

# Chapter 2

## A Framework of Neogeography

### 2.1 Introduction

Within the current literature, confusion exists as to the terminology used for the various technologies, innovations and phenomenon associated with VGI. This is best highlighted by Elwood (2008) in that *these developments [in geotagging data] have been referred to with a plethora of terms, including neogeography... web mapping... volunteered geographic information... ubiquitous cartography... and wiki-mapping*. This extensive list is added to by Crampton (2008) with *Spatial Media, Locative Media, Spatial Crowdsourcing, Geocollaboration and Map Hacking*. Suggesting an explanation for this, Tulloch (2008) suggests that initial islands of research producing unique or proprietary vocabulary may introduce *buzzwords* which suit their cause, yet die out over time. As Crampton (2008) commented, the [neogeographic] situation has from its birth been both increasingly important and *interestingly messy*, with its confusing terminology being linked with the emergence of the Web 2.0 and Neogeographic phenomenon itself (Das and Kraak 2011).

The confusion highlighted by Elwood (2008) and Crampton (2008) is further underlined in how neither goes on to distinguish between these various definitions. Neither do they present a distinction between the types of data type or technique being described. The lack of agreement on terms by these and other authors (Coote and Rackham 2008; Haklay et al. 2008; Shin 2009) highlights the lack of consensus in terminology, leading to multiple authors using various different phrases to describe the same thing. In order to avoid such detrimental mistakes within this book, the following must be achieved:

- Set out the *true* definitions of the terms related to neogeography, providing a consensus for this book and hopefully further work.
- Discuss the way in which the different elements of neogeography interact with one another, providing a framework on which the information types in this book shall be based.
- Develop a framework of neogeography so neogeographic projects may be effectively compared and contrasted through this book.

## 2.2 Background Literature

### 2.2.1 The Nature of Neogeography

Often in the literature, the terms *Neogeography*, *Mashup* and *VGI* are substituted for other terms such as Public Participatory GIS (Aberley and Sieber 2002) or Geoweb (Haklay et al. 2008). This is often without full justification for the change, and without full and proper definitions. Although adding to the general confusion of what is VGI, this helps to suggest that the different names given to VGI and Neogeography need to be addressed and fully defined, allowing their appropriate use through common understanding.

One example includes the comments by Idris et al. (2011, p. 120) who claimed “*neogeography relies on user generated content that is locationally tagged*”. Although Idris et al. were correct on the reliance of locational data within neogeography, their statement that user generated content (VGI) is a necessary component to Neogeography was incorrect.

While the term *neogeography* has been used in various forms from at least 1944 (Miller and Miller 1944), it was Turner (2006, p. 2) who cemented the term in the form it is used and understood within this book:

*Neogeography means “new geography” and consists of a set of techniques and tools that fall outside the realm of traditional GIS, Geographic Information Systems. Where historically a professional cartographer might use ArcGIS, talk of Mercator versus Molweide projections, and resolve land area disputes, a neogeographer uses a mapping API like Google Maps, talks about GPX versus KML, and geotags his photos to make a map of his summer vacation.*

