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Relevance of Volunteered Geographic Information In A Real World Context

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ABSTRACT: *Volunteered Geographic Information* has the potential to offer *value* and *usability* benefits to end-users over and above that of *Professional Geographic Information.* For this to be accomplished, the user centred factors of both information types must be understood in detail. Through a series of focus groups, the differences between *volunteer* and *professional* information sources are investigated relative to the characteristics which are the most, or least *relevant* to the end-user. These findings have implications for how different forms of information may be most effectively utilised within different usage situations.

KEYWORDS: VOLUNTEERED GEOGRAPHIC INFORMATION; NEOGEOGRAPHY; HUMAN FACTORS; USABILITY; RELEVANCE

1   Introduction

Both Elwood (2008) and Zielstra & Zipf (2010) have previously proposed that both *Volunteered Geographic Information* (VGI: Goodchild 2007) and *Professional Geographic Information* (PGI: Parker, May & Mitchell 2010) posses their own advantages and disadvantages, suggesting that no singular information type may fulfil all of a users' requirements. In order to develop new systems based on the principles of interaction design, the users' capabilities, current tasks and goals, conditions of product use and constraints on the products performance must first be understood (Preece, Rogers & Sharpe 2002, Coote, Rackham 2008). From this, a need arises to understand how the nature of *VGI* and *PGI* influences the decisions made by the user when searching for and utilising information (Kuhlthau 1993) within a use context. Here, the *usability* and *relevance* of that information to the user forms the priority to research into VGI.

In order to understand the use of VGI in sufficient detail, a singular *Special Interest Group* (SIG) was required. Previous research (Parker, May & Mitchell 2010) has suggested that SIG understand, produce and integrate VGI more than other key user groups. For this purpose kayakers were selected as they 1) exhibit a wide range of skills and abilities 2) have groups in a diverse range of geographical locations 3) are socially focused and 4) use a diverse range of information, much of which is geographically referenced. Their activity also involves a certain level of risk, which promotes an increased amount of critical reflection during their information search (Carlson, Gieseke 1983). Consequently, the central theme of investigation was information use during the planning and undertaking of kayaking trips.

The purpose of this research was to understand in detail the information impact and use of VGI by a specified user group in relation to PGI. Ultimately, this exploratory study shall identify unique opportunities for VGI to add benefit to products over and above that of PGI in a use situation. Further research shall aim to test these hypothesise. This paper focus on aspects of the research concerned with the differing characteristics of VGI and PGI in terms of their relevance to the user. Consequently, results relating to the contribution of VGI, impact of information sources on tasks and materials used by kayakers are not covered in this article.

2   Supporting Literature

Around 2006 a trend arose for including volunteered aspects within neogeographic systems: *"a set of techniques and tools that fall outside the realm of traditional GIS"* (Turner 2006). This led Goodchild (2007) to coin the term *VGI* to describe the creation of geographic information by largely untrained volunteers - encompassing any data where a geospatial element is present. While in part fulfilling an early outcry for 'more specialist maps' (Crone 1968), a need to understand the different benefits of VGI and PGI from the end-users perspective has arisen (Goodchild 2008, Harding et al. 2009).

Considering sources of information Hawkins et al. (1995) described two categories of *internal* (accessed from the user's *Personal Experience)* and *external* (the search process from external stimuli) sources of information. This paper concerns itself only with the user's perception of external information relevance, therefore internal information and personal experience is not addressed.

Usability may be described as *"the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use"* (ISO 9241-11: 1998). Within the context of VGI, a 'product' is a device providing access to geographic information. Although of course the physical artefact influences how successfully information can be accessed and used, the focus of this article is on the attributes of the information, rather than the features of the physical device. Therefore, a framework of *relevance* (Alonso, Rose & Stewart 2008, Cooper 1971) rather than *usability* may be used to understand the important attributes of VGI and PGI to the end user.

