecemeal and from anyone anywhere: the population at large, or the crowd. Hence, the term crowdsource is used to describe this. Howe (2006) is credited by some as having invented the neologism and describes it as a distributed labour network that it arose because of:

- the Internet enabling the exploitation of the spare processing power of millions of human brains;
- technological advances that brought professional quality and capabilities into consumer-grade software and products, such as digital cameras; and
- the large pool of networked hobbyists, part-timers and dabblers now with a market for their efforts.

Drawing on Howe (2006), Saxton et al. (2013) define crowdsourcing as "a sourcing model in which organizations use predominantly advanced internet technologies to harness the efforts of a virtual crowd to perform specific organizational tasks", or the intersection of the crowd (whatever it might be), outsourcing and advanced internet technologies. Oddly, while their definition is appropriate, they think the main difference from Howe (2006) is their "explicit incorporation of advanced internet technologies into the definition" (Saxton et al. 2013). Their focus also seems to be on only those crowdsourcing models that reward the contributors.

Crowdsourcing was happening long before it was recognised as a concept (Chilton 2012; Saxton et al. 2013), such as the reading programme of the Philological Society

for A New English Dictionary on Historical Principles (now the Oxford English Dictionary), to collect quotation slips with passages illustrating word usage (Wikimedia 2016). An older example is the Longitude Prize of the 1700s in Britain (Sobel 1998). More recent are the television programmes inviting the public to submit content, such as America's Funniest Home Videos, which started in 1989 and has evaluated over one million videos (AFV 2017). Crowdsourcing has been prevalent in open-source software development and open data archives, where contributions can be made piecemeal, such as fixing a bug or contributing a routine in an open-source project, or contributing a record or a data set to an open-data archive.

Clearly, the Internet facilitated crowdsourcing, through virtual communities and the like. Using crowdsourcing in commercial applications is controversial, as it can appear to circumvent minimum-wage legislation. For example, Amazon Mechanical Turk provides a market for small tasks known as Human Intelligence Tasks (HITs) (Amazon 2016). The reward or payment for completing many tasks can be tiny: only a few US cents each. Using rates as at 31 December 2011 and an average HITS reward of US$ 0.20, an American would need to complete 37 HITS to achieve the US Federal minimum wage of US$ 7.25 an hour, which probably requires sustained, intensive work. However, a South African would need to complete 'only' 640 HITS to achieve the South African minimum wage of R 1041.00 per month: for a working month of 160 hours, that is 4 HITS an hour. The disparity shows why outsourcing to other countries is so attractive.

6. Neogeography

Historically, the term neogeography seems to have been used for the complex interrelationships between people and geography, possibly similar to psychogeography (Haden 2008). As the philosopher Debord (1955) stated: "psychogeography could set for itself the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behaviour of individuals". Expanding on Self (2007), psychogeography can include the relationship between psyche and place; breaking the constraints imposed explicitly and implicitly by physical structures; the personality of a place; deep topography (extreme or parochial local history); and being a flâneur (a stroller, saunterer and urban explorer).

There are many different interpretations of the term neogeography, with a popular one over the last decade (eg: Turner (2006), Graham (2010) and Capineri (2016)) being the use of GNSS receivers, mobile devices, GISs and Web mapping by anyone (not just professionals) to produce maps and geospatial data sets. Neogeography can also encompass innovative colloquial applications (even absurd ones), ad hoc mapping, open data repositories, geo-tagging, mashups, differing perceptions of what is meant by quality (such as relative quality being more important than absolute quality (Goodchild 2008)), and unconventional uses of the technologies and data, such as for virtual land art (Haden 2008; Wikimedia 2016). Batty et al. (2010) suggest the advent of mashups in 2004 heralded neogeography and McConchie (2015) suggests its roots are in the computer hacker culture.

If neogeography just means going beyond the traditional scope of professionals, it implies that the professionals themselves are unable to "think out of the box" and escape their professional training and paradigms, which is patent nonsense! Today's avant-garde of any field (not just in the sciences) becomes tomorrow's standard practice, or remains controversial, or becomes discredited, or simply lapses into obscurity, or even disappears completely. So, while having ordinary users produce data and applications does add a "neo" to "geography", neogeography really should go beyond just that, encompassing the likes of psychogeography (as outlined above), critical GIS (social theory, social justice, feminism, power relationships, epistemology, manipulation, ethnography, etc), qualitative applications and ethical issues (privacy, surveillance, etc). All of these require major contributions from professionals, and not just geographical information scientists. Professional cartographers are also at the forefront of the likes of literary geography, providing a new dimension for literary studies (Piatti et al. 2009).

Neogeography could also imply re-inventing the discipline every now and again. Batty et al. (2010) suggest the technical developments, free software and the like facilitating mashups and neogeography for end users will change GISc, but will not undermine professional GISc. Rather, they will provide new technical and scientific challenges and opportunities. Nevertheless, GISc professionals and the profession need to ensure their ongoing training keeps them relevant and able to analyse what is going on around them in a geospatial context, and not treat GIS merely "as a commodity tool for putting dots on maps" (Roos 2015).