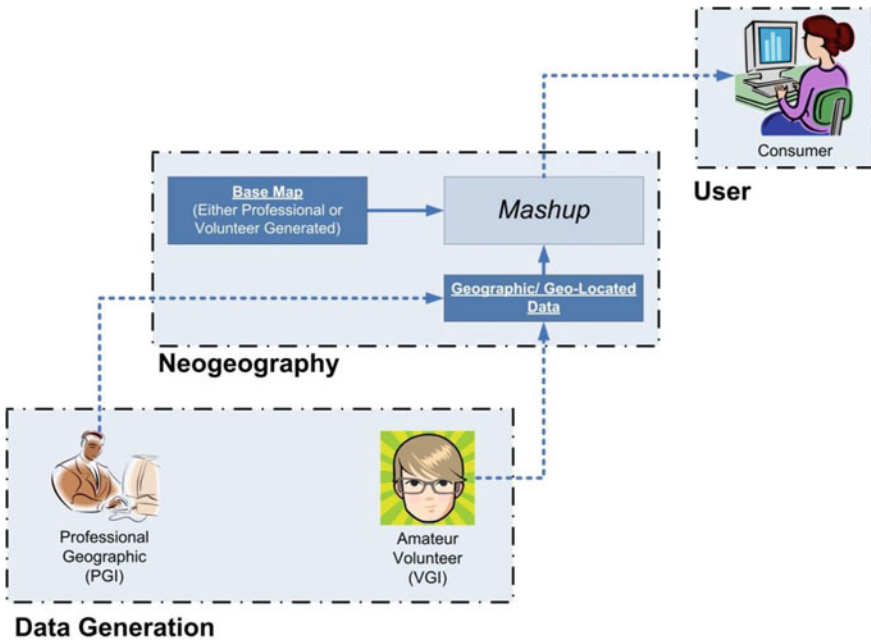
According to his description, neogeographic systems may exist and function in the fullest sense while relying only on professional information sources; see Fig. 2.1. However, the need to present the disconnection between neogeography, VGI and PGI denote a degree of further explanation is required in order to fully define the terminology relevant to this book.

To understand neogeography this chapter deals with the various elements of the phenomenon, with each taxonomy list relating to one particular element of the phenomenon. For simplicity, these elements are referred to as:

- *Data Generation Aspect*—People, either volunteers or professionals creating raw data; VGI or PGI.
- *Neogeographic Aspect*—Combining geo-data with a form of map to produce a mashup.
- *User Aspect*—Referring to any group or individual who takes the product of the neogeographic element and utilises it in some way.

The interaction between these three elements is highlighted in Fig. 2.1 above.

Figure 2.1 highlights how neogeography is the process of combining geo-data with maps to create mashups, whereas VGI and PGI are simply the creation of one form of data. It is important to mark the distinctions between VGI and PGI. VGI is



**Fig. 2.1** Elements constructing the neogeographic phenomenon

essentially geographic information created by largely untrained amateur volunteers (Haklay and Weber 2008). In defining VGI, Goodchild (2007a) opened up the scope of *geographic objects* that could be described through volunteered means to be “*not confined to traditional geographic identifiers such as trees and streets but to any data where a geospatial element is present*”. However, it does not exclude professionals or organisations from contributing. This has resulted in projects where the quality in terms of positional accuracy and data richness of VGI projects may outreach that of similar PGI projects (Haklay 2010b). However, while a professionally trained person may contribute to a VGI project, it would be predominantly as a hobby using the same tools as the amateur volunteer, and without any privileges or advantage.

Further to the naming of the information based on the professionalism of the author is the issue of how the geographic objects are being described in a more general sense. In the context of consumer products, Zeithaml (1988) regarded the elements of *price*, *quality* and *value* as important descriptors for the ways different people interact with information. However, according to Zeithaml (1988) and Sheridan (1995), the perspectives of *quality* and *value* are relative to both application and use. This suggests that utilising user perceptions of information may not necessarily be the best way to categorise projects within the framework. This is because a user may perceive two very different mashups (containing different data and use characteristics) as being equal in utility, efficiency and satisfaction.

Additionally, price is not necessarily a good descriptor either, due to the non-traditional business model usually applied to neogeographic products (Tapscott and Williams 2008).

To take a more user centred design perspective, mashups and neogeography are tools utilised by users to achieve their goals and to create products specific to their personal requirements. Das and Kraak (2011). gave the example that a user can create a map *showing* all local fitness centres; presenting collected data. Alternatively, a user may use the same map to *explore* local fitness centres. This creates two distinct design opportunities since although the data required by both user groups is the same, their use and relationship with the data are different.

