

USE AND USER REQUIREMENTS FOR NEOGEOGRAPHY MAPS

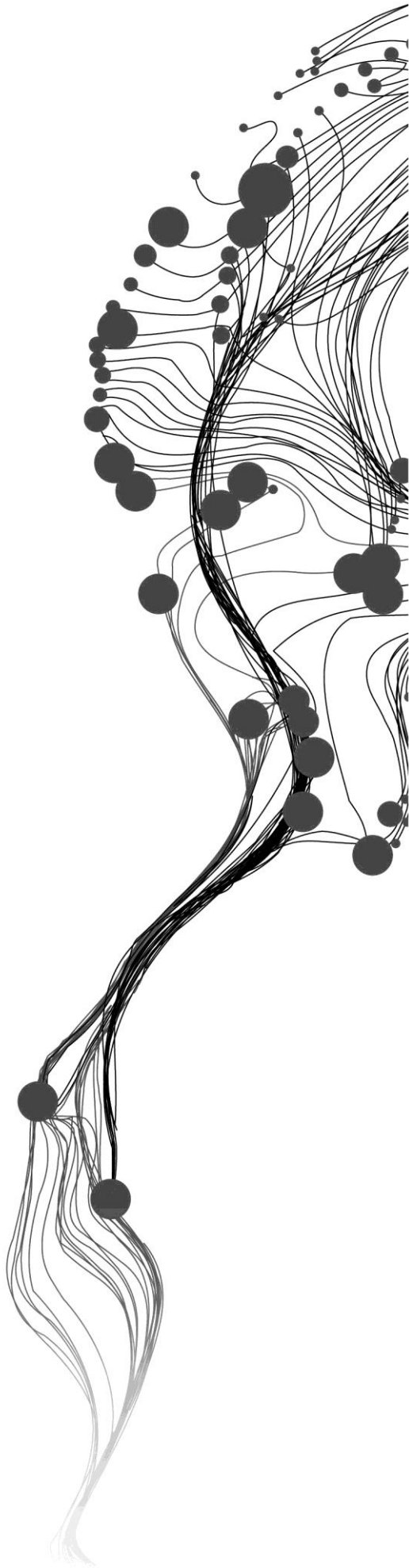
MOSA TIMELETSO MOSEME
February 2012

SUPERVISORS:

Dr. C. P. J. M. van Elzaker

Prof.Dr. M. J. Kraak

Mr. T. Das (Advisor)



USE AND USER REQUIREMENTS FOR NEOGEOGRAPHY MAPS

MOSA TIMELETSO MOSEME

Enschede, The Netherlands, FEBRUARY 2012

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.

Specialization: Geo-informatics

SUPERVISORS:

Dr. C. P. J. M. van Elzakker

Prof.Dr. M. J. Kraak

Mr. T. Das (Advisor)

THESIS ASSESSMENT BOARD:

Chair: Prof.Dr. M. J Kraak

External Examiner: Prof.Dr. C. R. Slutter (Federal University of Parana, Brazil)

DISCLAIMER

This document describes work undertaken as part of a programme of study at the Faculty of Geo-Information Science and Earth Observation of the University of Twente. All views and opinions expressed therein remain the sole responsibility of the author, and do not necessarily represent those of the Faculty.

ABSTRACT

Neogeography maps are maps created voluntarily by people who normally have no skills in the disciplines of geography, cartography, information science and related fields. These maps use the www as the platform for sharing and contributing information. Neogeography maps are designed for a purpose and the purpose of these maps differs from map to map. Some neogeography maps are designed with a mandate to assist in the collection of data, others for navigation while others are designed to facilitate sharing of information among friends and family. Similarly the maps have different users as well as uses. These users have different characteristics needs and preferences and to ensure an optimal use of these maps and the tools that are used to generate them, we have to learn more about their users and uses.

To achieve the goals of this study, several methods were used to learn and gather information about uses, users and types of neogeography maps. First, the literature was reviewed and criteria were formulated to characterise and distinguish between the different types of neogeography maps. This resulted in the generic types of neogeography maps. These types of neogeography maps proposed were, data collection maps, navigation maps, validation maps, information maps, crisis maps, tourism maps and social maps. Secondly, two neogeography maps (the Flickr World Map and OpenStreetMap (OSM)) were selected and discussed as case studies. The users of these maps were contacted and information related to their characteristics, needs and use of the maps was gathered. The methods used for gathering the data included the use of online surveys which was administered via e-mail addresses and the messaging pages on the map's portals. A number of users (OSM) were also invited for actual user test at the ITC building in Enschede, the Netherlands. This was done to observe users while performing tasks with OSM, to observe how they interact with the interface and the tools provided. The following techniques were used for user test: screen logging, think aloud, video recording, eye tracking and interviews. An interview was used after the user test for debriefing and for gathering information on issues that could not be resolved during the test.

The results showed that most of the respondents of these maps were male and only a small percentage were female. The distribution of respondents was between the ages of 26 and 40. The needs of users differ with the way they interact with the maps. For the users who contribute information, their interests are to have user-friendly tools and more tools for adding data that cannot be added presently. For those who extract data, their wish is to be able to extract data using other formats. Editing the OSM features seems to be a challenge for novice users as it is difficult to figure out how to start and stop the editing. The tools for editing map details have to be improved for better use by novice users. Even though the users agreed that indeed the quality of data was not satisfactory, they were still able to perform their tasks and achieve some of their goals. Users gave comments related to what they wished to see in the future, among others they would like to be able to contribute and extract cadastre and metadata. Users would also like to have tools enabling 3D view.

To my hubby Matli and my babies Mpho and Kori

ACKNOWLEDGEMENTS

Therefore I will praise you, Lord, among the nations; I will sing the praise of your name (Psalm 18:49)

First and foremost I would like to thank my supervisor Dr. C. P. J. M. van Elzaker, for your continuous support during my thesis writing. You were so kind to me you never let me feel lost or down you always gave me encouraging words. I would also like to thank my second supervisor Proff. Dr. M. J. Kraak, even though we never worked close together your input during the mid-term presentation meant a lot. To my advisor Mr. Tanmoy Das you were a create help you continuously took your time to help I would like to thank you for that. Mr. Willy Kock, for the assistance he provided in the usability lab, many thanks to you for that.

To the TU Delft and the Move Project Collaboration, for the pedestrian data I used in the user tests as GPS points uploaded by users, thank you so much, it wouldn't have been easy.

To all the people who took their time to look at and contribute to my questionnaire, those who came for my usability tests thank you a lot. To all my friends and family in Enschede Ngoaneso: Nthabi, Faith, Sibule, Abel, Armindo, Mamodu, Purity, Lucy and many others I thank God for meeting and knowing you. To the SADC community in Enschede, thank you for making me feel at home. To the congregation at the ITC Christian Fellowship thank you all for letting me pray and praise the Lord with you.

To the Joint Japan/World Bank Graduate Scholarship Programme (JJ/WBGSP) I truly thank you for giving me the opportunity to further my studies.

Last but not least to my family, my husband 'Matli, thank you for waiting patiently for me. My daughter Mpho and son Rorisang, I know it wasn't easy but you tried and always smiled while asking "*when is mammy coming?*" To every member of my family especially my mom thank you for the support I love you all.

TABLE OF CONTENTS

| | | |
|------|---|----|
| 1. | INTRODUCTION | 1 |
| 1.1. | Background and Motivation | 1 |
| 1.2. | Problem statement | 2 |
| 1.3. | Research identification | 3 |
| 1.4. | Research methodology | 3 |
| 1.5. | Thesis structure..... | 4 |
| 2. | CREATING TAXONOMY | 5 |
| 2.1. | Introduction | 5 |
| 2.2. | Definition of terms | 5 |
| 2.3. | Categorising the terms | 9 |
| 2.4. | Production of volunteered geographic information..... | 9 |
| 2.5. | Conclusion | 12 |
| 3. | USERS AND USES OF NEOGEOGRAPHY MAPS | 13 |
| 3.1. | Introduction | 13 |
| 3.2. | Characteristics of Neogeography Maps..... | 13 |
| 3.3. | Criteria for Distinguishing Neogeography Maps..... | 13 |
| 3.4. | Types of Neogeography Maps | 23 |
| 3.5. | Conclusion | 23 |
| 4. | LEARNING FROM USERS OF OPENSTREETMAP AND THE FLICKR WORLD MAP | 24 |
| 4.1. | Introduction | 24 |
| 4.2. | Case studies | 24 |
| 4.3. | Information needs | 27 |
| 4.4. | User research techniques..... | 28 |
| 4.5. | Conclusion | 35 |
| 5. | USE, USER CHARACTERIZATION AND NEEDS..... | 36 |
| 5.1. | Introduction | 36 |
| 5.2. | Response rate | 36 |
| 5.3. | Knowing the users: Results of the online survey..... | 37 |
| 5.4. | Working with the maps | 38 |
| 5.5. | Users' future needs..... | 42 |
| 5.6. | Observing the users: The OSM user tests..... | 43 |
| 5.7. | Discussions | 48 |
| 6. | CONCLUSIONS AND RECOMMENDATIONS..... | 51 |
| 6.1. | Conclusions | 51 |
| 6.2. | Limitations | 53 |
| 6.3. | Recommendations | 53 |
| | URLs..... | 57 |
| | Appendix A OSM questionnaire..... | 59 |
| | Appendix B Flickr questionnaire | 65 |
| | Appendix C Combination of Flickr and OSM questionnaire | 69 |
| | Appendix D Test setup | 79 |
| | Appendix E Users tasks Novice users | 79 |
| | Appendix F User tasks Expert users..... | 80 |
| | Appendix G Interview questions..... | 82 |

LIST OF FIGURES

| | |
|---|----|
| Figure 1-1: An example of a neogeography map with crowded markers (URL 5) | 2 |
| Figure 2-1: Geotagged images (source: URL 12) | 6 |
| Figure 2-2: An example of a map mashup (source URL 22) | 7 |
| Figure 2-3: Edited town on OSM (source URL 4) | 8 |
| Figure 2-4: Example of placing markers on an existing map (Source: URL 37)..... | 8 |
| Figure 2-5 Flowchart of production of VGI..... | 10 |
| Figure 3-1: Direct contribution to the map (source: URL32) | 16 |
| Figure 3-2: Incident reporting form (source: URL33)..... | 17 |
| Figure 3-3: Shared location in Google Latitude (source: URL 34)..... | 18 |
| Figure 3-4: Neogeography maps used for navigation (source: URL 17)..... | 19 |
| Figure 3-5: An example of a map used for finding a place of interest (source: URL 37)..... | 20 |
| Figure 3-6: The Washington Voting Map (source: URL 39)..... | 21 |
| Figure 3-7: OSM used a base map layer (source: URL 9)..... | 22 |
| Figure 4-1: OpenStreetMap showing part of Enschede (Source: URL 4)..... | 26 |
| Figure 4-2: Flickr Map of part of the Enschede area (source URL 38)..... | 27 |
| Figure 4-3: Distribution of OSM users around ITC building (source: URL 4) | 29 |
| Figure 4-4: Message from Flickr reflected on a personal e-mail (source: URL 68) | 30 |
| Figure 4-5: Calibrating the test person's eyes..... | 33 |
| Figure 4-6: Equipment set up in the usability lab..... | 33 |
| Figure 4-7: Annotated image of Mohale's Hoek town that users were working on in task 1 | 34 |
| Figure 5-1: Respondents' experience in the field of geography and related fields | 38 |
| Figure 5-2: Using OSM as a base map layer (source: Anonymous respondent) | 41 |
| Figure 5-3: A completed task 1 for novice participants | 45 |
| Figure 5-4: Search results from OpenStreetMap Nominatim and GeoNames | 46 |
| Figure 5-5: Adding Start/End tool to the OSM side window..... | 46 |
| Figure 5-6: Output of eye tracking showing the heat map for the GPS points downloading page | 47 |

LIST OF TABLES

| | |
|---|----|
| Table 1-1: Research objectives and corresponding questions..... | 3 |
| Table 1-2: Research methodology | 4 |
| Table 3-1 Inventory of neogeographic environments..... | 15 |
| Table 3-2: Generic types of Neogeography Maps. | 23 |
| Table 4-1: Test person’s experience and use of OSM..... | 32 |
| Table 4-2: Test person’s characteristics | 32 |
| Table 5-1: Questionnaire response rate | 36 |
| Table 5-2: Users of OSM and Flickr | 37 |
| Table 5-3: Respondents’ characteristics..... | 37 |
| Table 5-4: Years and frequency of working with OSM and Flickr | 38 |
| Table 5-5: Use of the Flickr World Map | 39 |
| Table 5-6: Why users do not use the Flickr World Map..... | 39 |
| Table 5-7: Purpose of using OSM..... | 40 |
| Table 5-8: How OSM is used | 40 |
| Table 5-9: Cross tabulation of purpose of using OSM and the ways in which users use the map | 40 |
| Table 5-10: Types of data contributed on OSM | 41 |
| Table 5-11: Improvements needed in OSM and Flickr World Map..... | 42 |
| Table 5-12: OSM user needs and requirements | 43 |
| Table 5-13: Summary results of the actual user testing..... | 44 |

1. INTRODUCTION

1.1. Background and Motivation

The act of people using and creating their own maps, on their own terms and by elements of an existing toolset is known as neogeography (Turner, 2006) and involving people in this was termed Volunteered Geographic Information (VGI) by Goodchild (2007). This expanded with easy access of faster internet connections, low costs in gadgets such as GPS receivers, digital cameras and cell phones with in-built GPS receivers. Even though this was given several terms, Neogeography (Turner, 2006), Crowdsourcing ([URL 80](#)), VGI (Goodchild, 2007), and User-Generated Content ([URL 3](#)), for the purpose of this research, the term neogeography will be used. The end-products (which can be photos, videos, text etc.) can be displayed on top of base maps such as Google Maps or Microsoft Bing Maps and be referred to as Neogeography Maps (Das & Kraak, 2011). This includes the maps that users design by putting place markers or editing the existing maps as is the case with WikiMapia ([URL 20](#)).

Maps are used to connect and integrate datasets by inherent geographic location and present them to users in a user-friendly way (Virrantaus et al., 2009). Like any other map type, neogeography maps play a vital role in the visualization of user generated data. By virtue of their nature (free for all), some people use them as a framework for storing and sharing personal data (such as photos, videos and text) and some as a repository for information. On the other hand, the public may group themselves and establish a project dealing with collecting and visualizing information on issues such as tourism to provide other users who may wish to visit their towns with maps and information they may need ([URL 1](#)). Neogeography maps also assists users to easily find what they want and locate their whereabouts in town, which saves people time and resources ([URL 2](#)), for instance one can use maps such as CliptooMap to find traffic information or weather information on a certain place ([URL 45](#)).

The information extracted from neogeography maps is very useful as it provides citizens, consumers and students with enormous information because of their collaborative and sharable content (Habib, 2011). These maps are distinguished relatively by their applications. Some maps are meant for developmental projects whereby initiatives are made to establish or improve what already exists for the benefits associated to the community, for example the OpenStreetMap project (OSM) ([URL 4](#)). Other maps are utilized as an aid in disaster interventions and to effectively assist areas struck by natural disasters such as tsunamis, earth quakes, wild fires etc. These maps have a push factor of crisis. The public are pushed by their humanitarian nature and voluntarily assist those that are in crisis. The examples are the use of OSM in the Haitian earthquake ([URL 5](#)) and the Russian Winter Map ([URL 6](#)). There are maps which are intended to assist in areas that are prone to disasters and conflicts. In this instance, users post information on early warnings of a certain disaster or conflict before they occur. For example, the neogeography map of Sudan's conflicts ([URL 7](#)). The neogeography maps can also be used for reviewing and validating existing data such as in [URL 8](#) whereby users register and review hot spot maps of global land cover disagreement and verify authenticity of that data.

In as far as it is easy to create these maps (just upload information on an online base map), this process lacks established methods and control which results in cluttered and disorganised maps (Das, 2010). Presently, interacting with neogeography maps is a strenuous work as most of the maps tend to be cluttered and difficult to read/interpret or even extract meaningful information from. As such this makes it difficult for end users to use these maps effectively and productively. This occurs in special cases for instance whereby the map has many points of interest (POI) or where the map is viewed with a low zoom level. This is in part caused by what Tahir et al. (2011) refers to as the information abundance facing the spatial domain, where every user has the freedom to post information. Figure 1-1 illustrates the problem

of data abundance where the map is crowded with symbols. There is still a need for in depth presentation of this information though it has to be conducted with less complexity.

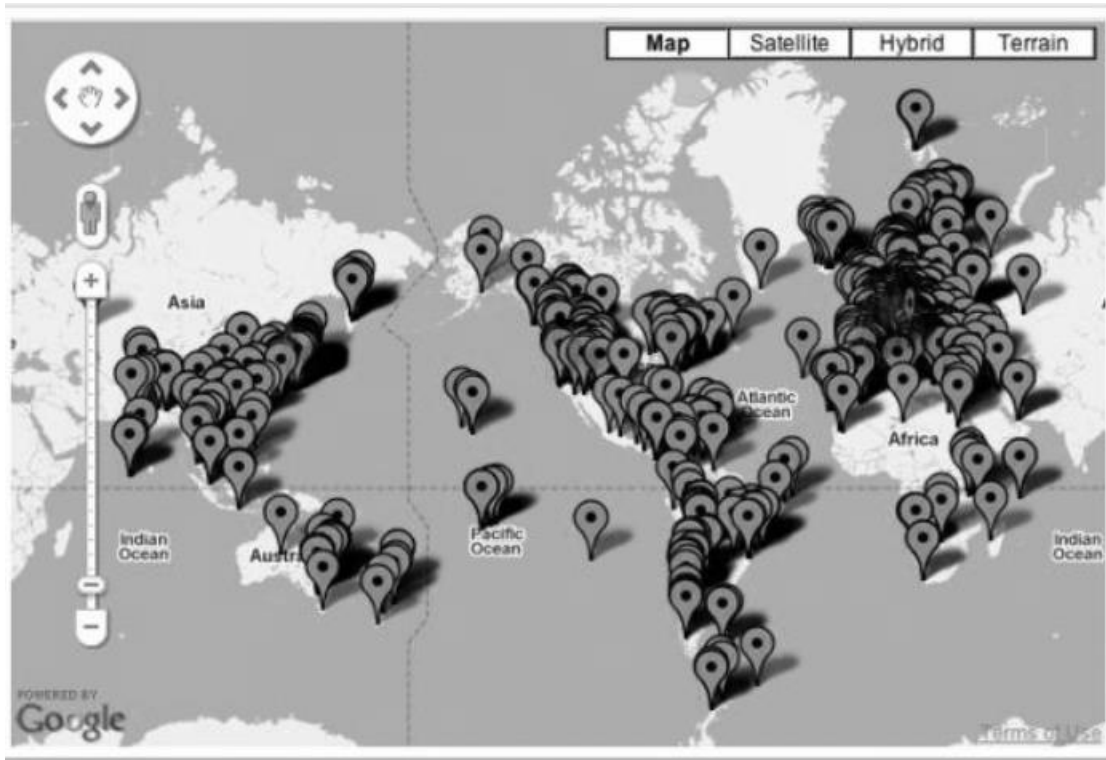


Figure 1-1: An example of a neogeography map with crowded markers ([URL 5](#))

The need for improving these maps fulfils user satisfaction which seems farfetched in as much as the professional diversity is concerned. Due to this diversity, the role of map users (both creators and end users) is no longer clear-cut, therefore, these users have different needs and expectations (Schobesberger, 2010).

Users in this context are defined as people who willingly contribute either by producing or utilizing neogeography maps. Turner (2006) defines them as people who use mapping APIs such as Google Map and Microsoft Bing Maps to upload, geo-tag and create their own maps (neogeographers). These diverse and unknown users (Tsou & Curran, 2008) may perhaps be categorised into three groups. The first group may comprise of users who only ‘create or produce’ the maps. They can be both skilled and unskilled people who collect and upload the information voluntarily and willingly to produce the maps. This could include tourists, citizens in an affected area (in the case of crisis maps) and people who collect location based data as a hobby. The second group would cover users who ‘create or produce and use’ the maps whereas the third group would comprise of those who only ‘use’ the maps. Moreover, the latter two groups can include governments, professionals and students in the fields of cartography, remote sensing and other related disciplines who use these maps for rescue services, damage assessment, developmental planning and any other reason for example doing geographical research.

1.2. Problem statement

The fact is that, presently, we do not know enough about the uses and users of neogeography maps. Therefore, the use made of these maps is probably not optimal.

In as much as the diversity of users and uses of neogeography maps is concerned, it is evident that the user’s interests, needs and use of the neogeography maps will differ relatively among users. The purpose

of this research is to shed more light on the uses and users of neogeography maps, so as to make possible their better use.

This research is aimed at promoting a better and more productive use of neogeography maps by giving a systematic overview of the uses as well as needs and characteristics of the users. Presently, there is no thorough classification of users and uses of neogeography maps. Furthermore, no research has attempted actually engaging the users themselves while gathering more information about uses and users. This research will focus on studying the needs, expectations and characteristics of users of neogeography maps through involving users themselves. The research aims at producing a more comprehensive (not generic) categorization of user characteristics and uses of neogeography maps.

1.3. Research identification

1.3.1. Research objectives

The main objective of this research was to give a systematic overview of the uses as well as needs and characteristics of the users of neogeography maps as the means to promote a better and more productive use of these maps.

1.3.2. Specific research objectives

The objectives of this research were achieved through the following specific objectives;

- To gain knowledge on the uses of neogeography maps.
- To find out, who the users of neogeography maps are and what are their characteristics.
- To determine the needs of the different types of users.
- To gain in-depth knowledge about the user requirements for neogeography maps.

