

# Developing a Guidance Tool for VGI Contributors

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## 1 Introduction

As part of COST Action TD1202, one of the deliverables is to create a guidance tool for the contributors of VGI. Everybody is familiar with the ubiquitous VGI project OpenStreetMap (OSM), but there are many other projects that are not as well known to volunteers. Thus the aim of the proposed guidance tool is to raise awareness of existing initiatives or websites where volunteers might search to match their interests. For citizen science, the Zooniverse website (<https://www.zooniverse.org/projects>) helps volunteers find the right project based on their interests. The proposed guidance tool would go a step beyond that and try to match interests, motivations, activities and levels of expertise/technology with recommendations for what types of projects and activities would be appropriate.

The proposed guidance tool is directly relevant to three objectives in the TD1202 COST Action as follows:

- #3: Recommendations on how to influence the behaviour of citizen sensors and encourage collection of valuable VGI, summarized in popular/professional and academic papers;
- #8: An enriched community in which the role of volunteers is recognized and appreciated as well as an enrichment of the volunteers themselves through close integration with science;
- #9: Expansion of the community engaged constructively in mapping, from individual members of the public to academic researchers; with an emphasis on developing young researchers.

The proposed guidance tool will provide contributors with the necessary information regarding how to choose an appropriate VGI project that is aligned with their motivations and interests (objective 3) so that they will be more likely to engage and provide useful VGI (objective 9) while being recognized for their contributions (objective 8).

Thus, the aim of this document is to outline how such a contributor tool could be designed, with the goal of helping volunteers to find the project that matches most appropriately to their underlying motivations so as to ensure that high quality information is collected. In the next section we present contributor motivations from the literature followed by an outline of the proposed guidance tool. This is followed by some examples of typical user profiles and an outline of the next steps in this process, which would involve implementation of the tool.

## 2 Contributor Motivations

The starting point for the conceptualization of a VGI contributor guidance tool is motivation. The reason for this is that if the motivations are aligned with the VGI project, then volunteers will be more likely to participate, be less likely to get demotivated, and have interests in providing better and more complete data. Such an alignment with volunteer motivations will also make better use of the time of the volunteers, where some may be happy to follow stricter protocols and good/best practices than others.

The starting point for motivation is the paper by Budhathoki and Haythornthwaite (2012), who reviewed the literature on motivations, as well as the book chapter by Fritz et al. (2017), who assigned more general VGI-related motivations to the ones identified in Budhathoki and Haythornthwaite (2012), where the focus was on OSM. These motivations, which can be categorized as intrinsic and extrinsic, come from the fields of volunteerism, leisure and online user-generated content. A summary is provided in Figure 1.