### 2.2.2 Issues with Current Taxonomies

From a GIS perspective, Grimshaw (1996, 1992) highlighted how previous taxonomies had oversimplified the viewpoints of the GIS discipline and assumed a static technological infrastructure, rather than one that changes over time. Consequently, Grimshaw (1996) produced a more complex and overarching framework consisting of Management Strategy, Technology and Decision. Bai et al. (2009) noted that this framework is rooted in the key concepts of information systems, yet departs from the concrete functionalities, specific communication protocol definitions and expected usage scenarios within geospatial sciences. This has in turn prevented it from being properly utilised. However, the largely dynamic, unstructured and *anarchic* nature of neogeography (Budhathoki et al. 2008) suggests that the production of a framework along a similar approach may prove more useful than when applied to the more rigid platforms in GIS. Additionally, while a justification for using the framework of Grimshaw (1996) may be possible, the dimensions do not sit comfortably within the neogeographic literature. Therefore a more appropriate and accessible framework is required to fulfil the need for a relevant classification system for neogeographic projects.

Coleman et al. (2009) produced a series of models relating specifically to VGI, characterising, amongst other things, the spectrum of contributors, characteristics of use, motivations to contribute and the institutional requirements. Whilst interesting and insightful, their disjointed nature (i.e. the lack of connection and integration between the models) makes them difficult to use in an overarching framework. A more recent attempt at classifying VGI within a taxonomy was provided by Cooper et al. (2011), who identified dimensions of VGI and Neogeography as being:

- The continuum of responsibility for determining the specification of the data.
- The classification of data from base (e.g. streets networks) to Points of Interest (POIs).

A weakness of the framework is that the presentation of the framework is largely inaccessible due to its reliance on unconventional terminology (e.g.

custodian and POI not commonly used in neogeographic literature) and its basis on informality. This is a theoretical perspective at odds with the lack of universal standards of procedures across the spectrum of neogeography, constantly changing to fit the desire or needs of the producers. Additionally Cooper et al. (2011) combined both neogeographic project with GIS phenomenon (e.g. *tracks4africa* and *PPGIS*), which while interesting from a taxonomy perspective are two incompatible concepts within a single framework.

## 2.3 A Framework of Neogeography

### 2.3.1 A Terminology of Neogeography

The provision of a terminology is necessary in order to overcome the potential confusion amongst neogeographic creators and those wishing to discuss neogeographic phenomenon. Although a detailed overview of definitions relative to this book is provided in the glossary at the start of this volume, it is necessary to highlight the key terms this taxonomy related to; see Table 2.1.

In the advent of neogeography, Al Bakri and Fairbairn (2011) presented a series of new and previously unmet challenges to the world of geo-information, focusing on accuracy, data integration, quality, region of geographic description, and information attributes. This list may be added to by considering more traditional metrics of GI; quality (Devillers et al. 2010), accountability (Coleman 2009) and data standards (Brando et al. 2011).

Although research has demonstrated VGI to be able to produce information to the same *quality* as PGI (Haklay et al. 2009; Haklay2010a, b), the optimal word here is ‘able’. That being, simply because one project (e.g. OpenStreetMap) is able to produce maps as good as OS Meridian, does not mean that all are (e.g. ThePeoplesMap). While looking further into the reason for this high accuracy coming from amateur volunteers, Haklay et al. (2010) demonstrated that at least five edits from proficient persons is required to converge on a truth of high enough quality. Therefore, we may consider the degree of standardisation in how data are produced as a mechanism for achieving high quality products. While PGI sources have a long and established history of standardisation of practices (Crone 1968), VGI may be considered anarchic (Budhathoki et al. 2008). As Brando (2011) demonstrated, the way in which VGI is produced, categorised and retrieved may be standardised within a project to an efficient and effective level, there is no guarantee of such implementation. Further too this, the very concept of standardisation of VGI is alien to the anarchic mechanism of producers *doing as they will* to produce the products they desire in the way they see fit. A concern of professionals which is prevalent within the scoping study of this book is the concern for accountability and trust as derived from VGI. Due to the high degree of quality control within PGI (Goodchild 2000), this information form has been the