1.3.3. Research questions

Table 1-1: Research objectives and corresponding questions

| Specific Research Objectives | Research Questions |
|--|---|
| To gain knowledge on the uses of neogeography maps | What are the purposes of neogeography maps? What are the different kinds of neogeography maps? |
| To find who the users of neogeography maps are and what are their characteristics. | Who are the users of neogeography maps? What characteristics do they possess? What is the best way to categorize the users? |
| To determine information needs for the different types of users | What do different types of users contribute in neogeography? How do and how can different types of users benefit from neogeography? What are the user's future needs? |
| To gain in-depth knowledge about the user requirements for neogeography maps | What are the user requirements for neogeography maps? |

1.4. Research methodology

below is the methodology that was followed to achieve the objectives of the research.

Table 1-2: Research methodology

| Research questions | Method |
|--|---|
| What are the different kinds of neogeography maps? | Literature |
| What are the purposes of neogeography maps? | Literature |
| Who are the users of neogeography maps? | Literature and User research techniques |
| What characteristics do they possess? | Literature and User research techniques |
| What is the best way to categorize the users? | Literature |
| What do different types of users contribute in neogeography? | Literature and User research techniques |
| How do and how can different types of users benefit from neogeography? | User research techniques |
| What are the user's future needs? | User research techniques |
| What are the user requirements for neogeography maps? | User research techniques |

1.5. Thesis structure

This is the structure that was followed to achieve the objectives of this research. Chapter two is the literature review, the terms used in neogeography environment are reviewed and taxonomy is made. This helps in making a clear distinction between the data and the way information is stored and visualized. This was achieved through the use of a geographic information production flowchart which was used to identify the potential uses and users of neogeography maps. Chapter three presents the uses and users of neogeography maps as well as their categories. This was made on the basis of the research conducted in the previous chapter. The outcome of this was the proposed uses, users and types of neogeography maps and the inventory of neogeography map environment which was used in the succeeding chapter. Chapter four focused on selecting the case studies. The choices and motivation for those choices were made and the cases selected were discussed. This chapter was also used as the information gathering stage where user characteristics and needs were collected. This was done with an aim of acquiring more insight on the uses and users of neogeography maps using the choices made as point of reference. This chapter was followed by chapter five which was on presenting and elaborating the results of the questionnaire and the actual testing of the users. The outcome of this chapter was the use and user requirements for neogeography maps. The conclusions and recommendations were presented in chapter six.

2. CREATING TAXONOMY

2.1. Introduction

The evolution of Web 2.0 came with the coining of several terms to give explanation to what was taking place in the technological world. The collection, use and sharing of content by laypersons via the www was one of the phenomena that came into being during this era. Some named it VIG (Goodchild, 2007), some Neogeography (Turner, 2006) others Crowdsourcing ([URL 80](#)) depending on the angle one considered. Irrespective of the term used in one publication or the other it is quite confusing to know for sure which term to use while referring to the content and which one to use while referring to the display of the data. The terms that were used to explain the contribution and visualization made by users are discussed and grouped in this chapter. The processes the users go through to produce their volunteered data are also explained.

2.2. Definition of terms

In 2001, the world experienced the new generation of World Wide Web (www) which was termed Web 2.0 ([URL 10](#)). Web 2.0 is a broad term encompassing several web applications that allow information sharing, interoperability, user centred design and collaboration on the www. It is associated with technologies such as blogs (Web log), wikis, Really Simple Syndicate (RSS), mashups and others (Batty et al., 2010; Murugesan, 2007). It came with a new notion where individuals were availed the opportunity to collaborate and share information through the www. Following this was the mushrooming of new terms that came as an attempt to explain the contribution made by individuals to the collection and sharing of geographic information. These terms can be divided into two groups, those that explain the content (data) and those that define the representation of data.

2.2.1. Terms associated with the content

Several terms have been coined to explain the content contributed by users; these included User Generated Content (UGC), Volunteered Geographic Information (VGI), Citizen Science, Neogeography and Crowdsourcing.

2.2.1.1. User Generated Content

UGC can be referred to as any type of content created, uploaded and displayed by users on the www (Interactive Advertising Bureau, 2008). User generated content includes content from different streams such as news sites, trip planners, movie reviews, gossip sites, tips etc. This content is communicated to the public through the use of portals which are monitored by administrators for language and decency of the content. The information comes in various kinds of media content (Habib, 2011) be it text, video or pictures and is freely available for public consumption. For example the videos on YouTube ([URL 11](#)) are uploaded by unprofessional users and are freely available to the public. When this content has a 'geo' component, it is referred to as User Generated Geo-Content (UGGC) (Das, 2010). A geotagged image (Figure 2-1) contributed voluntarily by the users and displayed on the www for public consumption is an example of a UGGC.



Figure 2-1: Geotagged images (source: [URL 12](#))

2.2.1.2. Volunteered Geographic Information

The engagement of the public in the collection of geographic information for public consumption was coined Volunteered Geographic Information (VGI) by Goodchild (2007) which he regarded as a special case of UGC. As mentioned above, UGC refers to ‘any’ content contributed by users, VGI is said to be its special case since it deals with the voluntarily contributed geo content only, this excludes all the other types on content that are non-geographic. Seeger (2008) refers to it as the resulting data when the online digital mapping systems support users to generate, collaborate and share their own spatial content via the web applications. For a set of data to be considered VGI, it has to have a prerequisite of being a geographic content, contributed voluntarily by unskilled users, using elements of Web 2.0.

2.2.1.3. Citizen Science

The voluntary collection and processing of data as part of scientific enquiry is referred to as Citizen Science (Silvertown, 2009). This is a type of UGC which is specific to the scientific domain. The users contribute their content on science related topics such as climate change, ecological restoration, water quality etc. The examples of Citizen Science includes Chicago Wilderness ([URL 13](#)) where users contribute information pertaining to endangered species in order to protect nature and a well-known Christmas bird count project ([URL 14](#)). The citizens contributing in Citizen Science project also contribute on the voluntary basis and normally have no specific scientific training.

2.2.1.4. Crowdsourcing

Howe; (2008) explains Crowdsourcing as an act where an undefined group of non-professionals perform tasks conventionally performed by designated agents. Though crowdsourcing is also voluntary, it is not always free ([URL 80](#)); users are at times afforded an opportunity to make financial gains out of their

contributions. For example, a company called General Electric invited the public to contribute ideas for developing a power grid where the owner of a winning idea received a \$ 50,000 prize ([URL 15](#)). This is not the only Crowdsourcing activity whereby users are motivated, for example, in Get a Slogan ([URL 16](#)) users make slogans for advertising companies. Nevertheless, there are many other contributions which are free, such as Waze ([URL 17](#)) where users contribute traffic reports voluntarily and without any monetary motivation.

2.2.1.5. Neogeography

The act of people collecting, creating and using their own maps at their own terms and using elements of existing toolsets was termed Neogeography by Turner (2006). He continued to show that this newly emerged phenomenon incorporates all the complex techniques of cartography and GIS and gives the people an opportunity to put them in use. These techniques are therefore simplified and brought to the level where unskilled users can be able to utilize them. In other words Neogeography is about volunteered contribution, shared surface and the use of Web 2.0 tools.

2.2.2. Terms associated with representation of data

The second group of terms emphasises cartographic representation of the geographic information (Elwood, 2008). These include terms such as Neogeography Maps, Neocartography and Collaborative Mapping.

2.2.2.1. Neogeography maps

When neogeography products are overlaid on top of base maps such as Google Maps (Figure 2-2), they are referred to as Neogeography Maps (Das & Kraak, 2011). This includes using Web 2.0 technologies such as Extensible Markup Language (XML), RSS etc. to assemble map mashups such as in Yahoo Pipe ([URL 18](#)) and MapBuilder ([URL 19](#)). Alternatively, the content is also contributed directly to the existing map by either editing or tracing features (Figure 2-3) or by placing markers (Figure 2-4). This is done by creating features on an online mapping site through the help of a base map or a high resolution satellite image from which the users can identify a road, building etc. The implication is that neogeography maps have different characteristics, some are a result of map mash ups, some a result of tracing and editing aerial photographs and other a result of putting makers on an existing map as shown in the figures below. The above mentioned maps have different characteristics but are all referred to as neogeography maps since the contribution is done voluntarily by laypersons over the www.

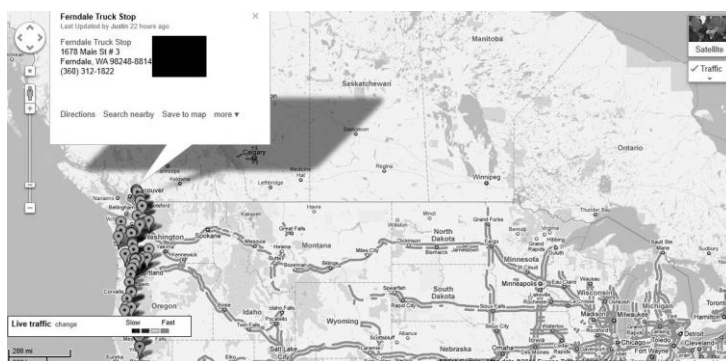


Figure 2-2: An example of a map mashup (source [URL 22](#))



Figure 2-3: Edited town on OSM (source [URL 4](#))



Figure 2-4: Example of placing markers on an existing map (Source: [URL 37](#))

2.2.2.2. Neocartography

Neocartography combines both the concepts of neogeography as well as those of ubiquitous cartography (Jobst & Döllner, 2009), where ubiquitous cartography refers to the ability to create and utilize maps anywhere and at any time (Takashi, 2007). Neocartography looks into the ability to make maps outside the formally accepted cartographic profession at any time using Web 2.0 tools. It is more concerned with user participation and sharing geographic information.

2.2.2.3. Collaborative mapping

Collaborative Mapping is used to explicate the voluntary contribution by a large, diverse and untrained group of users with the aim to collect and disseminate geo-spatial data (Heipke, 2010) and ([URL 46](#)). In Collaborative Mapping, users are able to create maps on a shared surface and changes are normally effected almost in real time. Other users are able to edit what their peers have contributed. This excludes applications where maps are not meant to be edited by users such as in Metro Reports Map ([URL 23](#)) where one is only allowed to add but not edit. These two conditions (changes effected almost in real time and editing of other's contribution) draws a line between Collaborative Mapping and Neogeography Maps.

The example of collaborative mapping includes WikiMapia ([URL 20](#)) and OSM where users digitize and add place names guided by a high resolution satellite image.

2.3. Categorising the terms

Based on the definitions given and characteristics of the terms we can conclude that the terms defined in section 2.2.1, can be grouped as follows;

- a. Terms explaining the collection and contribution of any kind of content. These terms include, User Generated Content and Crowdsourcing.
- b. Terms explaining the contribution of location based information. This group is made up of terms such as Volunteered Geographic Information, User-Generated Geo-Content and Neogeography.
- c. And terms used for the collection of information relating to a specific domain (science in this case). The group has only one member- Citizen Science.

2.4. Production of volunteered geographic information

Figure 2-5 below show a flowchart of the production of VGI. It illustrates the process individuals go through to produce and re-use the geographic information. The various stages are explained in the subsections below.

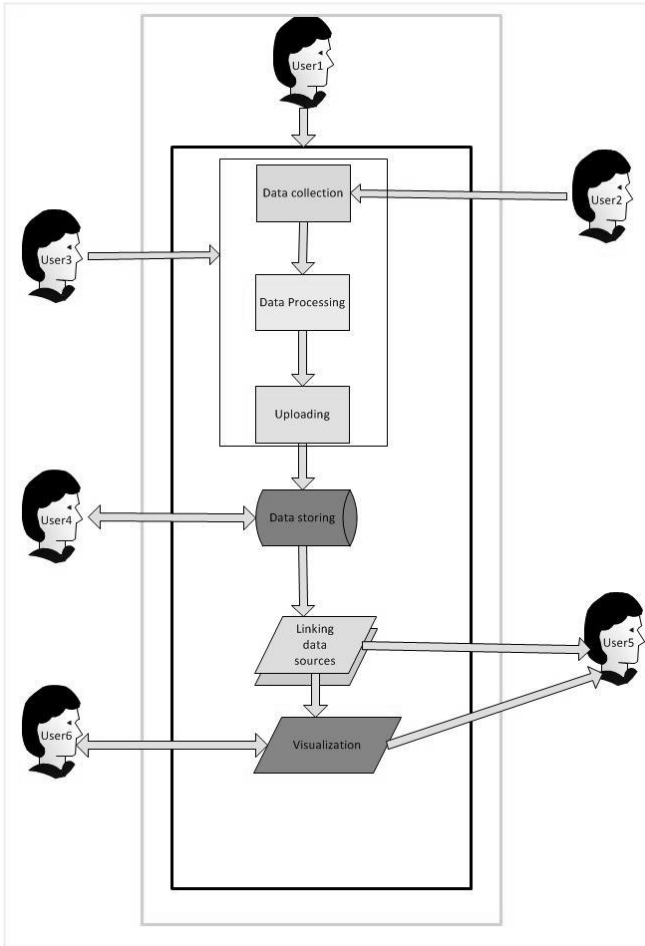


Figure 2-5 Flowchart of production of VGI

2.4.1. Data collection

The information is collected voluntarily by users, this is conducted by the use of different tools such as; PDA's, mobile phones, smart phone, digital cameras and GPS receivers etc. The type and level of contribution differs with every user. With reference to Figure 2-5 above, users 1, 2, and 3, symbolises the users who contribute information only. Users 4 and 6 are users who both contribute and utilize the information, while user 5 uses the information only. The scenario portrayed is as follows; 'User1' collects data with an intention of creating a map in an application such as MapBuilder ([URL 19](#)) or Quickmaps ([URL 25](#)) that will assist one to design a new map. This is the user who will continue with the process of producing VGI until the end (visualization). 'User2' is a carrier of a mobile device, which leaves traces of his or her tracks. In this case, the data is collected automatically (with or without the user knowing this). This is what Waze ([URL 17](#)) and Apple ([URL 26](#)) use to collect geographic data through the use of Location-Based Services (LBS). For example, Waze follows the signal from a vehicle with an active application and digitizes the newly found roads and visualizes them for public consumption. Apple uses this to collect information pertaining to the surrounding, such as Wi-Fi access points and cell towers from the devices that have the LBS turned on. This information is used to update the Wi-Fi hotspots and cell tower database.

'User3' collects the data, uploads them and never continues with the process. This could be a user of a social medium such as Flickr who would upload a geotagged image of some mountain and all the other processes such as visualization will be automatic or be undertaken by the administrator of the platform. 'User4' collects and uploads his data to the site, for example if one is taking part in a bird watch programme like 'pigeon watch' ([URL 27](#)), he or she can access information as well as load this on the site. The same applies to 'User6' who can be able to use the information on the map as well as add his content for example as in OSM.

2.4.2. Data Processing and uploading

As mentioned previously, the data is collected through the use of several tools. Therefore the data formats are also different. Some of the content is in formats which do not have a geographic location therefore, images and videos that are not automatically geotagged are given a location manually by the user through matching them with the location where they were taken by using the map. The GPS tracks, waypoints and routes are converted into suitable formats, and in case of tracks, the unwanted or duplicated points have to be deleted. This can be done through the use of applications such as GPS Visualizer ([URL 28](#)).

2.4.3. Data storing

When the information is processed, it is then uploaded to the site of one's choice. The applications mentioned in the previous section can also be used to store and visualize the data. For instance the GPS Visualizer will not only convert the points but will also store the points and create a map for the user. Flickr ([URL 29](#)) is one of the many websites that are commonly used to store geotagged images and videos. Some users use Flickr to store images and display them on their websites. For instance, in 'Uncornered Market' ([URL 30](#)) the photos are uploaded on Flickr for storage only to be visualized on their webpage.

2.4.4. Linking the data

The data can be linked with other sources of information through map mashups. Map mashups encompasses the latest easy to use technologies which include, XML, SOAP, WSDS, RSS, AJAX etc (Miah & Gammack, 2008). These technologies work together to assemble mashups. Additionally, map mashup can be either manual or tool assisted. Manual mashup are used by professionals who know their way through manipulating softwares and who have programming skills. On the other hand tool-assisted mashups can be used by unskilled users (Yu et al., 2008). Yahoo Pipes ([URL 18](#)) is one of the popular (Yu et al., 2008) mashup tools in the www.

With reference to Figure 2-5, 'user1' can now use the information stored in one of the web mapping pages mentioned in section 2.4.3 to create his or her own map. This would require him to source information from other sources and create a map mashup. At this level, other users (User5) can use the data he or she contributed in their own mashups as it is already shared.

2.4.5. Visualizing the data

The information can then be overlaid on top of a base map for visualization. Other users (User6) also have the opportunity to contribute certain information directly to the map as it's done in OSM and WikiMapia. 'User5' may also use the map as a repository for information and get information sought from the map.

2.5. Conclusion

This chapter dealt with the different terminology used in the publications as well as the www, which are used to refer to the contribution and display of the content contributed voluntarily by users on the www. These terms are normally used in a confusing manner as the people tend to use them interchangeable as synonyms. In the chapter taxonomy was made to differentiate between the terms referring to the actual content such as VGI, citizen science etc. and the terms referring to the representation of the data like neogeography maps and collaborative mapping.

A clear description of terms was made to show the types of data referred to and to show how each term differs from the next. The chapter also looked at the stages followed in the voluntary production and use of the geographic information. The possible users and their roles were also discussed. It can never be denied that there are more users and uses of the end products of voluntarily contributed geographic information (Neogeography Maps), hence, the need to discuss more on the possible users and uses of the neogeography maps in the following chapter.

3. USERS AND USES OF NEOGEOGRAPHY MAPS

3.1. Introduction

Neogeography maps are reservoirs for geospatial information collected by non-professionals for their own benefit and for the public at large. The chapter deals with the characteristics of these maps, it looks at the qualities that make them be featured as neogeography maps. It starts with by outlining the characteristics of neogeography maps and the criterion for distinguishing between different types of neogeography maps is created. The criterion looks at how the maps came into being. The chapter continues to look at the generic types of neogeography maps as well as their examples. It also shows the different users and uses of the maps.

3.2. Characteristics of Neogeography Maps

According to the definition given in the previous chapter, neogeography maps can be characterised in three distinct ways, voluntary contribution, crowdsourced data and use of www as platform.

- Voluntary contribution: The information mapped should be contributed at the users own free will. That is, the information contributed passively by users or as part of the user's job description is not considered here.
- Crowdsourced: The information should also be a collaborated effort; the users should share the surface of contribution for the map to be considered as a neogeography map. This implies that a map created by a single user showcasing his travelling experience around the world is not a neogeography map.
- Using the www as a platform: Neogeography maps are created using Web 2.0 tools, these tools are said to fall outside the realm of traditional and professional GIS (Turner, 2006). This implies that the maps created using professional mapping tools such as ArcGIS will not be considered as neogeography maps here.

3.3. Criteria for Distinguishing Neogeography Maps

The www is swamped with neogeography maps which have different characteristics and made for various purposes. In this section, the different characteristics of neogeography maps are discussed. The discussion is first of all based on how the neogeography maps were created, their purpose and their ultimate users. An inventory of neogeography maps found in the www was made and compiled, this collection might not be exhaustive but it gives a good representation of neogeography maps out there. The table below shows the inventory of neogeography maps.

| Name | Description | URL |
|-----------------------------|--|-----------------------|
| 360 Cities | Sharing photo around the world | Map1 |
| AmigoMapper | Sharing location live with friends | Map2 |
| Australian Bushfire | Australian bushfire map | Map3 |
| Bambuser | Visualization of most played videos on Bambuser | Map4 |
| Bikely | Sharing bicycle routes | Map5 |
| BlueMapia | Sharing sailing tips, videos, photos and comments | Map6 |
| Buddyway | Sharing GPS tracks and location using cell phones | Map7 |
| CliptooMap | Sharing local information with tourists | Map8 |
| CodexMap | Mapping books | Map9 |
| Coloci | Sharing trip information on places one plans to visit | Map10 |
| Cyclopath | Sharing bicycle routes, roads and trails | Map11 |
| Did you feel it? | Earthquake reporting in USGS | Map12 |
| eBird | Collecting and sharing information on the birds to | Map13 |
| | conserve and restore natural ecosystem | |
| EvolutionMegaLab | Collection and sharing data on snails | Map14 |
| Fietsrouteplanner | Sharing of bicycle routes in Europe | Map15 |
| The Flickr World Map | Geotagged photos on Flickr | Map16 |
| Fotki | Mapping images and videos on Fotki | Map17 |
| Mibazaar | Sharing videos for Gaza conflict | Map18 |
| Geo-Wiki | Global land cover validation on Geo-wiki | Map19 |
| Goole Map Maker | Editable map of the world | Map20 |
| Google Picasa | Mapping images, videos and sharing locations on | Map21 |
| | Google Picasa | |
| Haiti Earthquake Map | Crisis map of Haitian earthquake | Map22 |
| Hurricane Katrina | Crisis map of Hurricane Katrina | Map23 |
| Kathmandu Valley Earthquake | Crisis map of Kathmandu valley earthquake | Map24 |
| London Profiler | Visualizing and sharing of geospatial data in London | Map25 |
| Map Kibera | Visualizing reports in the city of Kibera Nairobi | Map26 |
| MapMyRIDE | Sharing of bicycle routes. | Map27 |
| Map My Tracks | Mapping routes for running, walking and cycling | Map28 |
| Mologogo | Sharing location live with friends | Map29 |
| Nearbyfeed | Sharing information about places nearby restaurants, | Map30 |
| | events | |
| OneSportEvent | Sharing running, walking and cycling tracks | Map31 |
| Open Algeria | Sharing with world the political situation in Algeria. | Map32 |
| OpenRouteService | Sharing routes (walking, cyclist, motor...) | Map33 |
| OSM | Digitizing and tagging the world map on | Map34 |
| | OpenStreetMap | |
| Pakistan Flooding | Crisis map for Pakistan flooding | Map35 |
| Polska Monitor | Monitoring Poland 2011 | Map36 |
| Rocwiki | Sharing the city of Rochester New York with tourists. | Map37 |
| Russian Winter Map | Crisis map of Russian winter map | Map38 |
| Safari Mappers | Sharing routes in the national parks in Africa | Map39 |
| San Diego Wild Fires | Crisis map for San Diego wild fires | Map40 |

| | | |
|-----------------------|--|------------------------------|
| Sinsai | Crisis map for Japan earthquake | <u>Map41</u> |
| Sudan's Conflicts | Crisis map for Sudan's conflicts | <u>Map42</u> |
| Syria Tracker | Reporting on the situation in Syria | <u>Map43</u> |
| Washington Voting Map | Reporting problems in Washington voting | <u>Map44</u> |
| WikiMapia | Collection and sharing of geospatial data on WikiMapia | <u>Map45</u> |
| WMATA problems | Reporting problems in Washington metro service | <u>Map46</u> |
| Waze | Sharing of traffic information and routes | <u>Map47</u> |

Table 3-1 Inventory of neogeographic environments

3.3.1. How the maps were created

The neogeography maps are created in different ways depending mostly on the rules and guidelines outlined by the hosting party. In order for users to contribute, the hosting party may or may not request users to register first. The nature of the contribution and the type of information collected by users also differs. In some cases, users take charge for starting and completing the whole framework of map production while in some cases there is a mediator to take over and approve the submission relative to criteria established by the hosting party. In the latter case, the tools for creating these maps are provided where necessary, and the guidelines are also set. Below are the ways and different requirements needed for users to contribute geographic information.