This describes how end-users assess the *relevance* of different items of information relative to their perspectives of use, and is central to the general understanding of the end-users assessment of information quality; see Table 1.

Table 1. Definitions Of 'Relevance' Terms (Barry, Schamber 1998)

Relevance Characteristic	*Definition*
Accessibility	Some effort or cost is required to obtain information
Accuracy, validity	The extent to which information is accurate, correct or valid
Affectiveness	The user exhibits an affective or emotional response to information or sources of information
Availability of information	The extent to which sources of information available
Clarity	Presented in a clear and well organised manner
Currency	Current, recent, timely, up-to-date
Depth, scope, specificity	The extent to which information is in-depth or focussed, is specific to user's needs; has sufficient detail or depth
Quality of sources	Source is reputable, trusted, expert
Tangibility	Relates to real, tangible issues or hard data
Verification	Information is consistent with or supported by other information within the field

3   Methodology

This study was conducted through four semi-structured focus groups involving members of kayak clubs in England, discovered through *purposive* sampling (Morgan 1998). Participants were required to have two years kayaking and a degree of trip planning experience to make their views applicable to a real world context.

During the hour-long focus groups, participants were presented with a series of topics to discuss on including their experiences of planning and undertaking trips and their understanding of VGI and PGI. Particular attention was given to the information search process and how the information influenced the outcome of the trips. Sessions were recorded, transcribed in full and analysed under thematic

analysis (Aronson 1994) using NVivo 8 (QSR International 2008) as a qualitative analysis tool. Salient themes were collated to reflect themes in participant discussion before being further reduced to best demonstrate the relevance of the information pertaining to the users perception of information characteristics. In total 32 participants took part in four focus groups; see Table 2.

Table 2. Breakdown Of Focus Group Participants

Focus Groups And Locations	Number of Participants by experience	
	1-4 Years (intermediate)	5+ Years (expert)
1 - Paddle Plus (Leicester)	3	6
2 - Holme Pierpoint (Nottingham)	2	6
3 - Rugby (Ruby)	3	7
4 - Loughborough Students (Loughborough)	1	4
TOTAL	**9**	**23**

4 Results and Analysis

Figure 1 identifies the characteristics of the information sources and sorts them with reference to the relative *relevance* descriptor. The vertical columns represent the number of references made in total by study participants across all focus groups.
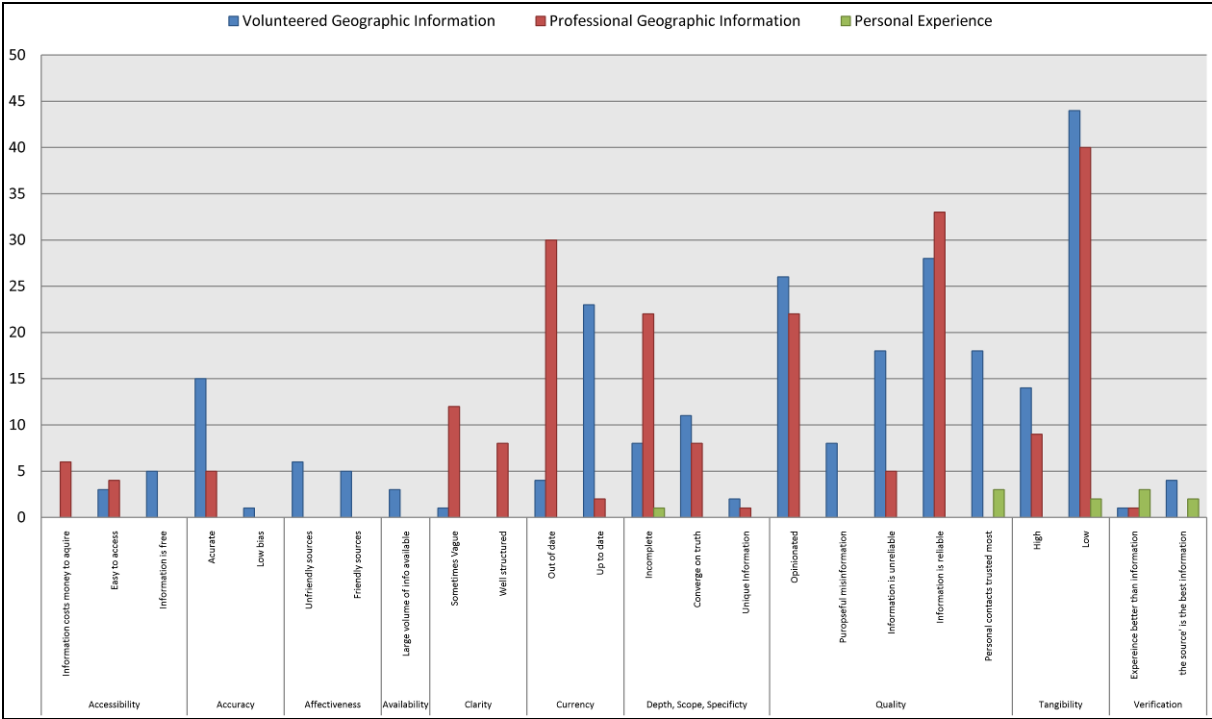