**Table 2.1** Key definitions within the framework

Term	Definition
<i>Geographic Information Systems (GIS)</i>	Medyckyj-Scott and Hearnshaw (1993) described GIS as “ <i>tools that capture, store, manage, manipulate, analyse, model and display information with respect to geographical space</i> ”
<i>Base Map</i>	A raster map used within a mashup on which information is layered (Das and Kraak 2011)
<i>Neogeography</i>	Turner (2006) defined neogeography as “ <i>people using and creating their own maps, on their own terms and by combining elements of an existing toolset</i> ”. In a broader research application context, Das and Kraak (2011) described this as “ <i>the domain where users make use of geographic information</i> ” (GI) using Web 2.0 applications
<i>Professional Geographic Information (PGI)</i>	While not a phrase in common use throughout the current literature, the term <i>Professional Geographic Information</i> (PGI) has been utilised within this book to make reference to geographic information not originating from volunteers; in contrast to VGI. This may be defined as structured geographic information produced by trained personnel (Fonseca and Sheth 2002), or those of able to provide detailed geographic information that can be verified and integrated at the national level (Goodchild 2007b)
<i>Volunteered Geographic Information (VGI)</i>	Goodchild (2007a) referred to this phenomenon as “ <i>geographic information created by largely untrained volunteers, which is potentially unstructured</i> ” (Fonseca and Sheth 2002)

bedrock of personal through to governmental actions since the creation of GI, notably in police, fire, rescue and military situations (etc.). Due to the lack of standardisation with VGI (Cooper et al. 2011; Zook et al. 2010) such equal implementation has been hampered and continues to be the alternative to PGI only when PGI is not fully available. However, quality control metrics have been, and are included within crowd-sourced projects. Examples for this range from the peer review and peer pressure of Wikipedia, through to automatic quality control filters of Tracks4Africa where contributed data must reach a minimum degree of logical consistency before it is accepted into the main data set (Cooper et al. 2011).

### 2.3.2 A Framework for Neogeography

The most fundamental aspect of a framework is the dimensions by which the subject matter is categorised. Within the general sense of geographic information, Coote and Rackham (2008) highlighted the four dimensions of *completeness*, *consistency*, *quality control* and *quality assurance* as key areas of concern within neogeography. While each of those points is valid, the one that stands out as most relevant to this section is quality control. This is for a variety of reasons; most notably (as highlighted above in the terminology of neogeography) that the amount

of quality control put in place is of high concern to a variety of users. Additionally, Goodchild (2008) highlighted this as one of the greatest challenges facing VGI, and Zeithaml (1988) and Sheridan (1995), placing quality as relative to both application and use. Furthermore, the conditions of completeness, consistency and quality assurance can either be considered as temporary states (i.e. the data set may become more complete over time), or can be addressed through proper quality control.

Alexander and Tate (2005) cited *authority, accuracy, objectivity, currency* and *coverage* as the key factors in assessing the *appropriateness* of an information source to a user's information search requirements. Out of these, objectivity was selected as the most appropriate second dimension of the framework. Within a general research context, both Boudreau et al. (2001) and Janesick (2000) considered *objectivity* to be one of the most crucial to the ratification of information. The remaining dimensions of appropriateness were not selected since it was not felt that their position was well enough supported in relation to VGI and its current understanding in the literature.

Because the evaluative judgement made by the user on information is comprised of *opinions, attitudes* and *beliefs* (Albaum 1997; Mizumoto and Takeuchi 2009), a need exists to quantify projects in an objective form. According to Preece et al. (2011), usually the most appropriate method of investigating the participant's response to information presented in a study is through subjective rating using Rating Scales. Tables 2.2 and 2.3 propose two Rating scales for quantifying both *quality control* measures and the level of *objectivity*.