3.3.1.1. Registration

Registration is a prerequisite in contributing information to some neogeography maps for example to contribute in OSM ([URL 4](#)), the users are expected to have usernames and passwords. This only applies to users who contribute information and does not apply to users who only utilise the maps. In other cases, for example WikiMapia ([URL 20](#)), registration is not mandatory; users can contribute information without registering though the access is limited for a non-registered user (in the case of WikiMapia). On the other hand, there are cases whereby registering is not required at all such as in the Haiti Earthquake Map ([URL 9](#)) and Nature Find ([URL 31](#)).

3.3.1.2. Method of contribution

The contributions by users are either made indirectly or direct to the map.

- a. Information is contributing directly to the map through tracing the aerial photography, tagging the content or uploading GPS tracks as is with the case in OpenStreetMap (OSM). Users are also able to contribute by editing and enriching what others have contributed (WikiMapia and OSM) or through verifying data that was collected using other sources as is the case in Geo-Wiki ([URL 8](#)). On the other hand the direct contribution may be done though placing makers on existing maps such as Google Maps as it's done in the Newspaper Food Column Map ([URL 32](#)). For example Figure 3-1 below shows an example of a neogeography map where place makers were erected to illustrate areas where there are newspapers with columns featuring latest recipes and food news.



Figure 3-1: Direct contribution to the map (source: [URL 32](#))

- b. Indirect contribution to the map entails contributing information through the mediator who in turn decides the content posted on the map. This is normally the case in crisis mapping where users are expected to fill and post reports pertaining to occurrence of incidents, for example Kathmandu Valley Earthquake Map ([URL 33](#)). The reports for contributing data as shown on Figure 3-2, are anonymous with the fields for names and emails optional. The users are provided with guidelines on what type of information to contribute which is generally the description of an incident, the location where it occurred and the category.

It should be noted though that direct contribution does not automatically imply non-existence of mediator as there are still neogeography maps where contribution is direct to the map yet the mediator counter checks the content and has the right to delete the inappropriate content such as in WikiMapia.

The image shows a web form titled "Submit a New Report" for an incident reporting system. The form is divided into several sections:

- Report Title:** A text input field.
- Description:** A large text area for describing the incident.
- Date & Time:** A dropdown menu showing "Today at 9:27 pm (Asia/Katmandu)" with a "Modify Date" link.
- Categories:** A list of checkboxes for incident types: Building Collapse, Deaths, Injuries, Road Blockade, Safe Places, Rescue Request, Medical, Stores and Facilities, Fire, and Evacuation Centers.
- Optional Information:** A section with three text input fields for "First Name", "Last Name", and "Email".
- Location Selection:** A map of Kathmandu with a red pin. Above the map is a "Find a location near you" section with a "Select a City" dropdown and a "Find Location" button. Below the map is a "Refine Location Name" section with an example: "Corner of City Market, 5th Street & 4th Avenue, Johannesburg".
- Additional Fields:** "News Source Link" and "External Video Link" (both dropdown menus), and "Upload Photos" with a "Browse..." button.
- Submit:** A green "Submit" button at the bottom.

Figure 3-2: Incident reporting form (source: [URL 33](#))

3.3.1.3. Rendering contributed information

Neogeography map production also differs with how quickly the information can be displayed on the map. For some maps (WikiMapia and OSM), information is shown in real time though mediator may delete it in a later stage (WikiMapia) or other users may edit or delete it (OSM). In maps such as OSM, the users can choose to render information in real time by selecting Osmarender as background or may choose to render in a maximum of two days by choosing Mapnik as a background. In Flickr World Map ([URL 38](#)) rendering is done automatically by the administrator when the users decide to mark their geotagged images as public. While in Google Latitude ([URL 34](#)) rendering is also automatic and is in real time with the condition that the user has chosen to share their location with others. Figure 3-3 below shows a shared geo location on Google Latitude, the location of the user in question can only be seen by her friends who are logged in the same application.

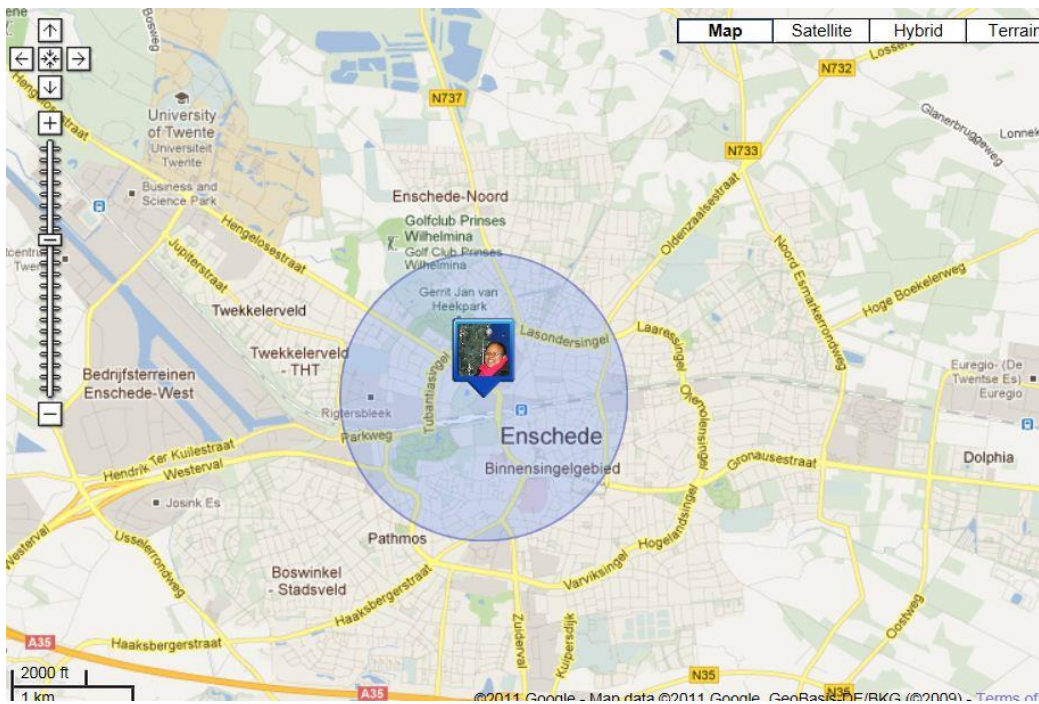


Figure 3-3: Shared location in Google Latitude (source: [URL 34](#))

3.3.2. Purpose of the maps

Neogeography maps like all other maps are created for a purpose. The purposes differ in each case; in this section, the discussion focuses on the purposes of neogeography maps.

3.3.2.1. Data collection and storage

There are neogeography maps which are created with a specific purpose of being used as tools in data collection and storage. OSM ([URL 4](#)) and Geo-Wiki ([URL 8](#)) are examples of neogeography maps with a mandate to collect geospatial information. These maps also play a major role as repository for the stored information. There are maps which are not created for the purpose of data collection (for instance the Flickr World Map), but are still used for storing user's information.

3.3.2.2. Navigation

Neogeography maps with information on roads, bicycle tracks etc. are used for navigation. These are the maps which are an aid to users while finding their way from point A to point B. The maps used for this purpose include Waze ([URL 17](#)) which is used by users to report live traffic updates (Figure 3-4) and MapMyRIDE ([URL 35](#)) which is used for mapping and sharing cyclist routes and tracks.

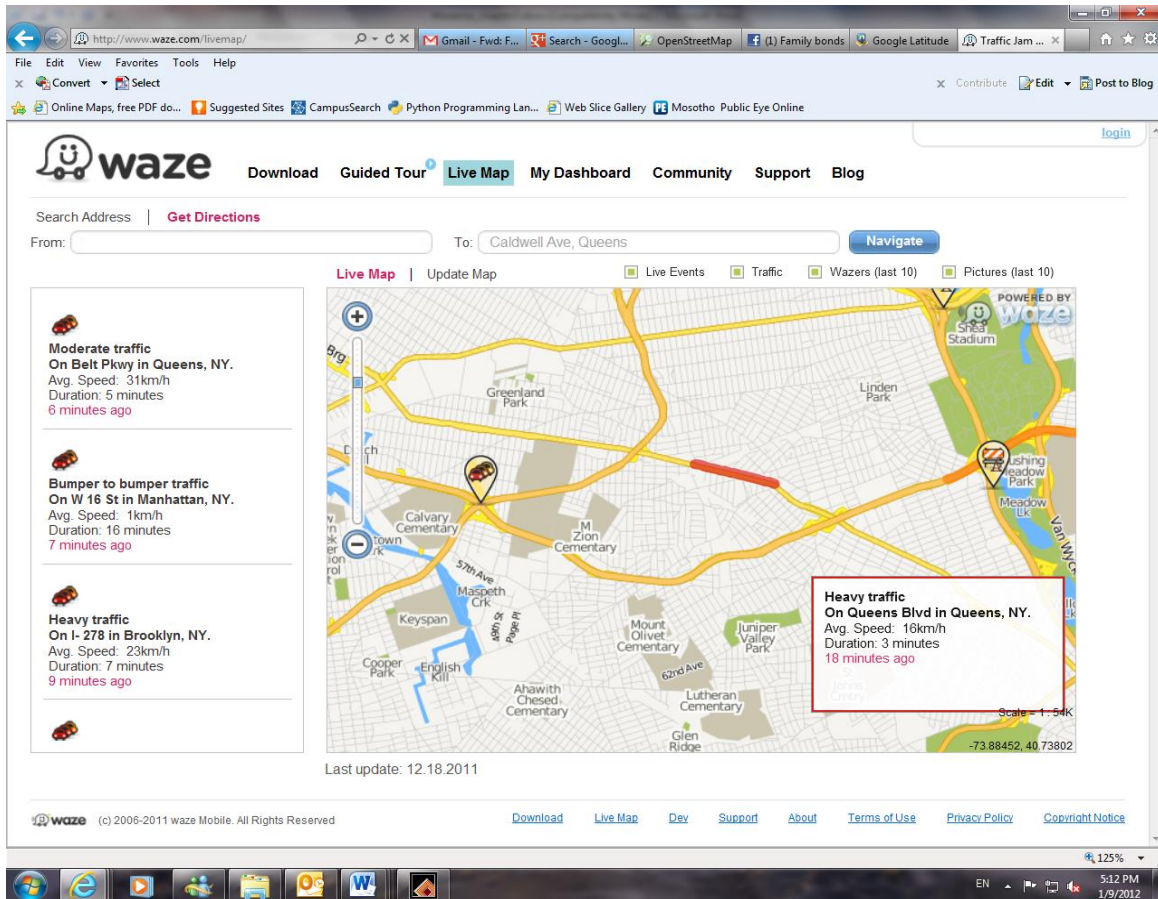


Figure 3-4: Neogeography maps used for navigation (source: [URL 17](#))

3.3.2.3. Validation

Validation of data is another way users are availed opportunity to contribute their data. Subject to satisfaction, the moderator replaces the existing data on the database with the user's contribution. Geo-Wiki ([URL 8](#)) is an example of a neogeography map that is used for validation of data.

3.3.2.4. Repository for geographic information

Neogeography maps are also used as a fountain of answers. They are used to answer questions such as; "How to get there?" "Where is?" and "What can be found there". Maps such as OSM and Google Map Maker ([URL 36](#)) can assist in answering questions such as "where is?" and "how to get there", while maps such as the Flickr World Map ([URL 38](#)) and the Fast Food Maps (Figure 3-5) can aid in answering questions such as "what can be found there".

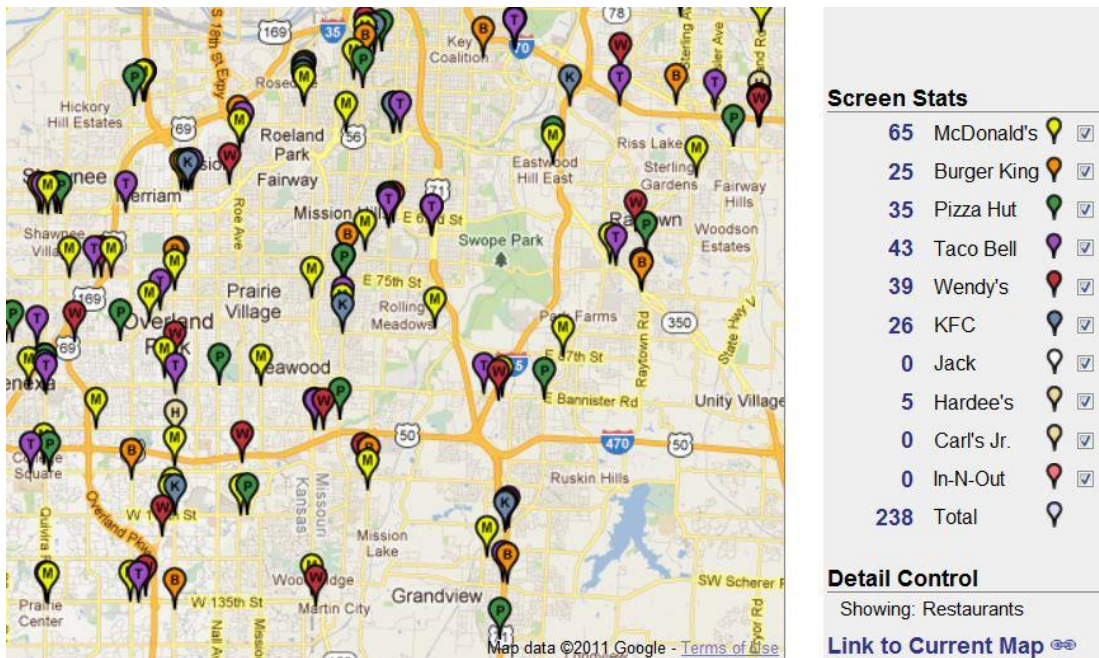


Figure 3-5: An example of a map used for finding a place of interest (source: [URL 37](#))

3.3.2.5. Crisis management

Other maps are simply created to assist in management of a certain crisis. Upon the completion of such a mission the maps are then used as a point of reference while relating to the event. Examples of maps that were used for this purpose include the Haiti Earthquake Map ([URL 9](#)) and the Kathmandu Valley Earthquake Map ([URL 33](#)).

3.3.2.6. Tourism

Maps which are rich in information pertaining to cities and tourist sites are used for tourism. Tourists use to maps to plan their trips and also to find places and routes when they are at their destinations. Tourists develop interest in maps that show locations where they would find food courts, nature reserves, tourist sites etc. such as CliptooMap ([URL 45](#)) and the Nature Find Map ([URL 31](#)).

3.3.2.7. Social media

Neogeography maps are also used for sharing information with friends and family. Users can share locations, geotagged images and videos with those linked to them. The maps are only meant to be shared between close friends who have also registered for using the map and are in the same circle of friends, examples of the maps include Map My Track ([URL 24](#)) and Google Latitude ([URL 34](#)).

3.3.3. Users of Neogeography Maps

In the previous chapter, a distinction was made between the different tasks performed by users of neogeography maps. There are users who complete the whole framework of neogeography map production, those who contribute the information only and those who use the maps only. There are also two major types of users of neogeography maps, the professional users and the non-professional users. Professional users of the maps do not contribute to the production of the maps instead utilize the maps for their own needs and projects. This includes governments, private organizations, researchers and website developers.

- **Governments:** This is a group of end-users who utilize the maps to plan, manage and intervene in problems at a state's level. The governments may utilize the neogeography maps through the concerned departments such as Tourism, Agriculture and Transport etc. depending on the issue at hand. For example the government may use a neogeography map such as Haiti Earthquake Map through the department of health if they are interested in extending a helping hand in a crisis situation. For example, the counties of Northern Virginia, Prince George and Montgomery used the Washington Voting Map (Figure 3-6) to track voting problems in these counties. The map was used to make it easier for users to plan their voting times and to report irregularities.

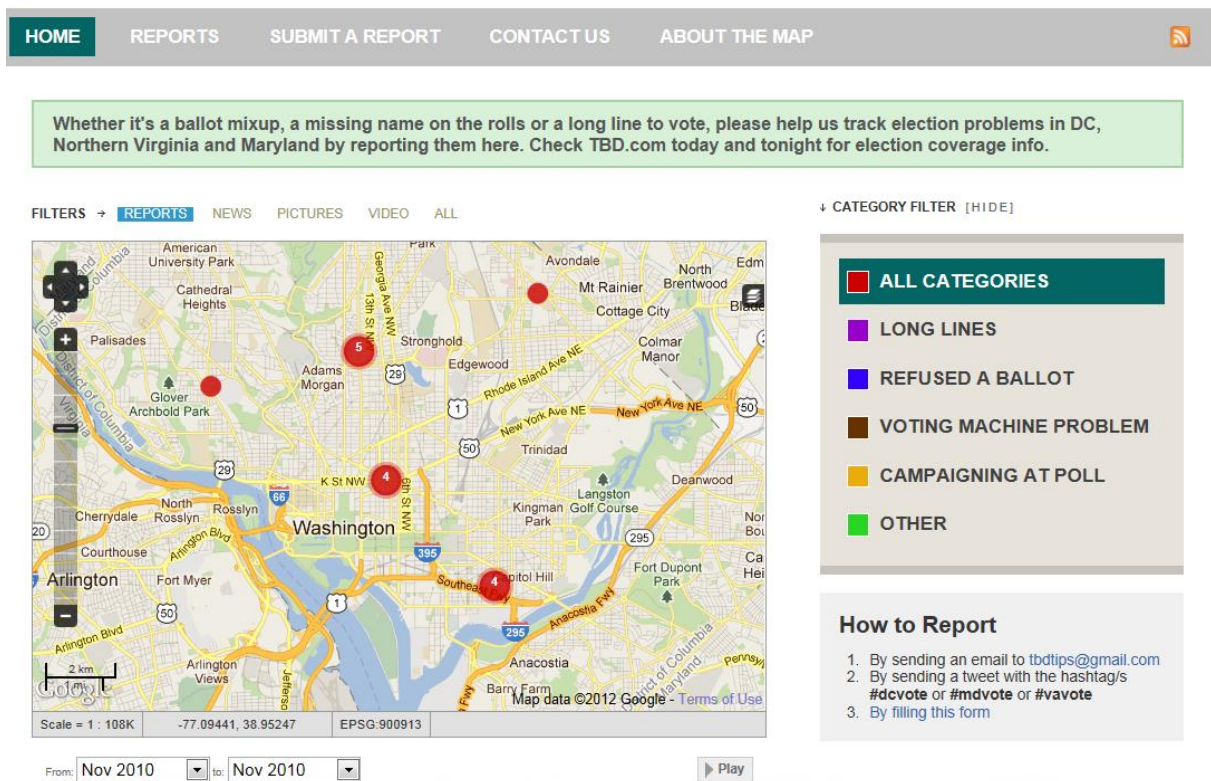


Figure 3-6: The Washington Voting Map (source: [URL 39](#))

- **Private organisations:** Like governments, private organisations utilize neogeography maps for planning contributions in relation to their interests. United Nations (UN), Salvation Army and Red Cross are examples of private organisations which occasionally utilize the neogeography maps.
- **Researchers:** This group comprises of individuals who use the neogeography maps for the purpose of answering their research questions. This includes academics and those belonging to private institutions. The researchers can also query and extract the information from the maps and re-use it.
- **Website developers:** Website developers embed the neogeography maps into their own web sites. For instance, Ushahidi and MapQuest ([URL 40](#)) use OSM ([URL 41](#) and [URL 42](#)) in some of their maps as base map. The website developers may also query and extract information on the maps and use it in other websites. For example, during the 2010 Haitian Earthquake, the OSM was used as a base map layer to create the crisis map in Figure 3-7.