Figure 1. Data Characteristics; Number Of References Made By Study Participants

Of the issues raised by the participants, those relating to accuracy, clarity, currency, depth and quality of the information were the most pertinent. The following sub-sections are a summary of the key findings from this study.

4.1 Accuracy

Similar numbers of participants commented positively on the accuracy of volunteered and PGI. Interestingly, 14 references were made to the beneficial accuracy of *VGI* against 5 references made to *PGI*. In summing up their opinions, as participant *2-1-02* commented on VGI:

[VGI is] often more accuracy with [its inclusion of] real time information.

4.2 Clarity

Although one of the key elements of PGI is its associated quality control (Chrisman 1984), a salient number of participants (9 participants with 12 references) found PGI at times vague and hard to understand, as participant *2-3-06* commented:

If you're reading it out of a book you might not quite understand certain aspects.

In contrast, only one participant made a single comment about VGI being hard to interpret.

However, several participants noted that PGI was in general well structured, as participant *2-4-05* commented:

[It's] often produced in a more usable format and more accessible (published bodies/ websites), not trawling through information on forums.

4.3 Currency

One of the most interesting outcomes was how participants perceived the currency of information. There were 30 references within the data where participants commented that PGI tends to be out of date, as participant *2-1-05* commented:

What maps and guidebooks don't give you is up to date information. Just because it was a good guide to the river five years ago doesn't mean it's a good guide to the river now.

In contrast, very few participants commented that VGI was out of date. This is enhanced by the salient proportion of participants who felt VGI was up to date, as participant *2-3-09* commented:

Quite often within a few days you will get a notice on a forum saying "be careful there is a big tree stuck on the rock on 'this' bend" sort of thing.

4.4 Depth And Scope

Although a proportion of participants made comment that VGI is 'incomplete', a far greater salience can be given to participants perceiving PGI as 'incomplete'), as participant *2-1-08* commented:

Like we said with maps, you can't gauge, like I said, bank levels, and you can't, it's, there more for distances and everything like that

Although the low level of dissatisfaction with VGI being 'incomplete' may be anticipated, it was not expected of professional information due to its associated information redundancy.

Outcomes from the focus group also suggested that PGI can (at times) describe the general overview of the outdoor environment, yet misses key details about the features most important to the participants. In its use, 18% of participants commented that rather than utilise a single VGI source, they access multiple sources and *converge on the truth*, as participant *2-1-04* commented:

I think you use it, all these little bits of information to build a whole picture of what you want to do.