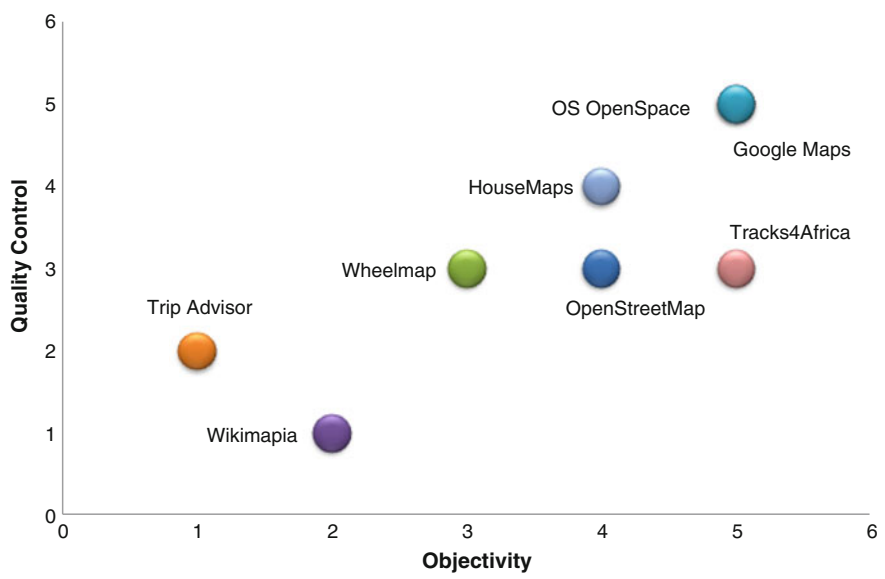
Building on the Rating Scales of Tables 2.2 and 2.3 and evolving the approach of Cooper et al. (2011), Fig. 2.2 presents a framework for how to consider and categorise neogeographic products.

**Table 2.2** Rating scale for assessing quality control

Level of quality control	Definition
1 <i>None</i>	All data entries are accepted into the data base without any control over any attributes, data cannot be edited or removed by anyone but the author
2 <i>Very low</i>	All data entries are accepted into the data base without any control over any attributes, data can be edited or removed by anyone
3 <i>Low</i>	Data may be accepted into the data base providing the minimum meta data requirements are met, data can be edited or removed by anyone
4 <i>Intermediate</i>	Data may be accepted into the data base providing the minimum meta data requirements are met, checked before being added to the system, data can be edited or removed by anyone
5 <i>Absolute</i>	All aspects of data entering the system must strictly comply to a pre-specified standards, data checked before being added to the system, edited and/or removed by any other person in the system with authority

**Table 2.3** Rating scale for assessing objectivity

Level of objectivity	Definition
1 <i>Totally subjective</i>	No way of verifying any of the data through quantitative measurements, can only come from users forming their own opinions
2 <i>Mostly subjective</i>	Most data has to come from users forming their own opinions, although a degree of quantitative measurement is required
3 <i>Equally subjective and objective</i>	All data can be achieved through either qualitative measurement, or through users forming their own opinions
4 <i>Somewhat objective</i>	Most data has to come from quantitative measuring methods, although some data should come from users forming their own opinions
5 <i>Totally objective</i>	All of the data can only be achieved through quantitative measurements



**Fig. 2.2** A proposed framework for neogeographic products

2.4 Discussion

The purpose of presenting this framework through a scatter graph is to allow a simple way to visualise how similar or dissimilar various projects may be, as judged by the objectivity and quality elements. For example, within Fig. 2.2 the close proximity of *Ordnance Survey*, *OpenStreetMap* and *Google Maps* suggests that while their focus may be different, they may be considered alongside each other and be categorised together; even though they are VGI and PGI projects.