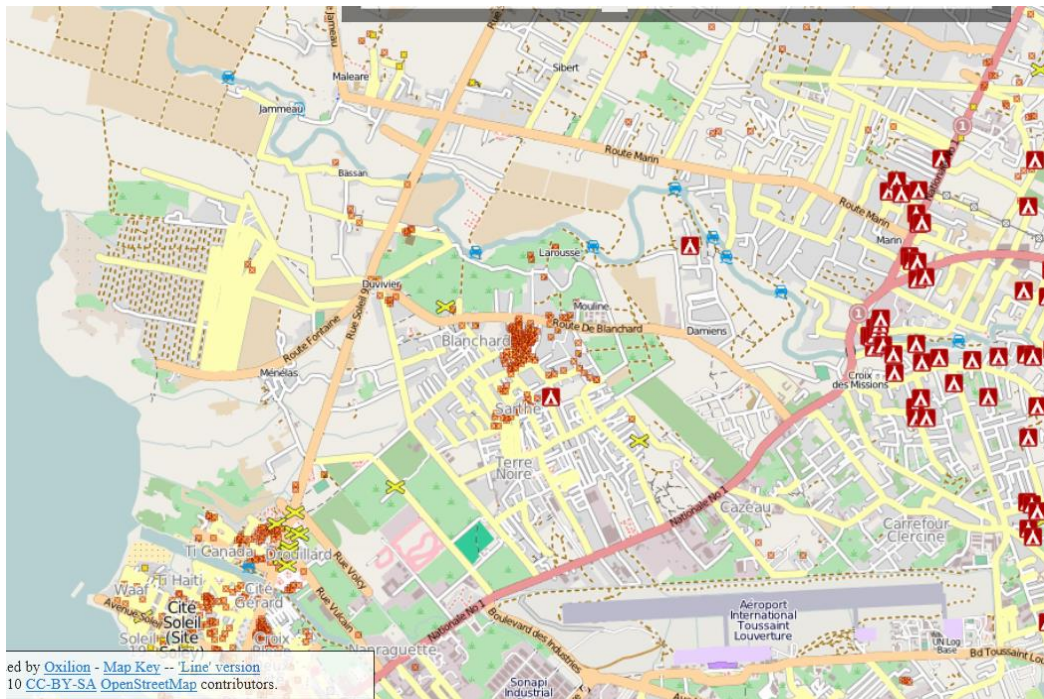


Figure 3-7: OSM used a base map layer (source: [URL 2](#))

Unlike professional users, non-professional users can be both contributors and utilizers. They also utilize the maps for non-professional purposes such as, recreation and sharing activities (running and walking) with friends. There are different users of neogeography maps such as tourists, cyclist and motorist etc.

- Tourists: Tourists use the neogeography maps to both contribute and use the end products. They use them to consider the sites for their vacations, to find what they will need in their destinations such as accommodation, routes to train stations etc. They contribute through adding geotagged images from their trips. They may also contribute by recommending and ranking the places they have visited for other tourists to find easily, this is known as collaborative filtering (SongJie et al., 2009).
- Pedestrians: Pedestrians use the neogeography maps for navigation. They contribute walking tracks as well as their surroundings. They also use maps such as Map My Track for sharing these walking tracks with family and friends.
- Cyclists: Cyclists on the other hand use the maps for recreation, navigation and for sharing with friends. They contribute cyclist routes for sharing and for data collection.
- Motorists: Motorists use the neogeography maps for navigation, they both collect and utilize the maps. There are neogeography maps such as Waze which are meant for assisting motorist to collect and share routes and other road related information (such as accidents) with others. Motorists use these maps to up-date the existing maps and to inform other motorist about the obstacle they may encounter as they follow the same route.
- Other contributors: This is a group that encompasses all the users who do not belong to the above mentioned groups but who contribute to different types of maps. Their contribution is a hobby, and they share images, species of birds or plants they watch etc. by contributing in maps such as 360 Cities ([URL 43](#)) and eBird ([URL 44](#)).

3.4. Types of Neogeography Maps

Based on the outcome of section 3.3, the types of neogeography maps are now deduced from the categorization outlined. The types of neogeography maps are created through looking at the purpose which the maps were created for. In this case, maps created for the same reasons are grouped together and given the name that suites their purpose. Table 3-2 below shows the generic types of neogeography maps proposed. In the table the maps used for data collection such as OSM and WikiMapia were grouped together and those intended for social media such as Goggle Latitude and Map My Tracks were also grouped together. The grouping can be seen in details in the table below.

| Types of neogeography maps | Examples |
|----------------------------|---|
| Data collection maps | OSM, WikiMapia |
| Navigation maps | Waze, MapMyRIDE |
| Validation maps | Geo-Wiki |
| Information maps | Fast Food Map, Google Map Maker |
| Crisis maps | Haiti Earthquake Map, Kathmandu Valley Earthquake Map |
| Tourism maps | CliptooMap, Nature Find |
| Social maps | Google Latitude, Map My Tracks |

Table 3-2: Generic types of Neogeography Maps.

3.5. Conclusion

The chapter was centred around the criteria used to distinguish the neogeography maps. Their production was discussed beginning with how they are created to why they were created including their users. It was shown that the method of contribution and rendering differs with maps. The groups of people using the maps also differ, and as such the purpose of the maps differs as well. At the end of the chapter the discussion resulted with the proposed generic types of neogeography maps. The types of neogeography maps proposed are data collection maps, validation maps, crisis management maps, navigation maps, information maps, tourism maps and social maps. The chapter also discussed the different groups of users and uses of these maps. There two main groups of users, professional and non professional users. Professional users included governments, private organisations and website developers. On the other hand, non professional users of neogeography maps included tourists, pedestrians cyclists etc. The maps are used for navigation, managing crisis, validating data, collecting and storing data. The next chapter will take a closer look at the users and uses of neogeography maps byway of selecting two maps to be used as case studies.

4. LEARNING FROM USERS OF OPENSTREETMAP AND THE FLICKR WORLD MAP

4.1. Introduction

In this chapter, the two neogeography maps used as case studies are selected and discussed. The maps selected as case studies are OpenStreetMap (OSM) and the Flickr World Maps. These maps are used in this chapter and the subsequent chapters to gather present and discuss specific information about the use and users of neogeography maps. They are used to gather information related to the use of the maps, benefits users get from the maps and characteristics of users of the maps. The gathering of information is done through the use of two methods online survey and actual user tests. The user characteristics are first collected through the use of online surveys and the users are invited for user tests. The user tests are conducted at the ITC building in Enschede.

4.2. Case studies

4.2.1. Selection of case studies

The discussion in the previous chapter resulted in a proposal for a generic typification of neogeography maps (section 3.4). The proposed groups included the groups that represented maps that could be used for decision making such as data collection maps, validation maps, crisis maps etc. and maps used for sharing information with family, friends and the public such as navigation maps, tourism maps, social maps etc. The OpenStreetMap ([URL 4](#)) was selected as a representative to maps meant for decision making and the Flickr World Map ([URL 38](#)) was selected as a representative for maps meant for information sharing in order to have a feel on how actual users use neogeography maps. The two maps were chosen because of possibility to contact their users by using their webpage messaging tool.

4.2.2. OpenStreetMap (OSM)

The OSM is a free editable world map open for the public to edit, add information, extracting/use information and tag places. The map was established by Steve Coast in collaboration with University College London (UCL) in 2004 (Heipke, 2010). It was developed for reasons such as non-monopolizing of the collection and distribution of geo spatial data. In the past, it was the responsibility of cartographic companies to collect geographic information, and this exercise was normally expensive and time consuming ([URL 74](#)). As OSM aims at providing the public with free access to digital geographical information across the world (Haklay, 2010), the use of OSM to collect data by using the public, serves this purpose well and makes people rely less on these organizations. OSM also aimed at bridging the gap between users and their creative productivity, the gap was caused by legal or/and technical restrictions hindering users to creatively use online maps ([URL 47](#)). In the time of writing (February 2012), the map had 535 801 registered users ([URL 48](#)).

Users are required to register for contributing and downloading (extracting) information from OSM, but no registration is required for viewing the map and getting directions from the map. Unlike other data collection neogeography maps (e.g. WikiMapia), OSM are not subject to a moderator's review ([URL 49](#)) but all registered users can intercede and correct the inaccurate data their peers made either maliciously or by mistake by deleting or editing their contribution ([URL 81](#)). Despite that, OSM has the 'data working group' whose duty is to control issues related to vandalism by blocking subscription and access from certain IP addresses ([URL 50](#)). The users of OSM are given three ways to interact with the map, they can,

contribute to the map, view the map (use it for navigation or to get answers to their geographical questions) and they can extract geographic data from the map.

a. Contributing to the map

Contribution to the OSM can be done through several ways such as collecting the data through the use of hand held devices, using local knowledge and editing the map:

- Collecting data: Users contribute through collecting GPS points and converting them to GPX format and uploading them to the map. This is considered as the most common way of contributing geo spatial data in OSM (Gartner & Ortag, 2011). The contribution can also be done through tracing the features on aerial photography provided by Microsoft Bing Maps, Yahoo! Maps MapQuest etc.
- Using local knowledge: Users are also at the liberty to use their local knowledge of the place they wish to contribute information on. This is what Goodchild (2007) referred to as ‘citizens as sensors’. This implies tagging places (e.g. parks and shops), naming places, etc.
- Editing map details: Users are also allowed to edit and modify what others have already added. As mentioned before OSM has no moderator to check and allow contributed content to be published but users ensure the quality and validity of the data contributed by editing the content themselves.

b. Viewing the map

Users also use the OSM as a fountain of information. The map can be used to answer questions such as “where is”, “how to” etc. To use the map for this purpose, users are not requested to register. Users can use the routing services using the OSM data such as OpenRouteService (Europe only) ([URL 51](#)), YOURS (Global) ([URL 52](#)), CycleStreets (UK only) ([URL 53](#)), CloudMade (Global) ([URL 54](#)), MapQuest (Global) ([URL 55](#)).

c. Extracting information

Apart from contributing and viewing the data, users can also extract data from OSM to use in their personal and private projects. Website developers embed OSM data into their websites. For instance, the OpenCycleMap ([URL 72](#)), which is the world’s cyclist route map, makes use of the data from OSM ([URL 56](#)). This is not the only way developers use the OSM data. Ushahidi, for example, also utilized the OSM as a base map to create editable crisis map of Haiti during the 2010 earthquake ([URL 9](#)).

Rendering of data on OSM can either be in real-time or not in real-time depending on the background selected. If the users select Mapnik, which is used for rendering the main layer (Slippy Map) for OSM, the rendering can be done in two seconds or can take up to a maximum of two days depending on the zoom level one is working on ([URL 57](#)). But if the users select Osmarender the rendering can be in real-time. The Osmarender helps in generating the two dimensional vector graphics of OSM data ([URL 75](#)).

Figure 4-1 below shows part of OSM in Enschede, the map shows the buildings, tracks, roads, street name, points representing parking space and hospital in the area.

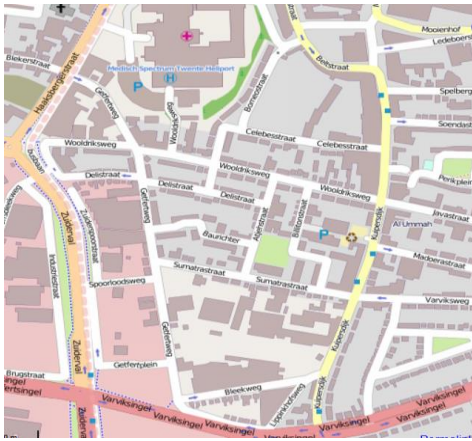


Figure 4-1: OpenStreetMap showing part of Enschede (Source: [URL 4](#))

4.2.3. Flickr World Map

Flickr is an image and video hosting website which was originally created by Ludicorp in 2004. The website was later taken over by Yahoo! ([URL 58](#)). Even though it is a social media site, Flickr is less used for user interaction and profile sharing but mostly for sharing content (Malinen, 2010). It enables its 51 million registered users ([URL 59](#)) to embed and share photographs on the provided world map. Flickr is also used as a way to store photos and videos. Website developers use this tool to store photos that are displayed on their websites while researchers use the georeferenced and tagged metadata to describe geographic space (Hollenstein & Purves, 2010). Users also use Flickr to store photos that are not meant for public consumption. Photos are sorted out with respect to their tags. For example, searching for 'blue' in the Flickr search bar would bring everything that was tagged 'blue' by different users.

For the purpose of uploading, sharing and tagging photos and videos, registration is required, but the Flickr World Map can be viewed by unregistered users.

Using the Flickr World Map

- a. **Uploading and sharing photos:** Users can use the Flickr website to upload both geotagged photos and videos. By geotagging photos, users assign the photos a location where they were taken. With the technology advancements, users are able to use digital cameras and smart phones that are able to give photos locations as they are shot. These photos have the GPS coordinates inserted as EXIF data which sometimes cannot be accessed by Flickr demanding the users to change the settings ([URL 76](#)). That is, for first time use, the uploading is not automatic, but when this is not done for the first time, the photos are automatically uploaded. When a user uploads photos, they have a choice to label them public or private. Photos labelled public are automatically embedded into the Flickr World Map.
- b. **Geotagging photos:** Users can upload their not automatically geotagged photos to the Flickr World Map by dragging them to the area where they were taken. This gives the users the ability to display and share their photos on the map.
- c. **Annotating photos:** Notes can also be added to the photos to describe photos and give other users more information on the photos. These notes are a description of photos, they can be in sentence format or even a paragraph. They are accessed when one moves the mouse over the photo. This is rarely used ([URL 60](#)) as users often use tags (keywords).
- d. **Using content contributed by others:** Users can also export photos and videos contributed by other users. To perform this task, users need to acquire permission to the sole owners of the photos before using them. Apart from downloading the content, a shapefile dataset ([URL 61](#)) has been provided for the public to use freely in their private projects. This dataset comprises of

a set of polygons generated from the geotags produced by users worldwide. It is currently not clear how this shapefile can be used but Flickr is encouraging users to come up with ways of utilizing it as well as producing their own ([URL 77](#)).

e. Browsing for photos: Users who are not registered are allowed to use the map to explore and search for photos taken around the world. The search can be filtered by country, continent or by topic etc. The users can also search for specific photos if they know what they are looking for. The images on the Flickr World Map are not just displayed according to the date of uploading, but they are also displayed subject to how interesting the photos are. For each place, the map can only show a maximum of 250 photos ([URL 62](#)) this depends on the choices the moderator makes for example in the Figure 4-2 below, the area of Enschede, has 19,500 geo-tagged items but less than 10 images are displayed on the map, these images are sorted by most interesting as seen by the moderator.

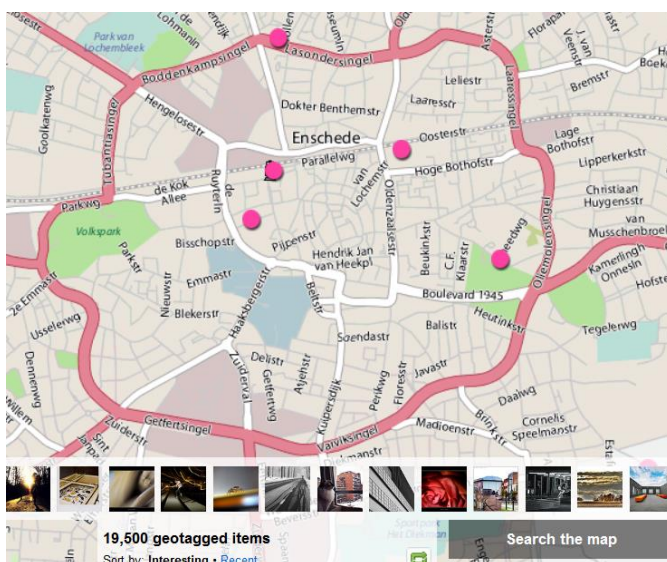


Figure 4-2: Flickr Map of part of the Enschede area (source [URL 38](#))

4.3. Information needs

In the previous chapter a distinction was made on who the users of neogeography maps were. The chapter listed and discussed the groups of users, but the question that is still unanswered is, “what are their characteristics, needs and preferences?” The goal of this research was to know more about users and uses of neogeography maps. The focus is on their characteristics, needs, preferences and how they use the maps. This information is important as it reveals users as concrete individuals (Nielsen, 1993). Below is an illustration of the type of information needed from the users to know who they are and what are their characteristics, needs and preferences.

- Demographics: Information on who the users are, their age, gender, level of education, field of study etc. is important for it shows the level of representation in different groups.
- Interests in neogeography mapping: This information shows in general what the users are interested in, how they contribute, what motivates them into contributing and using the maps and the benefits they gain from mapping.
- Mapping experience: This gives information on the level of experience one has in mapping as the contribution from a person who just started contributing months ago will be different from a person who has been contributing for years. The tools users use will also differ accordingly. For

example, in OSM, expert users choose to use more challenging editors such as JOSM which is an offline editor working with audio and photo mapping.

- d. Current activities and general satisfaction: This has to do with getting to know whether the users are achieving their desired goals and whether they are satisfied with the results, the tools and the quality of data acquired. It also communicates their future aspirations to achieve what they would like to see pertaining to the application they use.

4.4. User research techniques

In order to gather information from the users of the above discussed neogeography maps, it is first important to discuss the methods that can be used to achieve this.

There are several techniques that can be used for characterising uses and users and getting more information on their needs and preferences. These techniques involve: surveys, interviews, observations or contextual inquiries, focus groups, brainstorming, screen logging, etc. (Nivala et al., 2007). The choice of a technique to be used depends on the objectives of the study, time, costs and appropriateness ([URL 63](#)). Surveys are conducted through the use of a questionnaire where users are expected to fill the questionnaire and send it back to the researcher. The questionnaire can be administered over the internet, postal or it can be hand delivered ([URL 64](#)). For interviews, there is a one to one communication between the researcher and the respondent. This is done either face to face or through telephone. For the observations, the researcher visits the test persons' work station or invites the test person and observes as they perform their tasks. For focus groups and brainstorming test persons are gathered together in a meeting to discuss (focus group) or exchange ideas (in the case of brainstorming). Screen logging is a method of observing users without physical contact as the computer is used to automatically collect data as the users perform their tasks on the computer. The activities on the screen are recorded and can be re-played at a later stage. These are just examples of techniques that could be used; a combination of two or more techniques can be used as the techniques complement each other and provide additional information about uses and users ([URL 73](#)). For the purpose of this research, a combination of several different techniques will be used. A questionnaire, screen logging combined with thinking aloud, video recording, eye tracking and interviews. The reasons for the choices made will be elaborated in the coming sections.

4.4.1. Methods adopted

The information solicitation was divided into two main parts. First an online survey was designed and distributed to the users of both OSM and Flickr. Secondly the user tests were conducted for users of OSM. The tests were not conducted for the users of the Flickr World Map because of a low response rate to the survey related to the map. From the respondents who used the Flickr World Map, two users were willing to participate in the user test. Observing one or two users of the Flickr World Map would not portray the real use of the map as such the results would be bias. This section lists and explains the methods adopted in this research.

4.4.1.1. Online survey

A questionnaire was designed using an online tool SurveyMonkey ([URL 67](#)). There are several free tools on the www that could be used for this purpose, but this tool was selected because ITC already had its account. Even though it's a free tool, for the purpose of this research, extra features were needed and these features could only be available for premium accounts. The features included unlimited number of questions and ability to skip some questions automatically (skip logic).

A questionnaire was used at the first stage of information gathering in the research. It was used to gather user characteristics and also as a way of finding unknown users of both OSM and the Flickr World Map. Nielsen (1993) saw it as a good method for discovering user categories and their specific needs, which was one of the goals for this research. This method was selected over interviews (as a first method) because of time and cost constraints, as interviews are time consuming ([URL 65](#)) especially if there are a number of respondents to interview. The questionnaires were meant to reach as many people as possible, without them being physically available.

To solicit information from users; three questionnaires were designed. All the questionnaires were semi-structured with a mixture of both open-ended and close questions. The first and second questionnaires (Appendix A and Appendix B) focused on the use and users of OSM and the Flickr World Map. These questionnaires were meant to be filled by known registered users of OSM and the Flickr World Map that had their location set to Enschede. There were 30 users of OSM within a 1 km radius of the ITC building, which was used as test location Figure 4-3. These conditions (radius and number of users) were selected because the study needed participants in the area of Enschede who would be able to attend user tests. For Flickr, it was not specified how far the users were but users who were members of the two Flickr groups: ‘Enschede, Overijssel, Holland’ and ‘Enschede’ were considered. The groups had 55 and 227 members respectively; as a result, 30 respondents were selected randomly from both groups. The number of respondents selected was in such a way that both OSM and the Flickr Work Map get equal number of respondents for comparative purposes.

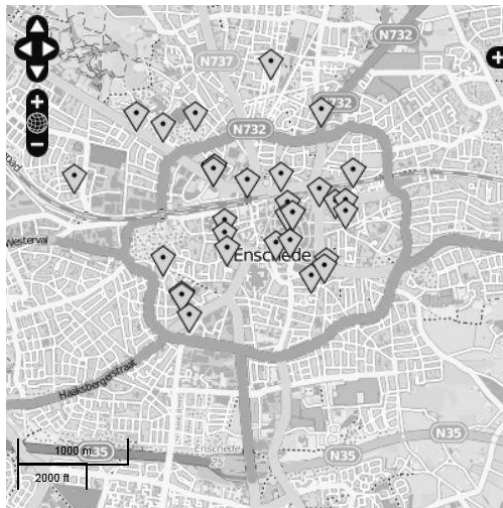


Figure 4-3: Distribution of OSM users around ITC building (source: [URL 4](#))

To approach the known users, a link to the survey was sent to the respondents through the messaging page provided on the OSM and Flickr web pages. The route of the message went through the respondents OSM/Flickr mail to the respondents personal e-mail addresses (Figure 4-4). The questionnaires stipulated that users show if they would like to be invited for a user test in the ITC building in Enschede.