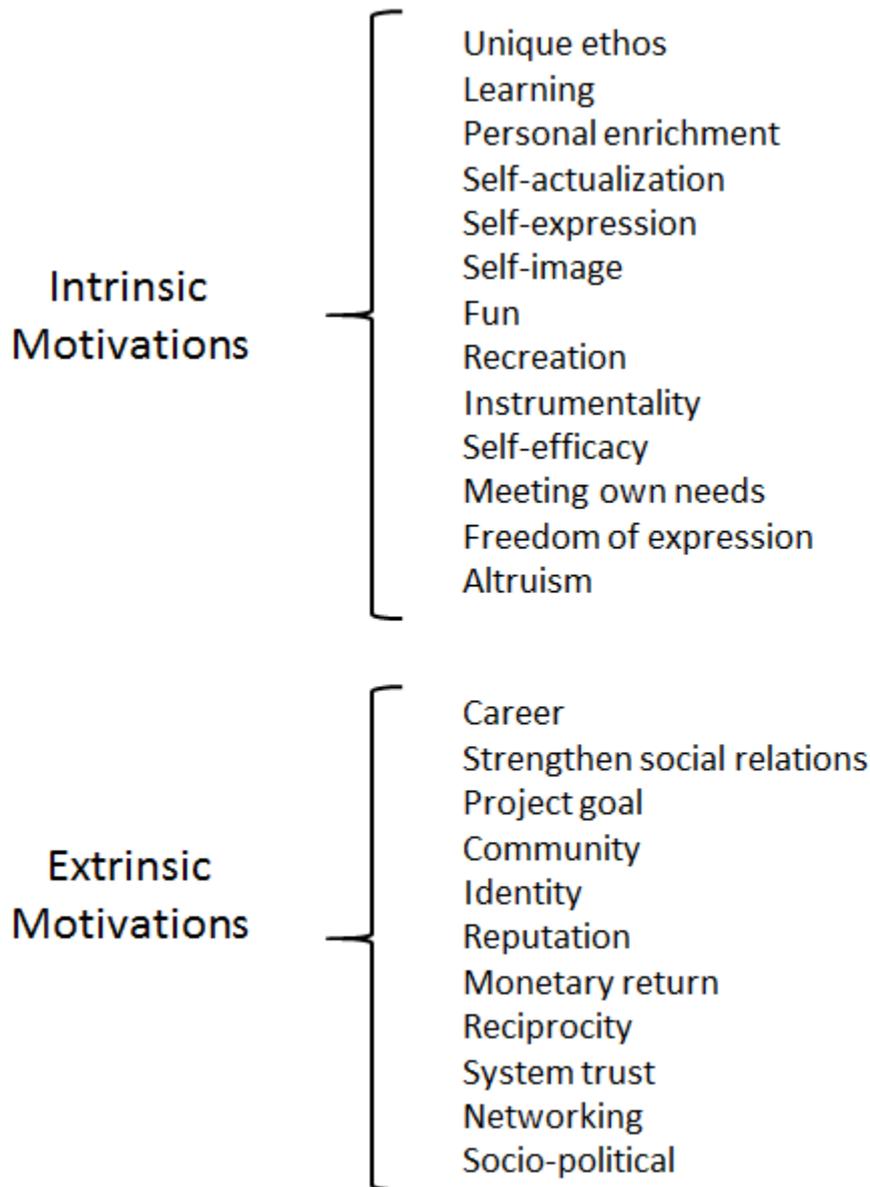


Figure 1: Intrinsic and extrinsic motivations from Budhathoki and Haythornthwaite (2012). More details of the meanings of these motivations can be found in the cited paper.

From this list, we have extracted a number of key motivations that will form the basis for building the proposed VGI contributor guidance tool.

### 3 Outline of the Guidance Tool

We propose to organize the tool into a hierarchy based on motivations, interests, subject areas and expertise, which will guide volunteers to existing VGI projects of the appropriate type so that they can contribute in the best way possible according to their hobbies and capabilities.

#### 3.1 Area of Interest and VGI Projects

We suggest drawing upon the VGI projects catalogue, which was compiled as part of the review of existing VGI websites and mobile applications that involve the collection of any type of georeferenced information as part of TD1202 COST Action Working Group 1; more details can be found in See et al. (2016). The starting point for this review was VGINet (<http://vgi.spatial.ucsb.edu/>), which was compiled by researchers at the University of California, Santa Barbara, Ohio State University and the University of Washington in 2011 (Elwood et al., 2012). VGINet was only a snapshot in time, so this list was never updated. It consisted of around 100 sites and/or applications that were reviewed and then updated by Working Group 1. We suggest that this list could be further expanded as part of the development of this tool. Then both specific sites, e.g. OSM, and categories of sites, e.g. volunteer mapping initiatives, could be suggested to volunteers. The websites and applications were categorized by subject area and are listed in Table 1.

Table 1: The subject area of the websites and applications reviewed in See et al. (2016), which can be used in the development of the guidance tool

<b>Subject</b>	<b>Description</b>
Communication	Providing IP addresses, mobile cell ids, wireless networks
Crime/Public Safety	Map showing reported crimes
Disasters (natural and man-made)	Mapping after a natural or manmade disaster
Ecology	Species identification, reporting of roadkill, species counts
Education	Environmental monitoring in schools, e.g. through the GLOBE (Global Learning and Observations to Benefit the Environment) program, where the primary focus is education
Environmental monitoring	Water levels and quality
Feature mapping	Mapping of buildings, other features of interest
Fishing	Fishing hotspots, stories, community building
Gazetteer	Place name site
Geocaching applications	Location-based treasure hunting games