However, OpenStreetMap is a very distant from Wikimapia, since OpenStreetMap is a project producing an objective map of features (e.g. roads, buildings, post boxes, etc.) while Wikimapia produces a subjective layer of descriptions on top of an existing map (e.g. ‘the pub in *this* part of the map is The Red Lion.... here is why I think it is very good’). This means these two ventures should be categorised as different forms of neogeographic products; despite both products being VGI based.

An interesting outcome from Fig. 2.2 is how when the various projects are considered against the categorisation of Tables 2.2 and 2.3, there appears to be a correlation between objectivity and quality control. Although the causal link between objectivity and quality control has been disputed (Stiles 1993), it does provide an interesting insight. If a neogeographic project seeks to capture rich user experiences about locations (e.g. the best spot on an island to watch the sun go down) then the framework suggests that low-level quality control is suitable for capturing such objective information. Similarly, to produce a mashup that describes geo-located information in a highly reliable fashion, information about locations (e.g. positions of post boxes), then a high degree of quality control is appropriate.

As highlighted previously, prior to this framework there did not exist a simple, effective and easily understood framework by which to consider different neogeographic and GIS products. Potential uses of such a framework could be considered as follows:

*Selection of a product for use*—This framework could be used to assess the degree to which new neogeographic products should be thought of in terms of their accountability and ability to provide meaningful, descriptive information to the user. This is particularly relevant when the information is to be used in highly sensitive situations where a degree of risk is involved; e.g. information for hospital paramedics.

*Understanding neogeography in research*—From a research perspective the framework outlines how although a large collection of projects can be considered neogeography, they can be very different. Therefore, future research should not look to treat (for example) Wikimapia and Tracks4Africa as the same since they fall into different categories of neogeography. However, comparing them as two different types of products, and understanding that their nature is very different may lead to a deeper and more useful investigation into how neogeography is used in society. Utilising the framework in this way would help to reduce the confusion in how neogeography is discussed in the literature.

*A framework for quality control*—As proposed by Bishr and Mantelas (2008), VGI data sets could be filtered to remove instances of VGI which do not meet a pre-specified quality control metric. The categories of the framework could be employed as such a metric to automatically assess the suitability of individual VGI contributions. For example, to produce a VGI contribution framework that would allow the end product to occupy the same space within the framework as OS OpenSpace, data would have to comply to a strict metadata structure, and be verified by others before it is published. This would allow mashups of (to a degree)

certified accountability to be developed from sources which in their complete state offer a wide variation in quality which make them unsuitable.

*Development of new products*—One of the most important aspects of any innovative new product or service is its unique attributes and ability to satisfy a currently unmet user need. By considering current neogeographic products alongside this framework the niches yet to be exploited may be understood, making this framework a useful tool for designers.

## 2.5 Conclusion

This chapter has helped address the research question of *what is VGI and how does it differ from PGI* by producing a detailed terminology and a working framework based on two of the key variables in the field of neogeography; *quality control* and *objectivity* of the information. Additionally utilising the framework allows for a useful way to discuss the differences and similarities between projects. As well as addressing the research aims, research within this book will aim to produce sufficient evidence to critically consider the dimensions that constitute this framework for their appropriateness and relevance to the user.