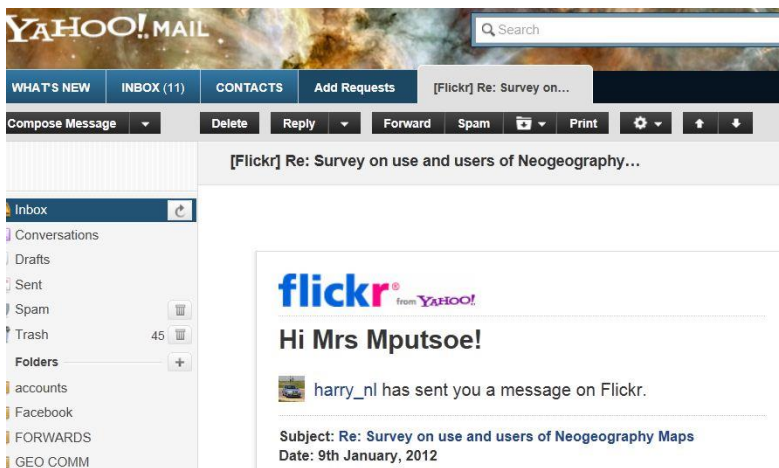


Figure 4-4: Message from Flickr reflected on a personal e-mail (source: [URL 68](#))

The third questionnaire (Appendix C) was a combination of questions related to the use and users of both OSM and Flickr. The questionnaire was meant to fish out the users of both maps amongst the students and staff of the Faculty of Geo-Information Science and Earth Observation (ITC) University of Twente. To approach the users, an e-mail with the link to the questionnaire was sent to all the users for them to fill the part of the questionnaire that was relevant.

For all the questionnaires, a reminder was sent to all the recipients to remind them to fill questionnaire as the response rate seemed to be very low.

4.4.1.2. User tests in the laboratory

The ITC user research laboratory was used as test station while gathering more information on users' use of OSM. As mentioned previously (section 4.4.1), the user tests were not conducted for users of the Flickr World Map. 16 users of OSM who showed interests in the user test were invited, only 13 users showed up for the test.

a. Purpose of the user test

The goal of the test was to observe how users work with the OSM tools, to find out from the way they utilize them if there were any tools missing or not working as users wish. The test looked at the hindrances the users acquired, how difficult it was for them to achieve their goals with the existing tools and how they interacted with the interface. The test was followed by an interview which was used as a way of getting inside information on the difficulties users encountered during the test.

b. User techniques used

As mentioned above, following the online survey, some of the users were invited to the user tests in order to learn from them how they interacted and use tools in OSM. A number of techniques were used in conducting these user tests. These techniques together with their pros and cons are explained below:

- **Screen logging**

Screen logging is recording the actual use of the interface on the computer screen as the user performs tasks. It was used as a way of observing users interact with OSM tools. It is known for its advantage of availing the researcher with the play back of what the test person was doing during the test ([URL 66](#)). It also helps while one wants to compare the results of individuals.

- **Think aloud**

The main disadvantage of the screen logging is that, though it shows what the users are doing, one cannot know why the users were doing what they did (Nielsen, 1993). The think aloud technique was selected as a solution to the problem mentioned above. The recording of the voice when the test person performs tasks helps in supplementing the data collected with screen logging. The technique has the ability to capture the cognitive part of the user's contribution to the test. This technique is also flexible and easy to learn ([URL 69](#)).

- **Video observations**

One of the limitations of thinking aloud is that some people cannot think aloud. Despite the researches constant efforts to keep them talking, they may try but eventually keep quite. Video recording was used in this study to capture respondents' expressions for both users who could and could not think aloud. The videos can also be replayed to get exactly how the respondent was behaving during the test.

- **Eye tracking**

This is the analysis of the movement of an eye as the test person performs the user test. It gives real-time feed-back of the eyes ([URL 70](#)) showing where the respondents successively look and for how long. Despite the fact that it added a feel on how first time users interacted with the OSM interface, the technique was mainly used because the testing environment allowed it. The results from this technique were not thoroughly analysed because of time constraints.

- **Interviews**

Interviews were also used to supplement the data collected with screen logging, think aloud and video observation. This method was used as a debriefing after the user tests were performed. One known advantage of interviews is that they avail the researcher an opportunity of probing while asking questions. As a result the researcher can get detailed information from the respondents. The method was used to get a better understanding on issues that the user did not voice during the think aloud.

4.4.1.3. Test persons

The user test on the OSM was performed on 13 test persons who responded and showed up for the test. The test persons were divided into two groups as they had different levels expertise in as far as editing the map details was concerned. The groups were formulated with respect to the level of experience the users had. This information was derived from the online survey where questions addressing frequency of use, years of using and mode of interaction (use, contribution, etc.) were used as a criterion to separate expert users from novice users (Table 4-1). This was done for designing suitable questions for each participant group and for comparison purposes as the way and time taken for task would be relatively different between expert users and novice users. The first group comprised of 3 users who had experience in editing the OSM, these participants had used the map for more than a year and had at least contributed by uploading GPS points or editing the map details. The 10 novice users had no experience in contributing to the map but had used it for viewing and extracting data. 10% of the novice users had used the OSM

but had done that once and were under supervision. This information was communicated by the participant before the test started.

Table 4-1: Test person’s experience and use of OSM

| Groups | Years of using OSM (%) | | | Frequency (%) | | | | Mode of interacting with OSM (%) | | | |
|---------|------------------------|-----------|----|---------------|--------------|-----------------|-------------|----------------------------------|------|------|---------|
| | <1 | >1 but <3 | >3 | Once a week | Once a month | Once in 6 month | Once a year | GPS points | Edit | View | Extract |
| Experts | 0 | 67 | 33 | 0 | 33 | 67 | 0 | 67 | 100 | 67 | 33 |
| Novice | 40 | 60 | 0 | 20 | 40 | 30 | 10 | 0 | 10 | 100 | 30 |

Table 4-2 shows the characteristics of the test participants. All the expert users were males and were aged between 26 and 60. Most of them were also graduates, with a few participants with high school degree. 67% of expert users had no experience in geography, information science, cartography and other related disciplines. While for novice users, though majority were male there were female users, the novice users were mostly undergraduates who had experience in the field of geography, information science, cartography and other related disciplines.

Table 4-2: Test person’s characteristics

| Groups | Gender (%) | | Age groups (%) | | Level of Education (%) | | | Experience in geography (%) | |
|---------|------------|----|----------------|-------|------------------------|---------------|----------|-----------------------------|----|
| | M | F | 26-40 | 41-60 | High school | Undergraduate | Graduate | Yes | No |
| Experts | 100 | 0 | 67 | 33 | 33 | 0 | 67 | 33 | 67 |
| Novice | 60 | 40 | 80 | 20 | 0 | 70 | 30 | 90 | 10 |

4.4.1.4. The test set up

The user test was performed at the ITC user research laboratory and all the four stages (preparation, introduction, test and debriefing) as proposed by Nielsen (1993) were undertaken.

The computers and all other devices were switched on and made ready for use before the test persons arrived. Upon arrival of test person, they were introduced to the user test, the techniques used and the equipment used. This was done in a similar manner for every user to maintain uniformity. To ensure this uniformity a step-by-step test setup (Appendix D) was designed. The setup outlined all the steps needed to be taken prior to, during and after the test. For the novice users, a short video on introducing beginners in OSM (*URL 78*) was played before the test. This was to show the participants how the OSM is edited and how to trace roads. Participants were also provided with a written introduction of the user test to read out loud in order to get used to the think aloud. The eye tracking device was calibrated (Figure 4-5) for the test person’s eyes, and after the calibration the participants were allowed to start the test.

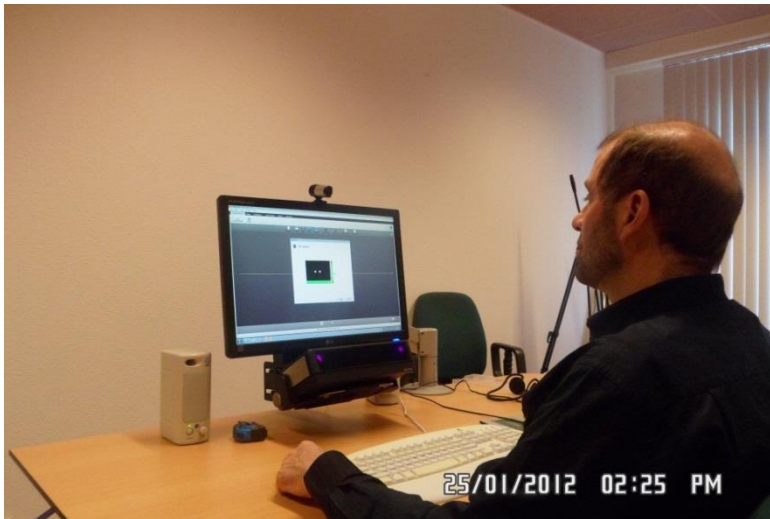


Figure 4-5: Calibrating the test person's eyes.

4.4.1.5. Equipment used

A couple of equipment (Figure 4-6) was used for the user test. Below is the list of all the equipment utilized during the test:

- Computer: A desk top computer equipped with Tobbi studio and eye tracking software was used for the test.
- Tobbi studio and Eye tracking software: This is an integration of eye tracking, screen recording, video recording and voice recording all in one recording ([URL, 79](#)). It assisted in gathering of information on user behaviour without repeating test as at the end of the test the output was different types of data. The software comprised of screen recording software, which recorded the screen as the participant performed the tasks, voice recorder integrated in a video recorder, and as a result it recorded the voice as well as the video and it also had software that captured the eye gaze and mouse clicks.

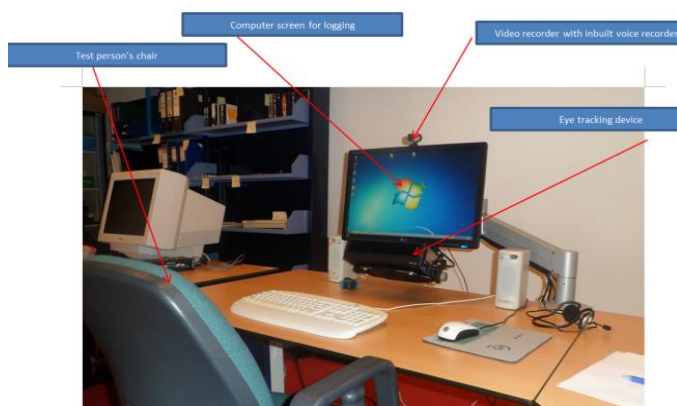


Figure 4-6: Equipment set up in the usability lab

4.4.1.6. Tasks

The test was made up of three tasks (Appendix E and Appendix F); the first task was different for both expert and novice users while the second and third task were the same for expert and novice users. As shown from Table 4-1, one of the main criterions set was that expert users have experience in editing the

OSM. This made the first task differ with groups as the novice users were given a simplified task and expert users were given an open task. The first task requested the test persons to edit the map details; the second task was on contributing the GPS points to the map while the last task requested the test persons to extract data from OSM.

a. Task1:

The first task was different for both novice users and expert users. The task was on editing the features of a town in Lesotho named Mohale's Hoek. For the novice users, they were given two reference points, the hospital and the A2 road and they were requested to trace the road that connected the two. On the other hand, the expert users were given an open task to trace and edit the map in whatever way they could in 5 minutes. The expert users were given an image of Mohale's Hoek town (Figure 4-7) showing what the buildings represented.



Figure 4-7: Annotated image of Mohale's Hoek town that users were working on in task 1

b. Task 2:

The second task was similar for both novice and expert users. The users were requested to upload GPS points that were already collected for them. The points were collected for a pedestrian movement study in the city of Delft Netherlands. Each user uploaded a different set of points to avoid duplication in the OSM database.

c. Task 3

The third task was also common to both groups of users; the task was about extracting data from OSM. The users were not given a specific format to save their traces instead they were expected to save the data in the format of their choice.

The user tests took three days to complete, as mentioned before 13 out of 16 invited participants took part in the tests. All tests started on time and the results were satisfactory. All the participants were able to think aloud though some needed constant reminding. Task one was a bit challenging for first time users though tasks two and three were well performed. The internet was sometimes slow as the tasks were performed from the Internet Explore. Thorough reporting on the tasks will be presented in the next chapter.

4.5. Conclusion

OpenStreetMap (OSM) and the Flickr World Map were selected in this chapter as the case studies. This was done in order to gather specific information on the use and user characteristics of the neogeography maps. The data was gathered through the use of online survey and user test. The online survey was dispersed to users through the use of the map's portals and e-mail addresses. The techniques used during the user tests included; think aloud, screen logging, eye tracking, video recording and interviews. The participants of user tests were divided into two groups, the novice users and expert users. The difference was that expert users had experience in editing the OSM. The results of the online survey and user tests are presented and discussed in the next chapter.

5. USE, USER CHARACTERIZATION AND NEEDS

5.1. Introduction

The last chapter was dedicated to the methods of gathering user information. This chapter takes a step forward and shows how the users responded to the online survey and the results of the actual user testing. It shows how users of the neogeography maps selected as case studies use these maps; it further shows the users' demographics, characteristics, preferences and future needs. The results of the actual user test show how the users performed in the tasks they were asked to execute. The hindrances incurred, goals achieved and goals that could not be achieved are also reported. The chapter further discusses the main findings of the research. The findings are compared with researches and it is discussed whether the findings are similar or different. Suggestions and recommendation are made to improve the neogeography maps used as case studies.

5.2. Response rate

The questionnaire meant for known users of OSM as shown in the previous chapter was sent to 30 users of which 33% responded. Similarly, from the 30 known users of Flickr 23.3% responded. The questionnaire that was sent to concurrently fish for both users of OSM and Flickr (shown as 'combination' in Table 5-1) had a response rate of 22.5%. And the overall response rate of the questionnaires was 23.3%. OSM users are seen to be more willing to take part in the survey than users of Flickr. This shows how motivated the users are in relation to contributing their information. In his interview with GIM International ([URL 81](#)) Steve Coast (founder of OSM) referred to them as keen contributors.

Table 5-1: Questionnaire response rate

| Questionnaire | Distributed questionnaire | Returned | Response rate |
|---------------|---------------------------|----------|---------------|
| OSM | 30 | 10 | 33 |
| Flickr | 30 | 7 | 23.3 |
| Combination* | 417 | 94 | 22.5 |
| Total | 477 | 111 | 23.3 |

* Questionnaire that combined the use of OSM and Flickr

Table 5-2 shows the responses of the combined questionnaire with respect to the neogeography maps the respondents used. 50% of the respondents never used both OSM and Flickr. While 2% did not attempt this question. 31.3% Used the OSM only while 5.2% used Flickr only. 11.5% Of the respondents have had an experience with both OSM and Flickr. It is already seen from this point that less people use Flickr. This is deduced from the response rate of the questionnaire dispersed through the Flickr messaging tool.

Table 5-2: Users of OSM and Flickr

| Answer Options | Frequency | Response (%) |
|-----------------------|-----------|--------------|
| OSM | 30 | 31.3 |
| Flickr | 5 | 5.2 |
| OSM and Flickr | 11 | 11.5 |
| None of the mentioned | 48 | 50 |
| Skipped | 2 | 2 |
| Total | 96 | 100 |

5.3. Knowing the users: Results of the online survey

5.3.1. Respondents' characteristics

When the combined questionnaire is split and non-users of OSM and Flickr as well as incomplete questionnaires are put aside, there are in total 43 users of OSM and 23 users of Flickr (Note: Not the Flickr World map). The results in this section and following sections will be based on this.

Most of the respondents for both users of OSM and the Flickr were male. This is shown in Table 5-3 where, the majority of OSM respondents (72.1%) were males and only a small percentage (27.9%) of the respondents were females. For the questionnaire sent to Flickr users, 82.6% of the respondents were male and 17.4% were female.

From Table 5-3 below, we can also deduce the distribution of respondents with respect to age. The table reveals that most of the respondents of the OSM questionnaire were between the ages of 26 and 40 (74.4%). 20.9% Of the OSM respondents were aged between 41 and 60. A very small percentage of OSM respondents were below the age of 26. A similar trend is witnessed for Flickr questionnaire. Most (65.2%) of the respondents were between the ages of 26 and 40. Conversely, for Flickr, there were also more respondents aged below 26 (21.7%) than between the ages of 41 and 60 (13%). This might be due to the fact that Flickr is for sharing photos with friends while OSM is more on data collection and use. Indeed if the Flickr World Map is a social map, its users will also be young enough to socialize. For both OSM and Flickr there were no respondents with age 60 and above. This is probably because at this age people are less active in computer related activities.

Table 5-3: Respondents' characteristics

| | Age group (%) | | | | Gender (%) | | Level of Education (%) | | | |
|--------|---------------|-------|-------|-----|------------|------|------------------------|-------------|---------------|----------|
| | <26 | 26-40 | 41-60 | >60 | M | F | < High school | High school | Undergraduate | Graduate |
| OSM | 4.7 | 74.4 | 20.9 | 0 | 72.1 | 27.9 | 0 | 7 | 37.2 | 55.8 |
| Flickr | 21.7 | 65.2 | 13 | 0 | 82.6 | 17.4 | 0 | 8.7 | 47.8 | 43.5 |

From the table above, it is also depicted that for the Flickr questionnaire, 47.8% of respondents had undergraduate degrees and 43.5% of the respondents had a graduate degree. A very small percentage (8.7%) of respondents had a high school degree. The table continues to show that for the case of OSM;

most of the respondents (55.8%) had the highest degrees. 37.2% Of respondents had undergraduate and 7% a high school or equivalent degree. There were no respondents with a less than high school degree. It is not a surprise that for both OSM and Flickr questionnaires most respondents had undergraduate and graduate degrees. Most of the questionnaires were dispersed in a university faculty.

5.3.2. Experience in the field of geography and related fields

In as far as experience in the field of geography and related fields (such as information science, cartography and urban planning) is concerned, the majority of respondents in both OSM and Flickr had the experience. Figure 5-1 shows that 81.4% of the OSM respondents had experience in relation to geography and related fields and 73.9% of the Flickr respondents also had such experience. 18.6% And 26.1% of OSM and Flickr respondents (respectively) had no experience in the above mentioned fields. This also not a surprise for the same reasons mentioned above. Apart from the questionnaires that were send via the OSM and Flickr messaging pages, other questionnaires were dispersed in the university faculty of Geo-information science. The respondents who had no experience in the field of geography and related fields are likely to be users of both OSM and Flickr contacted via the messaging tool of OSM and Flickr websites.

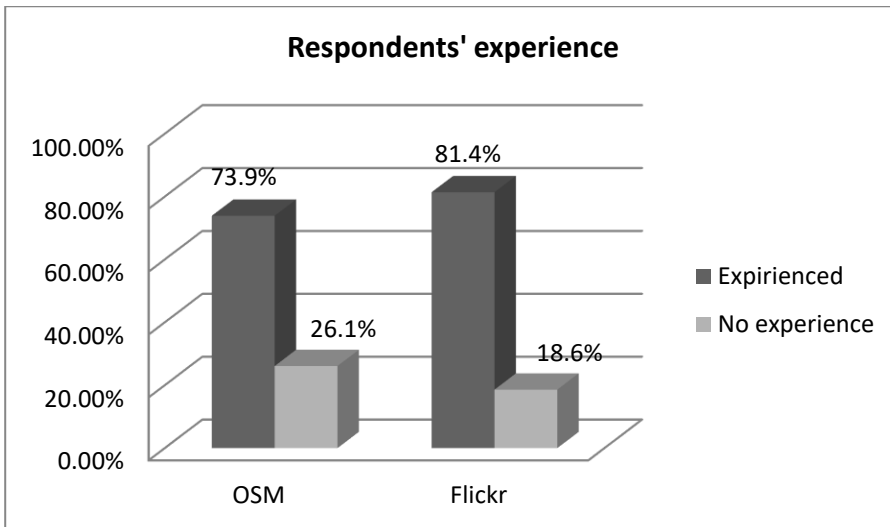


Figure 5-1: Respondents' experience in the field of geography and related fields

5.4. Working with the maps

Over half of the respondents had used the OSM for more than a year but for less than three years. The questionnaires were also filled by 37.2% of respondents who have been working with OSM for less than a year. 4.7% of respondents had been using the OSM for more than three years. In the case of Flickr, 39.1% of users had been using Flickr for less than a year while 17.4% had been using it for more than a year but less than three years.

Table 5-4: Years and frequency of working with OSM and Flickr

| | Years (%) | | | | Frequency (%) | | | | | |
|--|-----------|-----------|----|---------|---------------|-------------|--------------|--------------|---------------|------------|
| | < 1year | >1 but <3 | >3 | Missing | Daily | Once a week | Twice a week | Once a month | Twice a month | One a year |
| | | | | | | | | | | |

| | | | | | | | | | | |
|--------|------|------|------|-----|----|-----|------|------|------|------|
| OSM | 37.2 | 58.1 | 4.7 | 0 | 0 | 14 | 11.6 | 34.9 | 27.9 | 11.6 |
| Flickr | 39.1 | 17.4 | 34.8 | 8.7 | 12 | 8.7 | 26.1 | 34.8 | 8.7 | 8.7 |

A further analysis of the frequency of use of the map was also made; one third of OSM respondents (34.9%) use the map once in a month followed by those who use it just once in six months (27.9%). 14% of respondents use the map once a week while 11.6% of all the OSM users use the map once in a year. Almost the same trend is depicted from the Flickr results, where 34.8% of the respondents use Flickr at least once a month, but in Flickr many respondents showed that they use the website once in two weeks (26.1%). There are also users who use Flickr daily (12%). Even though there was high response rate with respect to OSM, most of the respondents had just started using the map for a period of less than 3 years. On the other hand, Flickr, whose respondents have been registered for more than 3 years, had the lowest response rate.

5.4.1. The Flickr World Map

Table 5-5: Use of the Flickr World Map

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------|-----------|---------|---------------|--------------------|
| Valid missing | 2 | 8.7 | 8.7 | 8.7 |
| No | 14 | 60.9 | 60.9 | 69.6 |
| Yes | 7 | 30.4 | 30.4 | 100.0 |
| Total | 23 | 100.0 | 100.0 | |

From Table 5-5 it becomes clear that most of the respondents do not use the Flickr World Map; 60.9% of all the Flickr users do not use this feature. The respondents gave their reason of not using the feature and they are shown in Table 5-6 below. 37.5% Of the responses were from the respondents who were not aware of the Flickr World Map. This could be due to several reasons including, location of the map on the interface, publicity in relation to the map and may be lack of interest in the geo component part of Flickr. While other users are aware of it but do not use it due to different reasons such as lack of interest in geotaging images manually (18.75%), lack of interest to the feature (18.75%), etc.