4.5 Quality

An equally strong number of participants referred to VGI and PGI being opinionated or subjective, as participant *2-4-05* commented:

[VGI] It's very open to interpretation. Someone else's grade 5 can be someone else's grade 3.

One observation unique to VGI was that of 'purposeful misinformation' as participant *2-1-05* commented:

There is a couple of people you shouldn't ask, people like Anglers, people like that. Because they often will give you very negative information.

Some other participants thought that VGI could be unreliable when the information provider lacked relevant contextual knowledge:

Locals will probably know more about access, but locals are often not kayakers.

In comparison, a salient number of participants (11 participants with 23 references) provided examples of situations where they valued the reliability of VGI, as participant *2-1-02* commented:

I think it's possibly more reliable, up to date, and you could be talking to somebody who is local and knows the river and walked past it that morning.

As expected, a larger proportion of participants perceived PGI as reliable. Participants in the focus groups commented that PGI creators are *"honest and trying to the best of their knowledge; it's their reputation"* and their material is *"usually [a] very trustworthy source with high level of experience"*.

Although a higher degree of trust in PGI was resounded from participants, a salient proportion of the participants commented that they trust their personal contacts (e.g. friends) more than anonymous sources (e.g. guidebooks), as participant *2-2-04* commented:

I'll chat to my friend Andy... I put that much sway on what he says that it really does influence what I where I want to go, what I want to do, whether I'm going to be any good at it or not... That means so much to me that you just don't get from website or books or anything like that.

The final point to be considered within this analysis is that although the focus group participants may be classed as heterogeneous by their various origins and behaviours, a large degree of homogeneity was observed in their comments regarding kayaking experiences and information use; irrespective of which club they belonged to.

5   Discussion

VGI offers a wide spatial coverage of potentially up-to-date information on artefacts important to the disseminating community. It can be subject to opinionated interpretation from contributors, as well as purposeful misinformation, resulting in elements being considered incorrect. However, as a body of information it was generally considered reliable.

Timeliness of the artefact being described dictates the most relevant information source for the end-user to employ. Considering levels of accuracy, participants commented in favour of VGI over PGI, particularly in situations where the artefacts being described altered regularly (*dynamic* in nature), and in favour of PGI when considering artefacts that are slow changing (*static* in nature). Therefore, the higher the rate of change in the artefact being described the more up to date the information source describing that artefact needs to be. VGI has a tendency to provide a faster refresh rate of information than PGI, and thus its relevance to the end user is more proportional to the artefact's rate of change than PGI.

6   Conclusion

Related comments by participants that PGI has a tendency to be incomplete, referring to its inability to deliver relatively up-to-date information, and its relatively low perception by the focus group participants as 'accurate' suggests that in time dependant situations PGI may be a less relevant, and

less usable form of information than VGI. The use of VGI could therefore provide considerable benefits to kayakers in situations such as recent rain altering the paddling conditions found on a river, or temporary restrictions being put in place due to an angling competition.

The implications of this work should be to provide a framework for further research into appropriate use of either VGI or PGI in neogeographic mashups, and their integration; depending on the context of the artefact(s) they aim to describe. This could in turn lead to mashups of higher relevance and usability to the end user, when considering all of the important factors.

Further research is planned to investigate the outcomes from this study with a community dissimilar to kayakers, yet with similar information use characteristics. In particular, to develop an understanding of how alternate SIGs relate to VGI and PGI information differently. This should provide insight into how theory generated from this study relates to the information needs of different user groups.

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8   Biography

Christopher J. Parker is a third year PhD Research Student at Loughborough University, focusing on the User Value of Volunteered Geographic Information from a Human Factors perspective. Andrew May and Val Mitchell are Research Fellows specialising in User-Centred Design of new technologies. This study was undertaken within the Ideas in Transit project (www.ideasintransit.org), funded by the UK government (via the Engineering and Physical Sciences Research Council, the Technology Strategy Board and the Department for Transport).