Subject	Description
Hiking / Trails	Trail guides, GPS trails plotted on a map/mobile device
Land cover classification	Satellite and photograph classification by volunteers, e.g. Geo-Wiki and Picture Pile
Location-based social media	Sites that bring together people in close proximity, photo sharing sites, georeferenced check-in data, which has been used for mapping natural cities, etc.
Mobile data / Behaviour	Used to target customers by location
Search engine data	Google Trends, e.g. Google applications for monitoring trends in flu and dengue fever using archive of search data
Sky/Stars	Identification of stars, condition of the sky
Places of interest / Travel	Stories (text and video) and photos of places of interest; travel guides; travel advice
Transport	Navigation, real-time traffic, cycle routes, speed traps, mapping of roads
Weather	Weather data collection, snow depths, avalanches

### 3.2 Guiding Motivations

From the list of motivations provided in Figure 1, the following have been chosen and modified for use in the guidance tool:

1. **Learn new skills:** VGI projects can be used to participate in lifelong learning experiences and continuing education in fields that users are familiar with or want to learn more about.
2. **Contribute to science (by helping to develop scientific knowledge):** amateur scientists or volunteers with an interest in science together with professional scientists can help to develop scientific knowledge in many different areas.
3. **Receive a financial reward (monetary rewards or prizes):** this includes doing tasks for micro-payments or competing with the chance to win prizes, e.g. winning a tablet or another loyalty prize, which may be an important incentive for users.
4. **Have fun or enjoy the tasks:** joining a VGI project just to have fun may be one of the most promising motivations since it can create loyal contributors. Gaming activities can help to add this fun element to a VGI task or project.
5. **Altruistic motivations:** the idea of wanting to offer time and energy to a VGI project for a good social cause and without reward. This is an important value that is at the heart of crowdsourcing and can produce very productive contributors.
6. **Being part of a community:** as the success of social networks proves, the idea of being digitally connected to a virtual community or having the opportunity to meet a new community face-to-face can be very appealing. Participating in a VGI community of users with similar interests gives people the opportunity to exchange ideas, cooperate on tasks with a common goal and get feedback for their contributions. Some communities will be virtual while others will be face-to-face, e.g. meeting at real events such as OSM mapping parties.

7. **Contributes to a positive self-image and reputation:** people that consider themselves experts in a field, e.g. in bird observation, may find rewards in sharing their achievements with other people that have the same interests as well as gaining a reputation as an expert. For example, volunteers can reach different levels within a community whereby they have greater responsibilities or gain reputations as experts. This can contribute to positively reinforcing self-image and getting positive acknowledgements by virtue of participating in the network.
8. **Competing against others:** initial motivations for participating in a VGI project may be curiosity or some of the other motivations in this list, but long term participation may be the result of having a competitive element. Honorary distinctions such as “best contributor”, “most valuable player”, “best in rare contributions”, etc. may help to make users loyal contributors.
9. **Spotting errors and correcting them:** some people enjoy finding errors in data or on maps and may enjoy also providing correct answers. This type of motivation may be particular to people with special knowledge, e.g. local residents may know their areas very well and may be able to provide missing context that other contributors do not have. These may also be experts in mapping or in other domains who enjoy keeping information up-to-date and accurate. VGI projects of this kind may be proposed by governments or National Mapping Agencies (NMAs) to correct or update their datasets.

### 3.3 Types of Activity

A second level of questions will ask the user what type of activity they are interested in, choosing from the list below:

- A. Taking photographs
- B. Creating maps by digitizing, e.g. on very high resolution satellite imagery or aerial photographs
- C. Creating maps by going out into the field and doing a field survey (based on paper, smartphone, GPS, etc.)
- D. Giving opinions or ratings
- E. Taking part in outdoor activities
- F. Classifying data, e.g. identifying different features from high resolution satellite imagery
- G. Interested in cultural or historical topics
- H. Interested in playing games
- I. Any combination of the above choices

### 3.4 Level of Expertise and Complexity of Tasks

Volunteers will also be asked to rate their level of expertise in mapping, the familiarity with using technology (e.g. smartphones), information about what they have studied and their highest level of education, i.e. from high school to PhD. This can allow the tool to make recommendations that are tailored to the level of the user. The tool can also make recommendations related to the complexity of different tasks within a given VGI project.