Table 5-6: Why users do not use the Flickr World Map

| Why users do not use the Flickr World Map | Frequency | Percentage |
|--|-----------|------------|
| No time to geotag manually | 3 | 18.75 |
| Feature not popular in Netherlands | 1 | 6.25 |
| Not aware of the feature | 6 | 37.5 |
| Not interested in the feature (upload images only) | 3 | 18.75 |
| Aware of it but do not use it | 3 | 18.75 |
| Total | 16 | 100 |

5.4.2. How the maps are used

Table 5-7: Purpose of using OSM below shows the 54 responses on the purpose for using OSM. The table shows that using OSM for private or entertainment reasons was selected more often as it represented almost 51.9% of the responses. Using the map for work related purposes was the second most selected and it represented 24.1% of the total responses. Also selected were using the map as a way to help other users (13%), using the map for school work (9.3%) and using the map for geocatching (1.9%).

Table 5-7: Purpose of using OSM

| | | Responses | | Percent of Cases |
|---------------------------------------|---|-----------|---------|------------------|
| | | N | Percent | |
| Purpose of using the map ^a | Using the map for work | 13 | 24.1% | 33.3% |
| | Use of the map for school | 5 | 9.3% | 12.8% |
| | Using the map for private/entertainment | 28 | 51.9% | 71.8% |
| | Using the map for helping others | 7 | 13.0% | 17.9% |
| | Using the map for geocatching | 1 | 1.9% | 2.6% |
| Total | | 54 | 100.0% | 138.5% |

a. Dichotomy group tabulated at value 1.

From Table 5-8 below we deduce that, from the selected options, using OSM for seeking directions is mostly selected by respondents (55.6%), respondents also selected using the map for extracting data (22.2%). Other selected responses were utilizing the map as a base map layer (13%) for personal projects, storing data (5.6%), distance calculation (1.9%) and using the map as an environment for homemade games (1.9%).

Table 5-8: How OSM is used

| | | Responses | | Percent of Cases |
|--|---|-----------|---------|------------------|
| | | N | Percent | |
| Ways in which users use OSM ^a | Using OSM as basemap | 7 | 13.0% | 17.1% |
| | Using OSM to calculate distance | 1 | 1.9% | 2.4% |
| | Using OSM for directions | 30 | 55.6% | 73.2% |
| | Using OSM for extracting data | 12 | 22.2% | 29.3% |
| | Using OSM for storing data | 3 | 5.6% | 7.3% |
| | Using OSM as environment for homemade games | 1 | 1.9% | 2.4% |
| Total | | 54 | 100.0% | 131.7% |

a. Dichotomy group tabulated at value 1.

Table 5-9: Cross tabulation of purpose of using OSM and the ways in which users use the map

| | | Ways in which users use OSM ^a | | | | | | Total | |
|------------------------------------|---|--|---------------------------------|--------------------------|-------------------------------|----------------------------|---|-------|----|
| | | Using OSM as basemap | Using OSM to calculate distance | Using OSM for directions | Using OSM for extracting data | Using OSM for storing data | Using OSM as environment for homemade games | | |
| Purpose for using OSM ^a | Using the map for work | Count | 3 | 1 | 10 | 3 | 0 | 0 | 13 |
| | Use of the map for school | Count | 2 | 0 | 2 | 3 | 0 | 0 | 5 |
| | Using the map for private/entertainment | Count | 4 | 1 | 22 | 6 | 3 | 1 | 27 |
| | Using the map for helping others | Count | 1 | 0 | 5 | 2 | 0 | 0 | 6 |
| | Using the map for geocatching | Count | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Total | | Count | 6 | 1 | 28 | 10 | 3 | 1 | 37 |

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

Table 5-9 shows the cross tabulation of the purpose of using OSM and the ways in which users use the map. From the table it is illustrated that most users who use the OSM for work related purposes use it to get directions and use it as base layer and others use it to extract data to use them elsewhere. What is also

shown is that most responses related to using the map for private purposes were from users who also use the map for getting directions. Users also use the map for storing data for their private projects.

Most of the users contribute to OSM by editing map details. This is depicted from Table 5-10 below, and this is revealed by the number of responses which favoured this option (46.4%). Some of the users contribute by uploading GPS points, as shown by 32.1% of responses, while a few contribute through tracing features (17.9%) and editing attributes of the map (3.6%).

Table 5-10: Types of data contributed on OSM

| | | Responses | | Percent of Cases |
|---------------------------------------|---------------------|-----------|---------|------------------|
| | | N | Percent | |
| Type of data contributed ^a | Editing attributes | 1 | 3.6% | 6.2% |
| | Editing map details | 13 | 46.4% | 81.2% |
| | Feature tracing | 5 | 17.9% | 31.2% |
| | GPS points | 9 | 32.1% | 56.2% |
| Total | | 28 | 100.0% | 175.0% |

a. Dichotomy group tabulated at value 1.

5.4.3. Use of extracted information

The use of extracted data and images was not popular for the respondents. In the case of the Flickr World Map, only 28.9% of the respondents showed that they downloaded and used geotagged images for their projects. These images are extracted and used for academic purposes. From the OSM side, 13% of the respondents use the data extracted from OSM as base layer in their projects (Table 5-8). Some of the users could not give the webpages where the data was used because they were on their local network and some were for private consumption. Figure 5-2 is one example of how users use the OSM data as base layer for their own data.

Listing 1: osm.html

```

<html xmlns="http://www.w3.org/1999/xhtml"><head>
<title>OpenLayers Base: Single OSM Example</title>
<script src="http://localhost/openlayers/OpenLayers.js"></script>
<script type="text/javascript">
var myMap, myOSMLayer;
var myCenter = new OpenLayers.LonLat(
284031.6254016
);
function init() {
myMap = new OpenLayers.Map( 'mapDiv' );
myOSMLayer = new OpenLayers.Layer.OSM( "OSM Map" );
myMap.addLayers([myOSMLayer]);
myMap.setCenter(myCenter,16);
}
</script>
</head>
<body onload="init()">
<div id="mapDiv"
style="width:500px ; height:400px; border:1px solid;"></div>
</body></html>
myMap.addControl(new OpenLayers.Control.MousePosition());
myMap.addControl(new OpenLayers.Control.ScaleLine());
                    
```

(x)HTML header

include the API

define map and layer object

define center at ICU location

create map object

create OSM layer

add layer to map

zoom to center

map placeholder




Figure 5-2: Using OSM as a base map layer (source: Anonymous respondent)

5.4.4. User satisfaction

Both the users of OSM and the Flickr World Map seemed dissatisfied in as far as the quality of data is concerned. Only 11.6% and 1.3% of OSM and Flickr World Map users respectively, indicated that they were satisfied with the quality of the data. This leaves a bigger portion of respondents dissatisfied. Also only 14% of OSM users were satisfied with the design of the map, while 21.7% of the Flickr World Map users were satisfied with that design. In as far as achieving user goals are concerned, 93% and 26.1% of OSM and the Flickr World Map users respectively showed that they were able to achieve their intended goals. This could be because of the compromises users make. It is well known that the data is collected by the public therefore users utilize it with that in mind.

As shown in the previous sections, there are more people using the map than those contributing. 30% Of the latter group of respondents were not satisfied with the tools provided for data contribution. They indicated that the tools need improvement. The table below shows the areas where the respondents felt improvement is needed. The respondents felt the tools were not user friendly enough for beginners. They thought there should be more labels and tools that would make feeder roads different from main roads, and they also felt tools should be improved to allow the street sizes to differ. The respondents further expressed their dissatisfaction in relation to the threshold for starting to edit and felt that it should be lowered. They also indicated that there are many tools which cannot be used jointly and that they would like to see them combined.

Table 5-11: Improvements needed in OSM and Flickr World Map

| Map | Area of improvement | Description |
|------|------------------------|--|
| OSM | Tools in general | The tools are not simple enough for laypersons |
| | Limited attribute data | Icons for feeder roads should differ |
| | Streets | Sizes of the streets should differ |
| | Threshold | Lower threshold for starting to edit |
| | Streamlined tools | Tools are currently not harmonized (they should work together) |
| | Labels | More labels to assist in identifying positions |
| FWM* | Tags | Allow less tags to bring a small level of detail while searching |
| | Filters | Possibility for users to sort images with uploading time |

*The Flickr World Map

5.5. Users' future needs

Even though users can still use the data from both OSM and the Flickr World Map, there are still some improvements they wish for and there are other ways in which they would like to use the map but cannot. The respondents were asked of any improvements, needs and wishes they would want to see for better and more fulfilling maps that would help them achieve their goals in the future.

Flickr World Map respondents showed that they would like to have an instant connection with social media, better search results and be able to filter the photos on the map with respect to time. Ability to connect with social media such as Facebook ([URL 72](#)) would help users to share photos on the Flickr World Map. Currently it is possible to connect to the Flickr World Map with Facebook only, but this is done at the expense of one's account. When a user wants to connect to Facebook, they first have to forego their current accounts and start a new account using Facebook. This does not connect the two accounts as a result the collection of photos stays with the old account.

The users would like to have a quicker and customise rendering. This will allow them to take breaks between their edits save them without displaying until they are ready for display. They would also like to have tools for annotating as well as ability to add metadata.

Table 5-12 below illustrates what users suggested to best fit their needs and requirements.

Table 5-12: OSM user needs and requirements

| Area of interest | Suggestion |
|------------------|---|
| Map | <ul style="list-style-type: none"> • Rendering of data: Customized and quicker rendering of data • Fitness for use: Fit users purpose and needs • User-friendly : More user-friendly for first time mappers • Large coverage : Aerial photography should cover other regions of the world |
| Tools | <ul style="list-style-type: none"> • Legend: Show the legend to explain symbols used in OSM • Annotating: Have tools for annotating features • Designing maps: Have tools enabling design of maps for different purposes • Expert mappers: Have more editing tools for expert mappers • Mobile users: Have more application for mobile users and have vector mapping for mobile phone use • Social medias: Add tools enabling connection to social networks • Data extraction tools: User-friendly tools for extracting data • Water map tools: Addition of water maps tools • Photo tools: Inclusion of tools for contributing photos • 3D: Inclusion of tools supporting 3D viewing |
| Data | <ul style="list-style-type: none"> • Cadastre: Ability to contribute and extract cadastre from OSM. • Shapefiles: Ability to extract data in the form of shapefiles. • External data: Ability to combine OSM data with external data sources such as postal information • Metadata: Ability to contribute and extract metadata information • Layers of data: Ability to download wanted data only without downloading the whole dataset |

For the Flickr World Map, users suggested that:

- An instant connection with social media.
- Limited tags to limit the hits for searches.
- Filtering images by using time

5.6. Observing the users: The OSM user tests

As discussed in chapter 4, the Tobii studio was used, which is a combination of eye recording, video recording, voice recording and screen recording. Below is the output of the tests:

- i. Video recording and screen recordings of what the participants were doing as shown in Figure 5-3. The video recording was removed from the figure for anonymity of participant. The screen

- recording was used as a way to observe what participants were doing while the video recording was used to capture emotions of the participants.
- ii. While performing the tasks, the participants were expected to say out loud what they were doing, why and how they felt about that. This information was captured as voice recordings. The recordings were played back noted and categorised with respect to similarity in opinions.
 - iii. The eye movement of the respondents were also recorded (Figure 5-6). This information was useful as it showed what and where the participants were looking, if they got lost in the interface and where they looked when they got stuck.

5.6.1. Summary of the user test

As indicated in the previous chapter, the users of OSM were observed through the use of screen logging, think aloud, eye tracking, and video recording. The session ended with a short interview, which was used as a debriefing and a way to get more explanation on the choices made during the test. It was also explained that the participants were divided into two groups, the novice users and expert users. The novice participants group comprised of 10 people while expert participants group comprised of 3 people. The user test was made up of three tasks (section 4.4.1.6). The first task was to edit and trace the features on OSM. This task was different for the two groups of participants. The expert users were not given a detailed task, instead they were expected to take some time editing as they wished. On the other hand, novice users were given a task to trace a road that connected the hospital and the main road (A2). The second task required the users to upload GPS points and for the third task users were requested to extract data from OSM. The two tasks were the similar for expert and novice users.

below is the summary table of the test. The table shows the average time each user group took to complete the test and the tasks. It also shows the percentage of participants who completed, somehow completed (not fully completed) and who did not complete the tasks.

Table 5-13: Summary results of the actual user testing

| Group | Tasks | Average time | Percentage completion of tasks | | |
|--------|-----------|--------------|--------------------------------|-------------------|---------------|
| | | | Completed | Somehow completed | Not completed |
| Expert | All tasks | 20:34.2 | | | |
| | Task 1 | 9:49.7 | 100 | - | - |
| | Task 2 | 3:9.8 | 100 | - | - |
| | Task 3 | 3:24.1 | 100 | - | - |
| Novice | All tasks | 28:53.4 | | | |
| | Task 1 | 12:40.2 | 60 | 30 | 10 |
| | Task 2 | 5:40.55 | 100 | - | - |
| | Task 3 | 6:12.8 | 60 | 40 | - |

With consideration to the general overview of how the tasks went, the expert users were able to complete all their tasks as compared to the novice users who only fully completed task 2. The expert users also took comparatively fewer minutes to complete the whole test. It took on average 28 minute and 53 seconds for novice participants to complete the test, which is over 8 minutes more than the time it took expert users. For the expert users, it took longer to perform the first task. This was followed by the second task and the third task. Similarly, for novice users, it took longer to perform task 1. But it took longer to perform task 3 than to perform task 2. As mentioned in chapter 4, the thinking aloud was satisfactory as most users were able to think aloud. There were a few participants who needed to be reminded every now and then to keep thinking aloud. Most of the participants felt OSM was easy and user-friendly. They

indicated that the key is motivation, showing that if one is willing to contribute the use of the tools becomes easier. On the other hand, a few participants felt some tools were not use-friendly, that one needs to have some skills in cartography and computers to survive it. The following section will show the user tests were executed.

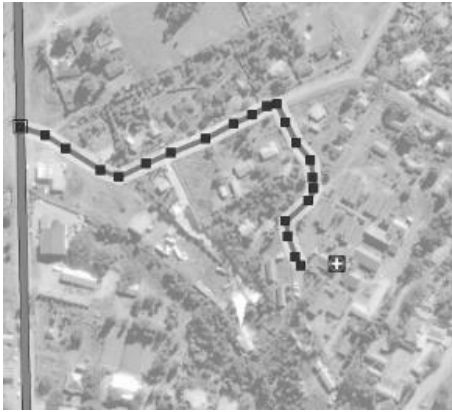


Figure 5-3: A completed task 1 for novice participants

5.6.2. Execution of the tasks and interviews

Below is the outcome of the actual testing of users. The results of the observations are supported with the results of the think aloud as well as the interviews. The interviews were used as a way of getting clarity to what the participants were saying during the test.

Task 1

Task 1 required the novice participants to trace the road that connected Ntsekhe Hospital with the A2 main road (as shown in Figure 5-3) in the district of Mohale's Hoek Lesotho. On the other hand the expert participants were required to free-style and edit the map as they wished. Though the task was different for novice and expert participants, the area of interest was the same. It took on average 9 minutes 50 seconds for expert users to complete their task. For novice users it took them over 12 minutes to complete this task. The task seemed a little challenging for novice users as only 60% of them were able to fully complete it. Users who somehow completed, and who did not complete the task had difficulties in:

- Finding the area of interest: While searching for the area of interest, the search resulted into two sets of results one from OpeStreetMap Nominatim and the other from GeoNames. The two brought different results, and users who chose to follow the suggestion by GeoNames could not easily find the area required. GeoNames' results are more general, so much that it is difficult to easily find an area one is not familiar with. Figure 5-4 below show the search results from both databases. From the results of GeoNames, the town of Mohales' Hoek looks generalized. All the features that one can refer to (the hospital and the runway) are not shown. On the other hand, from the results of OpeStreetMap Nominatim, those features are shown.

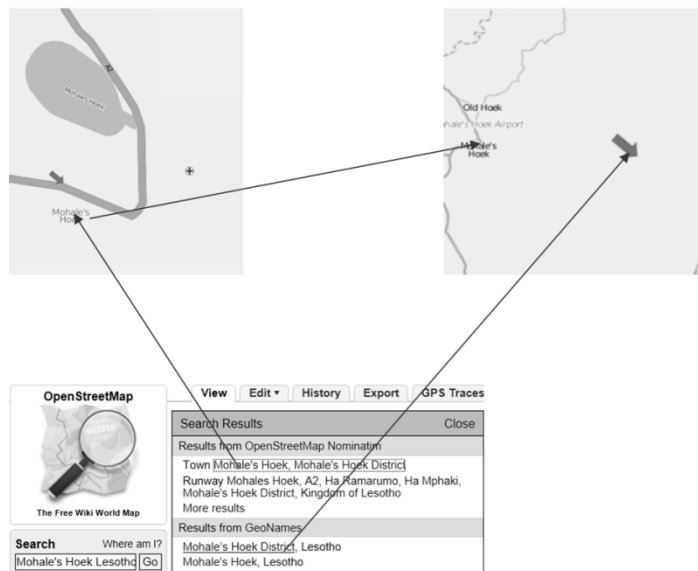


Figure 5-4: Search results from OpenStreetMap Nominatim and GeoNames

This research suggests that the OpenStreetMap Nominatim and GeoNames databases be harmonized to go to similar places when results are the same. Apart from harmonizing the database, OSM can adopt the Moderator concept and find voluntary moderators around the world whose job will be to check and correct entries. This will benefit the map as the names especially for cities and towns will be correct.

- Starting and ending editing: Participants found it difficult to start editing, they could not figure out the way to start a new node and when they finally did it was also difficult to stop the editing. The interface does not have a tool to guide users on the way to start or end the tracing. For most participants, the first node would just come as a result of randomly clicking around the map looking for a way out. If this happens the stopping would also be frustrating for them.

It is evident that currently, editing the OSM is a bit tricky. To alleviate the problem of starting and ending tracing of features, a command of a right mouse click can be created. This command will read 'start editing/end editing'. Alternatively the already existing side window on the bottom right hand side of the map can be used to add this tool (see Figure 5-5).



Figure 5-5: Adding Start/End tool to the OSM side window

- The aerial photography: As with the editing tool, the participants knew there was supposed to be an aerial photograph to trace features from but they could not find it. The participants spend relatively a lot of time in the 'View mode' thinking there were supposed to see and aerial photograph.

User 7 "... where is the Bing Map?... now I can't see the road I have to trace..."

User 15 "... now that's not so logical..." This was said after realizing that the Bing Map can only be seen after clicking 'Edit'.

To alleviate this problem a pop-up message can be used. This message would appear when users click on an un-editable map and read “to edit the map click on ‘Edit’”.

- **Connecting roads:** It was also observed that while tracing the roads it became very difficult for participants (both novice and expert) to connect the roads into a junction. The general idea would be starting the road where it connects with the main road but this was not easy to accomplish therefore the participants would start just near the main road.

The problem can be solved by a pop-up window which reads “do you want to connect these roads” that comes whenever the user leaves two roads unconnected. If the user’s answer is yes the two roads would connect automatically

Task 2

The task as explained in section 4.4.1.6, required the participants to upload already collected GPS points to OSM. The task was to the same for both expert and novice participants and all the participants completed this task. The average time taken was relatively lower than other tasks for both groups of participants. Even though the task went better than the other tasks, the users were frequently lost in the ‘GPS Trace’ page. They spent time looking for the correct tool to use. While they were thinking aloud, they kept on asking about a list of uploaded traces and if they were supposed to click on them or not. This resulted in participants leaving the page thinking they were not supposed to have been there. In a nut shell the participants got distracted or overwhelmed by what they saw in this page. The list of traces uploaded by other users distracts users. As a result it becomes difficult for them to see the link for uploading data.

Figure 5-6 shows that both expert and novice participants took time to look at the already uploaded traces before they could actually find the correct tool for uploading. The figure shows that other than looking at the link users were supposed to click to upload data, their eyes were caught by other contents of the page. This is shown by the red colour towards the middle of the page in the experts’ results. The difference in the colour between the expert’s and novice results shows that the experts did focus more towards the middle of the page.

User1: “... this information has nothing to do with me... well this uploads are for areas I have never heard of” the comment was given by an expert user during the interview. The participant said it’s not necessary to show the information to users as it is a bit distractive. This is evident from the figure below that participants began going through the list before they clicked on the necessary link.

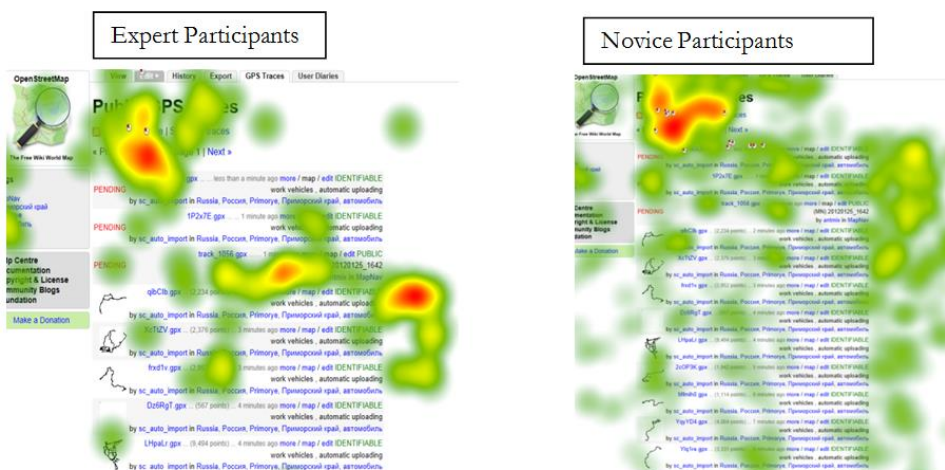


Figure 5-6: Output of eye tracking showing the heat map for the GPS points downloading page

A suggestion to this would be a link which one can follow to view these uploads. This will make the currently invisible (because of the font and clutter on the page) 'upload GPS points' visible again.