## References

- Aberley D, Sieber R (2002) About PPGIS In: Developed at first international PPGIS Conference held by URISA at Rutgers University, URISA, New Brunswick, New Jersey. Available at: <http://www.ppgis.net/ppgis.htm>. Accessed 3 April 2013
- Al Bakri M, Fairbairn D (2011) User generated content and formal data sources for integrating geospatial data. In: Proceedings of the 25th international cartographic conference and the 15th general assembly of the International Cartographic Association, ICC, Palais des Congrès, Paris
- Albaum G (1997) The Likert scale revisited: an alternate version. *J Market Res Soc* 32(2):331–348
- Alexander J, Tate M (2005) Evaluating web resources. Widener University, 2011 (March 25th). Available at: [http://www.widener.edu/about/campus\\_resources/wolfgram\\_library/evaluate/original.aspx](http://www.widener.edu/about/campus_resources/wolfgram_library/evaluate/original.aspx). Accessed 3 April 2013
- Bai Y, Di L, Wei Y (2009) A taxonomy of geospatial services for global service discovery and interoperability. *Comput Geosci* 35(4):783–790
- Bishr M, Mantelas L (2008) A trust and reputation model for filtering and classifying knowledge about urban growth. *GeoJournal* 72(3–4):229–237
- Boudreau M, Gefen D, Straub D (2001) Validation in IS research: a state-of-the-art assessment. *MIS Q* 25(1):1–16
- Brando C, Bucher B, Abadie N (2011) Specifications for user generated spatial content. *Advancing Geoinf Sci Changing World* 1(6):479–495
- Budhathoki NR, Bruce B (Chip), Nedovic-Budic Z (2008) Reconceptualizing the role of the user of spatial data infrastructure. *GeoJournal* 72(3):149–160. Available at: <http://link.springer.com/article/10.1007%2Fs10708-008-9189-x?LI=true#page-2>

- Coleman G (2009) Code is speech: legal tinkering, expertise, and protest among free and open source software developers. *Cult Anthropol* 24(3):420–454
- Coleman DJ, Georgiadou Y, Labonte J (2009) Volunteered geographic information: the nature and motivation of producers. *Int J Spat Data Infrastruct Res* 4:332–358
- Cooper AK et al (2011) Challenges for quality in volunteered geographical information. In: *AfricaGEO 2011*. AfricaGEO, Cape Town, p 13
- Coote A, Rackham L (2008) Neogeography data quality—is it an issue? In: Holcroft C (ed) *Proceedings of AGI Geocommunity'08*. Association for Geographic Information (AGI), Stratford-Upon-Avon, UK, p. 1. Available at: <http://www.agi.org.uk/SITE/UPLOAD/DOCUMENT/Events/AGI2008/Papers/AndyCoote.pdf>
- Crampton JW (2008) Cartography: maps 2.0. *Prog Hum Geogr* 33(1):91–100
- Crone GR (1968) *Maps and their makers: an introduction to the history of cartography* 4th ed. East WG (ed), London, Hutchinson
- Das T, Kraak MJ (2011) Does neogeography need designed maps? In: *Proceedings of the 25th international cartographic conference and the 15th general assembly of the international cartographic association*, International Cartographic Association (ICA), Paris, pp 1–6. Available at: <http://www.itc.nl/Pub/GIP/GIP-Academic-Output/GIP-Output.html?l=6&y=2011&d=GIP>
- Devillers R et al (2010) Thirty years of research on spatial data quality: achievements, failures, and opportunities. *Trans GIS* 14(4):387–400
- Elwood S (2008) Geographic information science: new geovisualisation technologies emerging questions and linkages with GIScience research. *Prog Hum Geogr* 33(2):256–263
- Fonseca F, Sheth A (2002) The geospatial semantic web, UCGIS, Leesburg. Available at: [http://www.ucgis.org/priorities/research/2002researchPDF/shortterm/e\\_geosemantic\\_web.pdf](http://www.ucgis.org/priorities/research/2002researchPDF/shortterm/e_geosemantic_web.pdf). Accessed 30 Oct 2012
- Goodchild MF (2000) Communicating geographic information in a digital age. *Ann Assoc Am Geogr* 90(2):344–355
- Goodchild MF (2007a) Citizens as sensors: the world of volunteered geography. *GeoJournal* 69(4):211–221. Available at: <http://www.springerlink.com/content/h013jk125081j628/>
- Goodchild MF (2007b) Citizens as voluntary sensors: spatial data infrastructure in the world of web 2.0. *Int J Spat Data Infrastruct Res* 2:24–32
- Goodchild MF (2008) Commentary: whither VGI? *GeoJournal* 72(3):239–244
- Grimshaw DJ (1992) Towards a taxonomy of information systems: or does anyone need a Taxi? *J Inf Technol* 7:30–36
- Grimshaw DJ (1996) Towards a taxonomy of geographical information systems. In: *Proceedings of the 29th annual hawaii international conference on system sciences*. IEEE Computer Society, Maui, p 547
- Haklay M (2010a) How good is volunteered geographical information? a comparative study of openstreetmap and ordnance survey datasets. *Environ Plann B* 37(4):682–703
- Haklay M (2010b) Openstreetmap completeness for England—March 2010. Slideshare, 2011 (Jan 2nd). Available at: <http://www.slideshare.net/mukih/openstreetmap-completeness-for-england-0310>. Accessed 3 April 2013
- Haklay M, Weber P (2008) Openstreetmap: user-generated street maps. *IEEE Pervas Comput* 7(4):12–18
- Haklay M, Singleton A, Parker C (2008) Web mapping 2.0: the neogeography of the geoweb. *Geogr Compass* 2(6):2011–2039
- Haklay M, Ather A, Zulfiqar N (2009) Beyond good enough? spatial data quality and openstreetmap data. Slideshare (July 29th). Available at: <http://www.slideshare.net/mukih/beyond-good-enough-spatial-data-quality-and-openstreetmap-data>. Accessed 3 April 2013
- Haklay M, Ather A, Basiouka S (2010) How many volunteers does it take to map an area well? In: Haklay M, Morley J, Rahemtulla H (eds). In: *Proceedings of the GIS research UK 18th Annual Conference*, University College London, pp 193–196
- Idris NH, Jackson MJ, Abrahart RJ (2011) Map mash-ups: what looks good must be good? In: Emma Jones C et al. (eds). In: *Proceedings of the 19th GIS research UK annual Conference*, GIS Research, Portsmouth, UK, p 119