### 3.5 Examples of Projects and Websites for Recommendation to Users

A major task in the development of the guidance tool would be to assign potential motivations and activities to each VGI website and application. Here are some examples of matching websites and applications to different activities but this would need to be done for both the complete list of applications and websites, and for all motivations, areas and levels of expertise.

- Taking geotagged photographs: Flickr; Panoramio; Instagram; Geograph; FotoQuest Go; Degree Confluence Project; Twitter; Facebook
- Creating maps by digitizing / georeferencing: OpenStreetMap; Wikimapia; Digital Library project to georeference historical maps; Cities at Night to georeference maps of nighttime lights taken from the International Space Station
- Classifying Data: Geo-Wiki; Picture Pile; several applications from Zooniverse including GalaxyZoo
- Giving opinions or ratings: Twitter; travel and booking websites such as TripAdvisor and Booking.com
- Taking part in outdoor activities: Wikiloc; Degree Confluence project; Strava
- Cultural or historical topics: Transcribe Bentham; Papers of the War Department; Map Warper; collect all the names of places and features in Britain from the Ordnance Survey's maps of around 1900 (<http://www.gb1900.org/#/>)
- Location-based games: Foursquare; Kort; Geocaching; FotoQuest Go; Ingress.

In some cases, based on the combination of motivations, activities, areas and expertise, the user might be recommended to start from websites that contain an inventory of projects, e.g. on Wikipedia ([https://en.wikipedia.org/wiki/List\\_of\\_crowdsourcing\\_projects](https://en.wikipedia.org/wiki/List_of_crowdsourcing_projects)), SciStarter (<http://scistarter.com/>), Citizen Science Alliance (<http://www.citizensciencealliance.org/>), OpenStreetMap wiki (<http://wiki.openstreetmap.org/wiki/Games>) or others such as:

- <http://www.urbanghostsmedia.com/2015/12/crowdsourcing-projects-helping-to-preserve-history/>
- <http://www.sierraclub.org/sierra/2014-3-may-june/green-life/4-crowdsourcing-apps-outdoors>

An inventory of these sites will need to be made.

### 3.6 Outline of the Guidance Tool and Examples

We would envisage that the guidance tool would be a series of questions arranged in a decision tree that would lead to recommendations for what initiatives to contribute to or what websites to consult based on answers provided at each stage as shown in Figure 2.

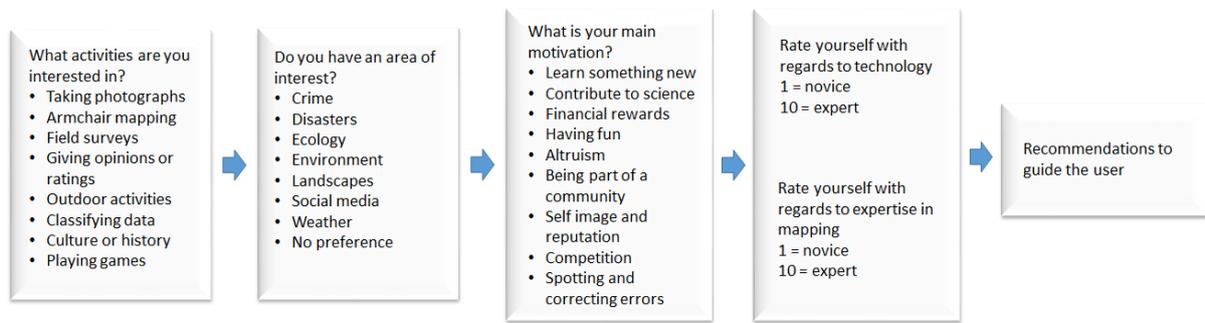


Figure 2: Organization of the questions to make recommendations to the user

Table 2: Examples of different motivations, activities, areas and expertise and the types of websites that might be recommended by the guidance tool