Task 3

The third task was also similar for both expert and novice participants. The task as explained in section 4.4.1.6 requested the participants to extract data from OSM. It took expert participants on average 3 minutes 24 seconds to complete this task. On the other hand, it took novice participants on average 6 minutes 12 seconds to complete the task. 40% Of the novice participants hardly completed the task. These was not related to the usability of tools, these participants misread the task and only used one street when the task requested an area between two streets. The participants thought the word 'Export' was too technical for a layperson. They kept on looking for more familiar terms such as download or extract. The participants were also worried that they could not select the features they wanted to extract; the extraction only works in cases where one wants to extract an area. Introducing a tool that would make it possible for users to extract individual features would be helpful. For instance a list a features to select from, if one wants a road only or a building is able to select from the list. Additionally the term 'Export' should be substituted with a more familiar term such as Download or Extract. These can be a major setback for users with no experience in geography and related fields.

5.7. Discussions

Lack of knowledge and lack of interest in the geo component of the Flickr website resulted into the low response rate in as far as the Flickr World Map is concerned. From the onset of the data collection, the percentage response for OSM has been higher than that of Flickr. The intrinsic motivation of OSM users is shown by a number of users who were willing to complete the questionnaire as well as undertake the user tests. 34% of the users of OSM (compared to the 17% of the users of the Flickr World Map) showed interest in taking part in the user tests without being offered any kind of incentives. In chapter 3, it was shown that different types on neogeography maps are created and used for different purposes. OSM was created for several reasons including collection and dissemination of geospatial data. On the other hand, Flickr was created at a more personal level, the two main reasons why Flickr was created was to help users share photos with people who 'matters' to them and to enable ways of organizing photos ([URL 29](#)). The reasons of creation portray the reasons for contributing. In other words, OSM is about sharing with the public while Flickr is more of a social media. One share first and foremost with people closer to them then shares selected items with the public. A person contributing for reasons such as building a global map would be more likely to take part in the survey than a person contributing the photos just to show off his/her best pictures.

From results of the other past researches (Nedovic-Budic & Budhathoki, 2010; Stark, 2011) that looked at the age distribution of contributors of VGI, it has been shown that the majority of users are aged between 20 and 40 years. This is also portrayed in this study, as more than 74% and 65% of OSM and Flickr respondents respectively were aged between 25 and 40. This seems to be the most active age group in relation to contributing VGI. The results pertaining to gender also agree with other researches. Males seem to be involved in activities related to neogeography mapping than females. Literature (Goodchild, 2007) shows that most often contribution to the neogeography maps is made by people with no skills nor education in geography or related disciplines. The results showed that most of the respondents had skills in the field of geography and related disciplines. My results on the experience of respondents in the field of geography and related fields were as expected, indeed. As shown earlier there were two methods of

dispersing the questionnaires the first was through the map's messaging page and second was the use of e-mails. The questionnaires that were sent by e-mails were dispersed in a university faculty of geoinformation science. It is therefore evident that most of the respondents were expected to have higher degrees and experience in the fields of geography and related disciplines. This does not dispute the results of past research but it adds to what was found that even scholars in the field of geography can be contributors and users of VGI.

From the results, it is evident that Flickr is used more for its social media abilities than it is used to collect and disseminate geographic data (in the form of geotagged photos). This is shown by a number of respondents (60.9%), who do not use the world map embedded in it. About one third of the respondents have been using Flickr for over 3 years yet only a small percentage knows and use the Flickr World Map. 30.4% Of responses were from respondents who admitted to have never heard of the feature. Users of Flickr are motivated by the ability to share and to be connected to other photographers (Malinen, 2010). The Flickr webpage does not apply effort to encourage the use of the Flickr World Map as well. And on the page where the map is located (the "Explore" page), the map is towards the end of the page where it is less likely for first time users to scroll to.

Based on the amount of literature related to the contribution of data on OSM, one would expect the majority of users to use the OSM for contributing information. In the past, researchers in this field (Haklay & Weber, 2008; Hall et al., 2010) focussed mainly on the contribution part of neogeography maps and little work was done with respect to the use of the maps. This research looked at both the contribution and use of the OSM and the Flickr World Map. The results showed that majority of users use the end products rather than contributing. The results of my research agree with that of Neis et al., (2011) in that OSM seems to be following the 90-9-1 rule of participation inequality. The rule states that most often 90% of users are users who only observe and use, 9% are users who scarcely contribute and 1% are dedicated contributors ([URL 71](#)). This could be a result of users feeling enough has been done with respect to collection data and the data is a stage where it can be conformably used.

It is not surprising that most users use OSM for private and entertainment purposes. Researchers such as Nedovic-Budic & Budhathoki (2010) have shown that one of the most common motivations to contribute VGI is self-need and show-off. Users use the data from OSM for private purposes such as creating their own maps by using OSM as a base layer for those projects. Some users go as far as using the maps for video games (entertainment) and use the OSM as an environment for such games. Similarly in the Flickr World Map case, very few people contribute geotagged images. In fact, people do not know about the map. But the majority of the respondents used the products of Flickr World Map which are geotagged images.

Researchers such as Haklay and Zielstra & Zipf (2010; 2010) have also tackled the issue of quality in as far as the data extracted from neogeography maps are concerned. In their methods they compared the OSM dataset with several other datasets such as data from TomTom, Navteq, Ordnance Survey and others. The results shown earlier concur with these researches, even though the methodology was completely different. The results of this research are an outcome of investigated views of users with respect to the data extracted. Image clutter seemed to be a major problem for the users of the Flickr World Map. They indicated that there were images which could not be used because of this. From the OSM point of view, the problem was that the data lacked details, attributes and metadata. Because of this, it would be rewarding to lower the threshold for adding data. This would allow contribution and extraction of information at micro level such as house numbers and post numbers.

There are a number of social media web pages used for sharing routes either by cyclists or runners. The data collected or shared on these web pages can also be used to build the global map. Connecting OSM with social media is one of the other needs users expressed. This would mean, for instance, connecting with websites such as Map My Tracks to share walking and running tracks, from these social media to OSM in a click. It would also be able to assist users to upload their track without doing it twice in two different webpage.

To end the chapter we will go through a list of points that were not expected in the research. Even though the research established in the first two chapters that users were not contributor only, but contributors as well as end users, the research still expected the majority of respondents to be contributors. This was because of direction most researches followed in the past few years, concentrating more on contributors as main users of neogeography maps. This brought about a belief that researchers are the only ones concerned with the quality of data collected with neogeography maps. My research has shown that even users themselves are concerned with data quality. Motivation of OSM users goes beyond tracing the map features. Users also wish to extend their contribution by linking OSM with other social media which are normally used as hobbies. On the other hand, the non use of the Flickr World Map was not expected too. With the questionnaire distributed in the university faculty of geo-information science, with almost 100% of students being international students, one would expect the use of this feature to be high. The use of the term 'Export' seemed to be a problem too, considering the percentage of respondents with experience in geography and related fields a problem like this was not expected.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

The research initially started with the question “who are the users of neogeography maps?” The problem was that hardly any research had tackled this question. Therefore the use of the neogeography maps was supposed to be not optimal.

In order to go deeper into the use and users of neogeography maps, there was a need to know exactly what it meant to refer to a map as neogeography. These maps are characterised by voluntary contribution, crowdsourced content and use of www as a platform. As stated in chapter 2, subsequent to the evolution of Web 2.0, the production of maps on the internet by laypersons burgeoned; resulting in the coining of different terms referring to this phenomenon. A need was seen to group these terms and sort out the confusion in the use of terminology. The terms were grouped in to two groups, terms referring to the content contributed such as VGI, neogeography etc. and terms referring to visualization of contents such as neogeography maps, collaborated mapping etc.

To achieve the goals of this research, there were a number of research questions that needed to be answered. The work I did to address these questions and ultimately meet the research objectives are presented below.

- What are the purposes of neogeography maps? and What are the different kinds of neogeography maps?

To learn more about the use and types of neogeography maps, a literature was reviewed. From what I learned from the literature a criterion for categorizing the neogeography maps was designed in chapter 3. This criterion followed the way neogeography maps were produced, their users and their uses. Neogeography maps are produced differently depending on their purpose. Some neogeography maps require users to register before contributing information while others no registration is required. The method of contribution also differs for the maps. For some maps, contribution is done directly to the map through tracing features and editing map details. Direct contribution can also be through placing markers on the existing base map such as Google Maps. On the other hand, indirect contribution can be through sending reports for the moderator to check and place on the map. Groups were then made to show how neogeography maps are used. First, a review on their background was made to learn why they were designed. This was done to group maps created for similar purposes together. The outcome showed that neogeography maps are used for data collection, data storage, navigation, crisis management, tourism, sharing content with friends (as in social media) and for getting answers to questions such as ‘where is?’.

Different types of neogeography maps were then deduced from these grouping. As such the types of neogeography maps were: data collection maps, navigation maps, validation maps, information maps, crisis maps, tourism maps and social maps depending on what they are used for.

- Who are the users of neogeography maps? What characteristics do they possess? and what is the best way to categorize the users?

People contributing to, viewing at and extracting data from neogeography maps are all considered as users. With the help of the literature review the users were grouped into two groups, professional and non-professional users. The professional group comprises of non-contributing users who only use end products such as governments, private organizations and website developers. The non-professional group of users comprises of individuals who voluntarily contribute to, view at and extract information from neogeography maps. This group of users comprised of tourists, cyclists, pedestrians, motorist etc.

To learn more about uses and users of neogeography maps, two maps were selected as case studies. The selected neogeography maps were the OpenStreetMap (OSM) and the Flickr World Map. The characteristics of users of these maps were gathered through the use of online survey and presented and discussed in chapter 4 and 5. The online survey was designed through the use of the online tool

SurveyMonkey ([URL 67](#)). Three questionnaires were designed, the first question was meant for registered users of OSM, the second for registered users of Flickr and the third questionnaire was meant for non registered users of both OSM and Flickr. On completion of the design, the questionnaires were dispersed through the use of two methods. First the questionnaires were sent to the registered users of OSM and Flickr through the messaging tool on their portals. Secondly the other questionnaires were sent via e-mail addresses to the students and staff members of the Faculty of Geo-information Science (ITC), Enschede.

The response rate for the Flickr questionnaire was lower than that of OSM. Nonetheless, the results showed that most of the users were male and the age of users was spread between the ages of 26 and 40. The users were a combination of people with skills in geography and related field as well as those without any skills in the mentioned fields. Most of the users were holders of undergraduate and graduate degrees.

- What do different types of users contribute in neogeography? How do and how can different types of users benefit from neogeography? and What are the user's future needs and requirements?

From the questionnaire responses it was discovered that users of OSM contribute through tracing features, editing attributes, editing map details and uploading GPS points. The users of the Flickr World Map contribute geotagged images. The users use both maps for private and entertainment purposes; they also use them for school and work related purposes. Users of OSM use the map to calculate distance, store data, and extract data to use elsewhere. Similarly the users of the Flickr World Map extract geotagged images to use elsewhere.

To learn more on how users use these maps, users were invited for actual user testing. Only users who showed interest in participating were invited. Users of the Flickr World Map were not invited to the tests because of a low response rate of the questionnaire. Only two respondents were willing to participate as a result the user test was only conducted for OSM users.

The participants to the test were divided into two groups, novice participants and expert participants. The criterion for grouping the users was derived from their responses from the questionnaire. Their responses with respect to their experience in using the OSM were reviewed. Concentration was on the years of using the OSM, frequency of use and more especially the mode of interaction with the interface. The participants were considered expert if they had an experience in editing the OSM. Three tasks were designed for users. The first task was different for the novice and the expert users. Novice users were given a task to trace a road connecting a hospital and the main road, while the expert users were given an area to freely work on. For this task a short introductory video on tracing in OSM was played for novice users. The other tasks (uploading and downloading data) were the same for both groups. For the user tests, several techniques were used to gather the data. The users were observed through the use of screen logging, their eye movements were also recorded together with the video and voice recording. After the user test, short interviews were conducted to get views of users with respect to tasks they were doing.

It took novice users twice the time of expert users to complete each task given to them. The results of the user tests also showed that editing the OSM can be challenging. It was not easy for users for figure out first of all how to show the aerial photo on the map. When this was figured out, beginning of tracing was also very difficult. Users could not find the tool to start tracing features and finally stopping the tracing was also not easy. Task 2 and task 3 were not that problematic except that for task 3 the term used on OSM 'Export' was often misunderstood by users. Users felt the term was too technical that a more familiar term such as download should be used.

The needs and preferences of users were gathered and presented. These were gathered through the use of online survey as well as user tests. Extracting data in shapefile format from OSM were some of the needs

users' had. The users wished to have a possibility for vector mapping to make the use of OSM on mobile phones easier. They also suggested addition of tools that will enable 3D view, adding photos and water maps. Users of Flickr World Map suggested an instant connection to other social media, filtering images with respect to time and limiting the search results to a fewer photos.

6.2. Limitations

Due to a low response rate and non-use of the Flickr World Map, the user tests for the map were not conducted. Therefore the users of this map were not observed. The results of questionnaire still give rough picture on what they would like, but it's not a satisfactory representative to a bigger group of users out there.

Because of time constraints, the results of eye tracking and mouse clicks were not thoroughly analysed, the results could have revealed a lot more on how user's interact with the OSM interface and tools.

6.3. Recommendations

Hopefully, this research contributes to designing and managing user friendly, usable and information-rich neogeography maps. Website developers have to consider what users would like to see in neogeography maps. In line with this study I would recommend the following for future research:

- The non-use or lack of knowledge regarding the Flickr World Map. Is the Flickr interface really the cause of this problem? Because of time constraints it was not possible to invite the non-users of this feature and investigate this.
- A study of the motivations with respect to users of the Flickr World Map. From this study it is obvious that users have no interest in the geospatial aspects of Flickr therefore users should be encouraged to participate and use this feature.
- Effectiveness of connecting OSM with social media. Users suggested connecting OSM with social media, but then the question would of course be 'how will this affect the OSM', will the motives for contributing change? Currently OSM users are contributing because they want to assist other users, they want to build a global map made by the public etc. Will this be affected by adding a social aspect to OSM?
- Addition of other types of data to OSM. The aim of OSM is to have a complete coverage of the map of the world. Most areas in the developed countries are already covered, but in the less developed countries there is still a lot to be done. Now can OSM handle such a big step as to include water maps and cadastre?

LIST OF REFERENCES

- Batty, M., Hudson-Smith, A., Milton, R., & Crooks, A. (2010). Map Mashup, Web 2.0 and the GIS Revolution. *Annals of GIS*, 16(1), 1-13.
- Das, T. (2010). *Visualization of User-Generated Geo-Content*, UGGC. Paper presented at the GIScience 2010 Doctoral Colloquium, Zurich, Zwitterland.
- Das, T., & Kraak, M. J. (2011). *Does Neogeography Need Designed Maps*. Paper presented at the 25th ICC Paris.
- Elwood, S. (2008). Volunteered Geographic Information: Key Questions, Concepts and Methods to Guide Emerging Research and Practice. *GeoJournal*, 72(3), 133-135.
- Gartner, G., & Ortog, F. (2011). *Lecture Notes in Geoinformation and Cartography*. Paper presented at the 8th International Symposium on Location Based Services, Vienna.
- Goodchild, M. (2007). Citizens as Sensors: The World of Volunteered Geography. *GeoJournal*, 69(4), 211-221.
- Habib, M. (2011). *Neogeography: The Challenge of Channeling Large and Ill-Behaved Data Streams*. Paper presented at the Data Engineering Workshops (ICDEW), Long Beach, California.
- Haklay, M. (2010). How Good is Volunteered Geographical Information? A Comparative Study of OpenStreetMap and Ordnance Survey Datasets. *Environment and Planning B: Planning and Design*, 37(4), 682-703.
- Haklay, M., & Weber, P. (2008). OpenStreetMap: User-Generated Street Maps. *Pervasive Computing, IEEE*, 7(4), 12-18.
- Hall, B. G., Chipeniuk, R., Frederik, R. D., Leahy, M. G., & Deparday, V. (2010). Community-based Production of Geographic Information Using Open Source Software and Web 2.0. *International Journal of Geographical Information Science*, 24(5), 761-781.
- Heipke, C. (2010). Crowdsourcing geospatial data. *ISPRS Journal of Photogrammetry and Remote Sensing*, 65(6), 550-557.
- Hollenstein, L., & Purves, R. S. (2010). Exploring Place Through User-Generated Content: Using Flickr Tags to Describe City Core. *Journal of Spatial Information Science*, 1, 21-48.
- Howe, J. (2008). *Crowdsourcing: Why the Power of Crow is Driving the Future to Business* (1 ed.): Crown Business.
- Interactive Advertising Bureau. (2008). *User Generated Content, Social Media, and Advertising-An Overview*: Interactive Advertising Bureau.
- Jobst, M., & Döllner, J. (2009). Neo-Cartographic Influence on Map Communication in LBS In G. Gartner & K. Rehr (Eds.), *Location Based Services and TeleCartography II* (pp. 207-219): Springer Berlin Heidelberg.
- Malinen, S. (2010). *Photo Exhibition or Online Community? The Role of Social Interaction in Flickr*. Paper presented at the Fifth International Conference on Internet and Web Applications and Services (ICIW), Barcelona, Spain.
- Miah, S. J., & Gammack, J. (2008). *A Mashup Architecture For Web End-User Application Designs*. Paper presented at the 2nd IEEE International Conference on Digital Ecosystems and Technologies (DEST), Phitsanulok, Thailand.
- Murugesan, S. (2007). Understanding Web 2.0. *IT Professional*, 9(4), 34-41.
- Nedovic-Budic, Z., & Budhathoki, N. R. (2010). *Motives for VGI Participants*. Paper presented at the VGI for SDI Workshop, Wageningen University, Wageningen.
- Neis, P., Zielstra, D., & Zipf, A. (2011). The Street Network Evolution of Crowdsourced Maps: OpenStreetMap in Germany 2007–2011. *Future Internet*, 4(1), 1-21.
- Nielsen, J. (1993). *Usability Engineering*. San Diego: Academic Press.
- Nivala, A.-M., Sarjakoski, T., L., & Sarjakoski, T. (2007). Usability Methods' Familiarity Among Map Application Developers. *International Journal of Human-Computer Studies*, 65(9), 784-795.
- Schobesberger, D. (2010). User-Centred Design of a Web-Based Cartographic Information System for Cultural History. In K. Kriz, W. Cartwright & L. Hurni (Eds.), *Mapping Different Geographies* (pp. 159-170): Springer Berlin Heidelberg.
- Seeger, C. (2008). The Role of Facilitated Volunteered Geographic Information in the Landscape Planning and Site Design Process. *GeoJournal*, 72(3), 199-213.

- Silvertown, J. (2009). A New Dawn for Citezen Science. *Trends in Ecology and Evolution*, 24, 467-471.
- SongJie, G., HongWu, Y., & Ping, S. (2009). *A Peer-to-Peer Based Distributed Collaborative Filtering Architecture*. Paper presented at the International Joint Conference on Artificial Intelligence Pasadena, California.
- Stark, H. (2011). *Warum Herr Schmidt in OSM Mitmacht, Frau Muller Hingegen Nicht*. Paper presented at the Geoinformatik-Geochance, Munster.
- Tahir, A., McArdle, G., & Bertolotto, M. (2011). A Web-Based Visualisation Tool for Analysing Mouse Movements to Support Map Personalisation. In J. Xu, G. Yu, S. Zhou & R. Unland (Eds.), *Database Systems for Adanced Applications* (Vol. 6637, pp. 132-143): Springer Berlin, Heidelberg.
- Takashi, M. (2007). Theory and Development of Research in Ubiquitous Mapping In G. Gartner, W. Cartwright & M. P. Peterson (Eds.), *Location Based Services and TeleCartography* (pp. 89-106): Springer Berlin Heidelberg.
- Tsou, M.-H., & Curran, J. M. (2008). User-Centered Design Approaches for Web Mapping Applications: A Case Study with USGS Hydrological Data in the United States. In M. P. Peterson (Ed.), *International Perspectives on Maps and the Internet* (pp. 301-321): Springer Berlin Heidelberg.
- Turner, A. (2006). *Introduction to Neogeography*. California: O'Reilly.
- Virrantaus, K., Fairbairn, D., & Kraak, M.-J. (2009). ICA Research Agenda on Cartography and GI Science. *Cartographic Journal, The*, 46(2), 63-75.
- Yu, J., Benatallah, B., Casati, F., & Daniel, F. (2008). Understanding Mashup Development. *Internet Computing, IEEE*, 12(5), 44-52.
- Zielstra, D., & Zipf, A. (2010). *A Comparative Study of Proprietary Geodata and Volunteered Geographic Information for Germany*. Paper presented at the The 13th AGILE International Conference on Geographic Information Science Cuimaraes, Portugal.