- Janesick VJ (2000) The choreography of qualitative research design: minutes, improvisations, and crystallisation. In: Denzin NK, Lincoln YS (eds) *Handbook of qualitative research*. Sage Publications, Thousand Oaks, pp 379–399
- Medyckyj-Scott D, Hearnshaw HM, (1993) preface. In Medyckyj-Scott D, Hearnshaw HM (eds) *Human factors in geographical information systems*, Belhaven Press, London, pp xvii–xx
- Miller ME, Miller IL (1944) *Encyclopedias of bible life*, 4th edn. Harper and Brothers Publishing, New York
- Mizumoto A, Takeuchi O (2009) Comparing frequency and trueness scale descriptors in a Likert Scale questionnaire on language learning strategies. *JLTA J* 12:116–136
- Preece J, Rogers Y, Sharpe H (2011) *Interaction design: beyond human-computer interaction*. Wiley, New York
- Sheridan TB (1995) Reflections on information and information value. *IEEE Trans Syst Man Cybern* 25(1):194–196
- Shin ME (2009) Democratizing electoral geography: visualizing votes and political neogeography. *Polit Geogr* 28:149–152
- Stiles WB (1993) Quality control in qualitative research. *Clin Psychol Rev* 13(6):593–618
- Tapscott D, Williams AD (2008) *Wikinomics: how mass collaboration changes everything*. Atlantic Books, UK
- Tulloch DL (2008) Is VGI participation? From vernal pools to video games. *GeoJournal* 72:161–171
- Turner AJ (2006) *Introduction to neogeography*, eBook: O'Reilly Media. Available at: <http://shop.oreilly.com/product/9780596529956.do?CMP=OTC-KW7501011010&ATT=neogeography>
- Zeithaml VA (1988) Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *J Mark* 52(3):2–22
- Zook MA et al (2010) Volunteered geographic information and crowdsourcing disaster relief: a case study of the haitian earthquake. *World Med Health Policy* 2(2):7–33

The Fundamentals of Human Factors Design for  
Volunteered Geographic Information

Parker, C.J.

2014, X, 138 p. 16 illus. in color., Softcover

ISBN: 978-3-319-03502-4