Motivations	Activities	Area	Expertise	Recommendation
Want to make a contribution to science?	Taking photographs	Ecology	None	iNaturalist, National Geographic
Being part of a community	Map production	Feature mapping	Beginner	Join in an OSM mapping party to learn how to contribute
Financial, wants to contribute to science and competition	Classifying data	Land cover	High in the area of land cover; low in the area of technology	Join a Geo-Wiki campaign like Cropland Validation
Fun	Play games	None specified	High in the area of technology; low in the area of mapping	Game apps such as the RoadPlex game to map POIs or FotoQuest Go
Altruism	Map production	Natural disasters	High	HOT armchair mapping and field mapping

This might be captured as a simple decision tree or be embedded within a system whereby users can rank motivations, activities and interests and thereby be given an even more tailored recommendation.

#### 4 User Profiles

In this section we provide examples of different kinds of user profiles and how they could potentially access and use the proposed guidance tool. The importance for VGI projects is to attract users that are not familiar with crowdsourcing and that do not realize that they have something valuable to offer while also gaining benefits for themselves (based on their motivations). The truth is that everybody may have specific knowledge or a skill that makes them a candidate contributor. However, there is usually a bias in contributors (e.g. the

majority of contributors are male) while non-technology savvy candidates might be discouraged from participating. Thus, the guidance tool is aimed at a range of users from different age groups and with varying levels of expertise.

In what follows, a number of hypothetical user profiles are presented, along with how the guidance tool could help them find projects that match their motivations, interests, areas and types of activities they prefer.

George is 12 years old, a high school student and, of course, a Pokémon Go player. Through Pokémon Go, he has become very familiar with maps on his Android phone. After playing Pokémon Go for several months, he decides he wants to play another geo-enabled game. The guidance tool leads him to FotoQuest Go (<http://fotoquest-go.org/>), where he can undertake quests by providing photographs and possibly winning a tablet if he becomes one of the top contributors. The guidance tool will help volunteers with interests in gaming find some interesting apps for them.

Elsa is a 20 year old, university student in a new city. In order to feel more comfortable in this new environment, she uses the tools developed in the VGI initiative CAP4Access (<http://cap4access.eu/>), which is a project funded by the European Commission. As part of the MyAccessible.EU project, CAP4Access has produced a number of tools aimed at improving accessibility for people with reduced mobility and raising awareness of the challenges faced by those people with regards to getting around in everyday environments. Elsa decides to become an active contributor and give her time to a good social cause while at the same time familiarizing herself with her new urban environment. The guidance tool would provide recommendations for a range of VGI projects that cater for altruistic motivations.

Manisha is 27 years old and was born in Kathmandu, Nepal. At the moment she is a geography student in the USA. After the devastating earthquake in Nepal, she joined the HOT (Humanitarian OSM Team) initiative lead by the local nonprofit Kathmandu Living Labs (<http://blog.kathmandulivinglabs.org/>) to help map the high priority areas indicated by the HOT team in Nepal. Although an expatriate, participating in this initiative remotely makes her feel like she is offering something back to her country while being abroad. Her main motivation is altruistic and her expertise is high due to her studies so she picks up the armchair mapping very quickly. Thus, disaster mapping is an ideal category of project to which Manisha can contribute and the proposed guidance tool would lead her to such a recommendation.

Leonidas is a 40 year old farmer. He is very good at recognizing different kinds of land cover and land use. Being a farmer, the digital world seems a little terrifying. But after using Google Maps to get instructions, he has seen his land in the satellite pictures and feels less of a stranger to this new technology. He decides to join GeoWiki's new Citizen Science Campaign: Cropland Validation (<http://geo-wiki.org/branches/sigma/>). His primary motivation is to contribute to science but he is also motivated by a combination of financial incentives and competition. Thus, he aims to get into the top 30 contributors on the leaderboard (ranked by a combination of the highest quality and quantity of validations) in order to receive an Amazon gift voucher, which ranges in value from 25 to 750 EUR. Our guidance tool would help Leonidas find this website and learn about the competition.