Early in GIS development, many professionals in the field realised that GIS went beyond the technology to refer to the institutional context, that is, the people using the GIS (Dale 1991). From the start, spatial data infrastructures (SDIs) included policies and institutional arrangements (Nebert 2004). Yet, Goodchild (2006) and Schuurman (2000) report that human geographers criticized the GIS community as being non-intellectual; beholden to its (assumed) military roots and commercial imperatives; engaged in naïve empiricism; positivist, and hence with objectionable ethics; and incapable of producing knowledge.

Warf and Sui (2010) suggest that professionals need to acknowledge the "validity of user-generated communities of truth" and exploit the "multiplicity of criteria that define useful knowledge". Unsurprisingly, "practitioners of GIS frequently felt that their perspectives on issues including the roots of GIS, its epistemological bases, and its ethics had been undervalued by critics" (Schuurman 2000). Similarly, "GIS, for all of its demonstration of confidence in Euclidean space, quantification, disambiguation, and reduction, has proven its capability to represent uncertainty and variability in the visualization of geo-spatial data" (Bodenhamer et al. 2013).

Recently, Bill Cartwright (then the Past President of the ICA), in a comment from the floor on the presentation "New cartographies, new aesthetics", by Steve Chilton and Alex Kent, ICC 2015, 26 August 2015, suggested we might be entering a post-neo-cartography era, due to concerns over the naïve cartography that can be associated with neo-cartography. VGI should not degenerate to being maps that are not understandable or even worse, that covey the complete opposite of the message they are meant to convey.

7. Examples of the differences

For these concepts, volunteered geographical information (or user-generated content), crowdsourcing, citizen science and neogeography, we list here examples of systems, processes or online repositories that show that while these concepts might overlap to varying extents, they are definitely not the same. The relationships are also illustrated in Table 1. Further, even if the outputs of one are then used by another, they are still different concepts. For example, a non-scientist might solicit online for Web pages with nice photographs of cats and women at recognizable landmarks, then geocode the photographs to do a feminist analysis of their distribution (however naïve it might be). The Second South African Bird Atlas Project (SABAP2) is an example that is VGI (contributions by amateur birders), crowdsourcing (active soliciting of contributors), citizen science (citizens extending the reach of professional ornithologists) and neogeography (using applications on GNSS-enabled mobile devices and new analytical techniques) (Underhill 2016).

- A blog or an activity tracker are examples of VGI that are neither crowdsourced nor citizen science (they are unsolicited).
- Activist Web sites such as Brown Moses (open-source investigations using satellite imagery, photographs, VGI, etc) are examples of VGI that are not citizen science.
- The Christmas Bird Count (running since 1900) is an example of VGI that is not neogeography.
- Projects exploiting spare computing power, such as SETI@Home, are examples of crowdsourcing that are neither VGI nor neogeography.
- Television programmes such as America's Funniest Home Videos, a trial by jury and crowd funding (eg: Kiva Microfunds, Indiegogo or a stokvel, which is "(in South Africa) a savings or investment society to which members regularly contribute an agreed amount and from which they receive a lump sum payment" (Oxford 2017)) are examples of crowdsourcing that are neither VGI nor citizen science nor neogeography.
- The Longitude Prize (for determining longitude accurately in the 1700s) is an example of crowdsourcing that is not neogeography.
- Amateur astronomers and fossil hunters are examples of citizen science that are neither VGI nor crowdsourcing nor neogeography.
- The Foldit Online Protein Puzzle (soliciting new protein designs) and Zooniverse: Planet Hunters (searching for indicators of exoplanets in imagery from the Kepler spacecraft) are examples of citizen science and crowdsourcing that are neither VGI nor neogeography.
- Critical GISc and feminist GISc are examples of neogeography that are neither VGI nor crowdsourcing nor citizen science.
- A flâneur (a stroller, saunterer and urban explorer) and virtual land art (drawing using GNSS tracks) are examples of neogeography that are neither crowdsourced nor citizen science.

	VGI	**Crowd source**	**Citizen science**	**Neogeo-graphy**
Overlap VGI	*	SABAP2	Old Weather	PPGIS
Not VGI	*	SETI@ Home	Zooniverse: Planet Hunters	Critical GIS
Overlap crowd source	Brown Moses	*	Belly Button Biodiversity Project	Crisis mapping
Not crowd source	Activity tracker	*	Amateur astronomer	Flâneur
Overlap citizen science	eBird Project	Inno Centive	*	Wide Noise
Not citizen science	Arab Spring	America's Funniest Home Videos	*	Virtual land art
Overlap neogeo-graphy	Ushahidi	Frontline SMS	Psyche and place	*
Not neogeo-graphy	Christmas Bird Count	Kiva Microfund	Longitude Prize	*

Table 1: VGI, crowd-sourcing, citizen science & neogeography (Cooper 2015, 2016).

8. Conclusions

We have discussed here the concepts of user-generated content, volunteered geographical information, crowdsourcing, citizen science and neogeography. While they overlap to varying extents, these concepts are sometimes confused with one another. We have provided examples to illustrate the similarities and differences between these concepts.

Hence, we would recommend that when one is researching or writing about these concepts, one should be careful to clarify one's own understanding of what they actually are. Otherwise, it could lead to misunderstandings – particularly with the concept of neogeography.

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