Philippe is 45 years old, works in the private sector and in his free time he is a volunteer firefighter. As he strongly believes in voluntarism, he can easily become a crowdsourcing fan. Once a week he has to patrol the area as a volunteer firefighter. He participates in the “Fix my street” project (<http://fixmystreet.org>), where he reports problems in the road network. The guidance tool would combine altruistic motivations with activities that involve providing a voice to citizens, i.e. via a type of opinion, towards applications that see tangible impacts in the form of responses from local authorities.

Dimitra is a 55 year old, single mother with two children. She did not manage to get to university because she had to work and raise her family. She has always loved science and dreamt of having such a profession. She spends a lot of time online so is comfortable with technology. She reads about citizen science and that every civilian can be involved in scientific projects. From Zooniverse (<https://www.zooniverse.org/>), she chooses the Old Weather project (<https://arctic.oldweather.org/>). By participating in this project, she will help scientists recover Arctic and worldwide weather observations made by United States ships since the mid-19th century by transcribing ships' logs. These transcriptions will contribute to climate model projections and will improve our knowledge of past environmental conditions. Her self-image really rises after such an involvement in the scientific world. Such a guidance tool would match Dimitra's love for science with a range of possible projects.

Gerard is 65 years old, retired and used to work in the GIS department of the municipality. His passion for GIS data, his expertise and his experience makes him an excellent contributor to OSM (<http://www.openstreetmap.org>). Based on his high quality contributions, he has been nominated “user of the month”. He feels connected to the project because it feels good to be acknowledged for contributions to a good cause when you are retired. Through active involvement in OSM, he has improved his self-image and reputation in the community, and because of his expertise, he has also been engaged in solving conflicts and correcting errors. The guidance tool would guide map lovers like Gerard to the right kind of mapping initiatives for them.

Helen is 70 years old, retired, and has a passion for photography and art. She has a lot of free time and she wants to build a network of new friends. Helen is very nostalgic about the city in which she was born and where she has spent all her life. She has noticed just how much people do not take notice of the sculptures that exist all around the city. In the news, she hears about the Athens Sculptures Atenistas project (<http://www.athenssculptures.com/p/blog-page.html>) that aims to document the sculptures in Athens city with photos, geocoding on the map and addition of descriptions. By becoming a member of this VGI project, she has entered a new circle of colleagues and participated in the recording of sculptures by providing photographs. The guidance tool would help people like Helen to combine their love of photography with their interests in art.

## **5 Next Steps**

This document provides a way to organize how a guidance tool for VGI contributors could be designed and presented. The next step would be the implementation of such an approach. The simplest way would be as a self-contained document in which the user answers a series of questions (in the form of a quiz) and the resulting score would be used to make some

recommendations about VGI applications. However, the number of recommendations using such a simple quiz might be limited.

A second method of implementation would be in the form of an online decision support system, whereby contributors would choose an activity, an area of interest, a motivation, etc. like shown in Figure 2, then be provided with a customized recommendation for what VGI projects to choose or be sent to specific catalogs to search for available projects that would suit their needs. This would involve a considerable amount of work to map each VGI project and application to an area of interest, motivation, activity, level of expertise, etc. in order to build a detailed decision tree.

The third and most complex type of implementation would be to develop this system as a wiki, whereby any user could update the site with VGI projects or motivations and build a living system. The ENERGIC COST Action is currently building a VGI Knowledge Portal that is also a wiki-based system and could be the source of many different VGI projects. However it is currently too complicated as a tool for volunteers looking for appropriate VGI projects, yet it may form a useful source of projects and initiatives that could feed into the guidance tool.

Implementation of the guidance tool is currently beyond the scope of this document and indeed the current action, which is due to end mid-October 2016. However, such a guidance system could be implemented as part of other relevant COST actions or VGI proposals in the future. Development of the tool would also make for an interesting student project.

Note that guidance documents for contributors could also be interpreted as best practice guidelines for helping users provide high quality contributions to VGI projects. However, the COST Action has already produced such guidelines, mostly from the perspective of developers of new VGI projects, see e.g. Fonte et al. (2015), Olteanu-Raimond et al. (2017) and Minghini et al. (2017).

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