URLS

| | |
|--------|---|
| URL 1 | www.rocwiki.org |
| URL 2 | http://floresgeog7.blogspot.com/2010/04/lab-3-neogeography.html |
| URL 3 | http://www.ncgia.ucsb.edu/projects/vgi/supp.html |
| URL 4 | www.openstreetmap.org |
| URL 5 | http://haiti.ushahidi.com/ |
| URL 6 | https://ict4peace.crowdmap.com/reports/view/896 |
| URL 7 | http://jan30sudan.crowdmap.com/ |
| URL 8 | http://www.geo-wiki.org/ |
| URL 9 | http://haiti.openstreetmap.nl |
| URL 10 | http://oreilly.com/web2/archive/what-is-web-20.html |
| URL 11 | http://www.youtube.com |
| URL 12 | http://www.gpsvisualizer.com/examples/google_photo_map.html |
| URL 13 | http://www.chicagowilderness.org/ |
| URL 14 | http://birds.audubon.org/christmas-bird-count |
| URL 15 | http://dailycrowdsource.com/2010/10/07/technology/ge-ecomagination-challenge-awards-50000-to-solar-roadways/ |
| URL 16 | http://www.getaslogan.com/ |
| URL 17 | http://www.waze.com/ |
| URL 18 | http://pipes.yahoo.com/pipes/ |
| URL 19 | http://www.mapbuilder.net/ |
| URL 20 | http://www.wikimapia.org/ |
| URL 21 | http://maps.google.com/ |
| URL2.2 | http://www.webmapper.net/carto2003/ |
| URL 23 | http://tbddc.crowdmap.com/ |
| URL 24 | http://www.mapmytrack.com/ |
| URL 25 | http://www.quikmaps.com/ |
| URL26 | |
| | http://www.pcworld.com/article/201486/apple_location_data_collection_policies_what_you_need_to_know.html |
| URL2.7 | http://www.birds.cornell.edu/pigeonwatch |
| URL 28 | http://www.gpsvisualizer.com/ |
| URL 29 | http://www.flickr.com/ |
| URL 30 | http://www.uncorneredmarket.com/ |
| URL 31 | http://www.nwf.org/naturefind/ |
| URL 32 | http://www.allmyfeatures.com/amf/foodmap/googlefoodmap.htm |
| URL 33 | https://ktmeq.crowdmap.com/main |
| URL 34 | https://www.google.com/latitude/ |
| URL 35 | http://www.mapmyride.com/routes/ |
| URL 36 | http://www.google.com/mapmaker |
| URL 37 | http://www.fastfoodmaps.com/ |
| URL 38 | http://www.flickr.com/map |
| URL39 | https://dcelection.crowdmap.com/main |
| URL 40 | http://open.mapquest.nl/ |
| URL 41 | http://en.wikipedia.org/wiki/Ushahidi |
| URL 42 | http://wiki.openstreetmap.org/wiki/MapQuest |

URL 43 <http://www.360cities.net/map#lat=45&lng=19&zoom=2>
 URL 44 <http://ebird.org/ebird/map>
 URL 45 <http://www.cliptoo.nl/home/CliptooMap/>
 URL 46 <http://www.webmapper.net/carto2003/>
 URL 47 http://wiki.openstreetmap.org/wiki/Main_Page
 URL 48 http://www.openstreetmap.org/stats/data_stats.html
 URL 49 http://wiki.openstreetmap.org/wiki/Web_front_end
 URL 50 http://wiki.openstreetmap.org/wiki/Data_working_group
 URL 51 <http://www.openrouteservice.org/>
 URL 52 <http://www.yournavigation.org/>
 URL 53 <http://www.cyclestreets.net/>
 URL 54 <http://maps.cloudmade.com/>
 URL 55 <http://open.mapquest.nl/>
 URL 56 <http://wiki.openstreetmap.org/wiki/OpenCycleMap>
 URL 57 http://wiki.openstreetmap.org/wiki/Beginners_Guide_1.5
 URL 58 <http://en.wikipedia.org/wiki/Flickr>
 URL 59 <http://advertising.yahoo.com/article/flickr.html>
 URL 60 <http://www.flickr.com/photos/cogdog/269039506/>
 URL 61 <http://www.flickr.com/services/shapefiles/1.0>
 URL 62 <http://www.flickr.com/help/map/>
 URL 63 <http://en.wikipedia.org/wiki/Usability>
 URL 64 <http://home.ubalt.edu/ntsbarsh/stat-data/surveys.htm#rss>
 URL 65 http://wiki.answers.com/Q/Advantages_and_disadvantages_of_interviews
 URL 66 http://www.boxesandarrows.com/view/recording_screen_activity_during_usability_testing
 URL 67 <http://www.surveymonkey.com/>
 URL 68 <http://www.yahoo.com/mail>
 URL 69 <http://www.useit.com/alertbox/thinking-aloud-tests.html>
 URL 70 <http://professionals306.blogspot.com/2007/05/advantages-of-eye-tracking-and.html>
 URL 71 http://www.useit.com/alertbox/participation_inequality.html
 URL 72 <http://www.opencyclemap.org/>
 URL 73 http://idrc.org/mimap/ev-56606-201-1-DO_TOPIC.html
 URL 74 <http://www.pcpro.co.uk/blogs/2009/07/29/why-open-street-map-is-brilliant/>
 URL 75 <http://wiki.openstreetmap.org/wiki/Osmarender>
 URL 76 <http://www.flickr.com/account/geo/exif/?from=privacy>
 URL 77 <http://code.flickr.com/blog/2009/05/21/flickr-shapefiles-public-dataset-10/>
 URL 78 <http://vimeo.com/24984085>
 URL 79 <http://www.tobii.com/en/eye-tracking-research/global/library/manuals/>
 URL 80 http://www.wired.com/wired/archive/14.06/crowds.html?pg=1&topic=crowds&topic_set=
 URL 81 <http://www.gim-international.com/index.php>

All URLs were tried and tested for availability on the 10th February 2012

APPENDICES

Appendix A OSM questionnaire

Use and Users of Neogeography Maps (OSM)

Knowing the Users

I am an MSc student in the department of Geo-Information Processing, I am doing a research on the use and user requirements for Neogeography Maps (maps created voluntarily by the public on the internet). I am keen to know more about the users and uses of OpenStreetMap as my case study. This will help me draw the recommendations to optimise usability of Neogeography Maps. A selected number of respondents may be invited for user tests in the usability laboratory in Enschede, the Netherlands, where we will learn more on how they use the OpenStreetmap. Please follow the link below to fill in the questionnaire and please indicate whether you will be available for a user test in January 2012.

1. Where do you live?

Enschede

Hengelo

Oldenzaal

Losser

Gronau

Other (please specify)

***2. Please select your gender**

Male

Female

***3. Please select your age group**

25 and younger

26-40

41-60

61 and above

***4. What is the highest level of education you have completed?**

Less than high school

High school degree or equivalent

Undergraduate (Associate, Bachelor)

Graduate degree (Master, MSc, PhD)

***5. Do you have a degree/training or work in one of the following disciplines: Geography, Cartography, Urban Planning, Information Science?**

Yes

No

Use of the map

Use and Users of Neogeography Maps (OSM)

6. How long have you been working with/using OpenStreetMap?

- Less than a year
- More than one year but less than three years
- More than three years
- I have never worked with it before

*7. How often do you work with/use OpenStreetMap?

- Daily
- At least once a week
- At least once in two weeks
- At least once in a month
- At least once in six months
- At least once a year

*8. Why do you work with OpenStreetMap?

- For my work
- For my school work
- For private/entertainment purposes
- For helping others with the contribution I make

Other (please specify)

*9. What do you do with OpenStreetMap?

- Contribute data only
- Use the map
- Both contribute and use the map

10. What kind of data do you contribute?

- GPS points
- Tracing aerial photos
- Edit map details

Other (please specify)

Use and Users of Neogeography Maps (OSM)

11. How would you describe the usability of tools provided for data contribution?

- Easy to use
 Easy to use but they need improvement
 Complicated

12. Are there any other tools you would like OpenStreetMap to include in the future?

- Yes
 No

13. If yes please elaborate:

14. For what purpose(s) do you use the map?

- As a base map layer for my mash-up
 Extract data
 Get directions
 Storing data

Other (please specify)

15. Please provide a Web link in which the OSM was used

16. If you use data extracted from OpenStreetMap for what purpose(s) do you use them?

17. Are there other ways in which you would like to use these data but you have not tried or tried but can not?

- Yes
 No

Use and Users of Neogeography Maps (OSM)

18. If yes please elaborate:

19. How would you describe the usability of tools provided for downloading data?

- Easy to use
 Easy to use but need improvement
 Complicated

20. In needs improvement what kind?

21. Are there other tools you would like OpenStreetMap to include in the future?

- Yes
 No

22. If yes please elaborate:

***23. Does OpenStreetMap help you to achieve what you want?**

- Yes
 No

24. If no please explain why not:

25. Are you satisfied with the quality of data in OpenStreetMap?

- Yes
 No
 I do not know

26. If no please explain why not:

Use and Users of Neogeography Maps (OSM)

27. Are you satisfied with the design of the map and map symbols in OpenStreetMap?

- Yes
 No
 I do not know

28. If no please explain why not:

29. Which platform do you use for contributing or using OpenStreetMap?

- PC (laptop or desktop)
 Mobile phone

Other (please specify)

***30. Are you able to perform your intended tasks on this platform?**

- Yes
 No

31. If no please explain why not:

***32. Which future improvements would you like to see in OpenStreetMap?**

User test

Some of the users may be invited to our usability lab in Enschede the Netherlands, the purpose for the invitation is to learn more on how users use the maps and the tools they are provided with. For example how data is uploaded or extracted from OSM.

***33. Will you be available if invited for user test in January?**

- Yes
 No

Use and Users of Neogeography Maps (OSM)

Receiving the invitation

For the purpose of sending you an invitation to the user test, your e-mail address is required. Please note that the e-mail address provided will not be used for anything else but the purpose mentioned above.

***34. Please type your e-mail address below.**

END

END of questionnaire thank you for participating

Use and Users of Neogeography Maps (Flickr)

***12. What do you do with the Flickr world's map?**

Upload and share geotagged images (Geotagging means tagging a place name) Extracting images Searching for images to use elsewhere

Upload and share non-geotagged images Storing images

Tagging images Organizing images

Other (please specify)

13. Have you ever uploaded your images/videos on the flickr world's map?

Yes

No

7.

14. How would you describe the tools provided for geotagging and uploading images on the Flickr worl'd map?

Easy to use

Easy to use but needs improvement

Complicated

8.

15. If needs improvement what kind?

***16. Have you ever downloaded/extracted and used the content of the Flickr world's map?**

Yes

No

9.

17. How do you use this content?

Use and Users of Neogeography Maps (Flickr)

***18. Have you ever used the geotagged images/videos from the Flickr world's map on other maps?**

- Yes
 No

10.

***19. How did you use the geotagged images?**

11.

20. How can you describe the process of searching images and videos on the Flickr world's map?

- Easy and well organized
 Easy but gives too much information
 Complicated

***21. Are there other ways in which you would like to use this data but you have not tried or cannot?**

- Yes
 No

12.

22. If yes please elaborate:

***23. Are you satisfied with the quality of data in the Flickr world's map?**

- Yes
 No
 I do not know

13.

Use and Users of Neogeography Maps (Flickr)

24. If no please explain why not:

***25. Are you satisfied with the design of the map, the map symbols and the arrangement of images on the Flickr world's map?**

Yes

No

14.

***26. Would prefer other types of display?**

Yes

No

15.

27. Please explain why you are not happy with the design and what you would prefer:

16.

***28. Does the Flickr world's map help you achieve what you want?**

Yes

No

17.

29. If no please explain why not:

***30. What would you like to see in the future on the Flickr world's map?**

18. User tests

Some of the users will be invited to our usability lab, the purpose for the invitation is to learn more on how users use the maps and the tools they are provided with. For example how data is uploaded or extracted from OSM.

Use and Users of Neogeography Maps (Flickr)

***31. Will you be available if invited for a user test in January?**

Yes

No

19. Receiving invitation

For the purpose of sending you an invitation to the user test, your e-mail address is required. Please note that the e-mail address provided will not be used for anything else but the purpose mentioned above.

***32. Please type your e-mail address below.**

20. END

End of questionnaire thank you for participating

Use and Users of Neogeography Maps (OSM/Flickr)

1. Knowing the User

1. Where do you live?

Enschede

Hengelo

Oldenzaal

Losser

Gronau

Other (please specify)

***2. Please select your gender**

Male

Female

***3. Please select age group**

25 and younger

26-40

41-60

61 and above

***4. What is the highest level of education you have completed?**

High school degree or equivalent

Undergraduate (Associate, Bachelor)

Graduate degree (Master, MSc, PhD)

Other (please specify)

***5. Do you have a degree/training or work in one of the following disciplines: Geography, Cartography, Urban Planning, Information Science?**

Yes

No

2. The use of OpenStreetMap and Flickr

Use and Users of Neogeography Maps (OSM/Flickr)

*6. Have you ever worked with/used OpenStreetmap or Flickr?

- Yes OpenStreetMap
- Yes Flickr
- Yes both OpenStreetMap and Flickr
- I have never worked with any of them

3. OpenStreetMap

*7. How long have you been working with/using OpenStreetMap?

- Less than a year
- More than a year but less than three years
- More than three year

*8. How often do you work with OpenStreetMap?

- Daily
- At least once a week
- At least once in two weeks
- At least once in a month
- At least once in six month
- At least once a year

*9. What do you use OpenStreetMap for?

- For my work
- For my school work
- For private/entertainment purposes
- For helping others with my contribution

Other (please specify)

*10. What do you do with OpenStreetMap?

- Contribute data only
- Use the map only
- Both contribute and use the map

4. Contribution in OpenstreetMap

Use and Users of Neogeography Maps (OSM/Flickr)

*11. What kind of data do you contribute?

- GPS points
- Editing map details
- Tracing features

Other (please specify)

*12. How would you describe the usability of tools provided for data contribution?

- Easy to use
- Easy to use but needs improvement
- Complicated

5.

*13. If needs improvement what kind?

*14. Are there any other tools you would like OpenStreetMap to include in the future?

- Yes
- No

6.

15. If yes please elaborate:

7. Use of OpenStreetMap

16. For what purpose(s) do you use the map?

- Extract data
- Get directions
- Store data
- Use as a base map layer for my mashup

Other (please specify)

Use and Users of Neogeography Maps (OSM/Flickr)

17. If you use OpenStreetMap as a base for a mashup please provide a link in which it was used.

18. If you use the data extracted from OpenStreetMap for what purpose(s) do you use them?

19. Are there other ways in which you would like to use this data but you have not tried or cannot?

- Yes
 No

8.

20. If yes please elaborate:

21. How would you describe the usability of tools provided for downloading data on OpenStreetMap?

- Easy to use
 Easy to use but needs improvement
 Complicated

9.

22. If needs improvement what kind?

***23. Are there any other tools you would like OpenStreetMap to include in the future?**

- Yes
 No

10.

Use and Users of Neogeography Maps (OSM/Flickr)

24. If yes please elaborate:

25. Does OpenStreetMap help you achieve what you want?

- Yes
 No

11.

26. If no please explain why not:

27. Are you satisfied with the quality of data in OpenStreetMap?

- Yes
 No
 I do not know

12.

28. If no please explain why not:

29. Are you satisfied with the design of the map and the map symbols in OpenStreetMap?

- Yes
 No

13.

30. If no please elaborate:

Use and Users of Neogeography Maps (OSM/Flickr)

*31. Which platform do you use for contributing or using OpenStreetMap?

PC (laptop or desktop)

Mobile phone

Other (please specify)

32. Are you able to perform your intended tasks on this platform?

Yes

No

14.

33. If no please explain why not:

*34. Which future improvements would you like to see on OpenStreetMap?

35. Have you ever worked with Flickr or visited www.flickr.com?

Yes

No

15. Use of Flickr

*36. Have you ever worked with/use Flickr or visited www.flickr.com?

Yes

No

16. Flickr

*37. How long have you been working with/using Flickr?

Less than a year

More than a year but less than three years

More than three years

Use and Users of Neogeography Maps (OSM/Flickr)

*38. How often do you work with/use Flickr?

- Daily
- At least once a week
- At least once in two weeks
- At least once in a month
- At least once in six months
- At least once a year

*39. What do you use Flickr for?

- For my work
- For my school
- For personal/entertainment reasons

Other (please specify)

17. Use of the Flickr world's map

On www.flickr.com under the option 'Explore', a world's map is provided, on this map, geotagged images and videos contributed by users are displayed. The following questions will be based on the use of this map, which will therefore be referred to as 'the Flickr world's map'.

*40. Do you use the world's map provided on Flickr?

- Yes
- No

18.

*41. If no please explain why not:

19.

*42. What do you do with the Flickr world's map?

- Upload and share geotagged images (Geotagging means tagging a place name)
- Upload and share non-geotagged images
- Tagging images
- Extracting images
- Storing images
- Organizing images
- Searching for images to use elsewhere

Other (please specify)

20.

Use and Users of Neogeography Maps (OSM/Flickr)

43. Have you ever uploaded your images/videos on the flickr world's map?

- Yes
 No

44. How would you describe the tools provided for geotagging and uploading images on the Flickr world's map?

- Easy to use
 Easy to use but needs improvement
 Complicated

21.

45. If needs improvement what kind?

***46. Have you ever downloaded/extracted and used the content of the Flickr world's map?**

- Yes
 No

22.

47. How do you use this content?

***48. Have you ever used geotagged images/videos from the Flickr world's map in other maps?**

- Yes
 No

23.

***49. How did you use the geotagged images?**

24.

Use and Users of Neogeography Maps (OSM/Flickr)

50. How can you describe the process of searching images and videos on the Flickr world's map?

- Easy and well organized
- Easy but gives too much information
- Complicated

51. Are there other ways in which you would like to use this data but you have not tried or cannot?

- Yes
- No

25.

52. If yes please elaborate:

53. Are you satisfied with the quality of data in the Flickr world's map?

- Yes
- No
- I do not know

26.

54. If no please explain why not:

55. Are you satisfied with the design of the map, the map symbols and the arrangement of images on the Flickr world's map?

- Yes
- No

27.

***56. Would you prefer other types of display?**

- Yes
- No

28.

Use and Users of Neogeography Maps (OSM/Flickr)

***57. Please explain why you are not happy with the design and what you would prefer:**

29.

58. Does the Flickr world's map help you achieve what you want?

- Yes
 No

30.

59. If no please explain why not:

***60. What would you like to see in the future on the Flickr world's map?**

31. User tests

Some of the users will be invited to our usability lab, the purpose for the invitation is to learn more on how users use the maps and the tools they are provided with. For example how data is uploaded or extracted from OSM.

***61. Will you be available if invited for a user test in January?**

- Yes
 No

32. Recieving invitation

For the purpose of sending you an invitation to the user test, your e-mail address is required. Please not that the e-mail address provided will not be used for anything else but the purpose mentioned above.

***62. Please type your e-mail address below.**

33. END

Appendix D Test setup

Prior to arrival of test persons

- Switch on the computer
- Make sure the interface (OpenStreetMap) is running and logged on to.
- Find the help video and get it ready
- Make sure the tasks are ready for the test person.
- Make sure the seat is in a correct position (in front of the computer)
- If using the mobile camera make sure it's ready and working.
- Make sure the voice recorder is charged and ready for use (for the interview).

Arrival of the test person:

- Welcome test person
- Introduce myself
- Introduce the test and equipment used
- Calibrate test person's eyes
- Play the help video (OSM for beginners Part 2) for the novice test person
- Once again encourage the test person to think aloud
- Start the recording and the test

After the test

- Stop the recording
- Thank the participant for a job well done
- Introduce the participant to the interview
- Switch on the voice recorder
- Start the interview

After the interview

Thank the test person for coming and participating.

Appendix E Users tasks Novice users

Introduction

As part of my MSC research, I selected OpenStreetMap (OSM) as one of my case studies. My interest is on people's contribution of geographic data, use of the map and use of the data extracted from the map. You were invited to the test because you completed the online survey and showed interest in participating in the test. This test is a supplement to the information you provided on the questionnaire.

The purpose of this test is to gain knowledge on how the users use the tools provided on OSM to achieve their goals and how they interact with the OSM interface. It is worth noting that this test is not meant to test you in any way, but just to learn from you. The test results will be used to make recommendations on what the users require and what they expect in the future relating to the use of the map. Even though the test results will be used in my MSc thesis, they will be used as summary statistics and individual results/names of the test persons will not be presented.

You will be asked to perform some tasks, as described below. Please relax and feel at home remember to 'think-aloud' and say what you are doing as you continue, if you find yourself stranded do not hesitate to ask. The test will take approximately 15 minutes.

Please read the instructions below carefully and remember to “think-aloud”.

Task 1: Editing the map details

As a user of OpenStreetMap (OSM) you are going to contribute to OSM by editing details of the map. OSM is already open on the computer. We are going to work on a small district called Mohale’s Hoek in Lesotho. Please search and go to this area. You are going to Edit the map using potlatch 2.

- On the map, there is a hospital shown with a red cross, please trace the road that connects the hospital with the main road (A2).
 - Label the road you just traced ‘Residential road’
 - When you have finished with your task save your edits as “edits, Mohale’s Hoek” and proceed to the next task.
-
- When you have finished with your task save your edits as “edits, Mohale’s Hoek” and proceed to the next task.

Task 2: Contributing GPS points

For the second task you are going to contribute GPS points. The points were taken in the Netherlands in the city of Delft. Please follow the steps you would follow to upload the points.

The points you are going to use can be found on the desktop in a folder named ‘OSM_Traces’. Please use the traces saved with your name.

After uploading the traces, please proceed to the next task there is no need to show/view the points on the map.

Task 3: Extracting data

In this task you are going to download data from OSM, this time we are using the area between ‘Stationsplein’ and the ‘road Boddenkampsingel’ in Enschede the Netherlands.

When the task is complete, please save the data (using your name) on the desktop in a folder named ‘OSM_Data’.

END

Thank you for participating

We now continue with a short interview about the tasks you have just executed.

Appendix F User tasks Expert users

Introduction

As part of my MSC research, I selected OpenStreetMap (OSM) as one of my case studies. My interest is on people’s contribution of geographic data, use of the map and use of the data extracted from the map. You were invited to the test because you completed the online survey and showed interest in participating in the test. This test is a supplement to the information you provided on the questionnaire.

The purpose of this test is to gain knowledge on how the users use the tools provided on OSM to achieve their goals and how they interact with the OSM interface. It is worth noting that this test is not meant to test you in any way, but just to learn from you. The test results will be used to make recommendations on what the users require and what they expect in the future relating to the use of the map. Even though the

test results will be used in my MSc thesis, they will be used as summary statistics and individual results/names of the test persons will not be presented.

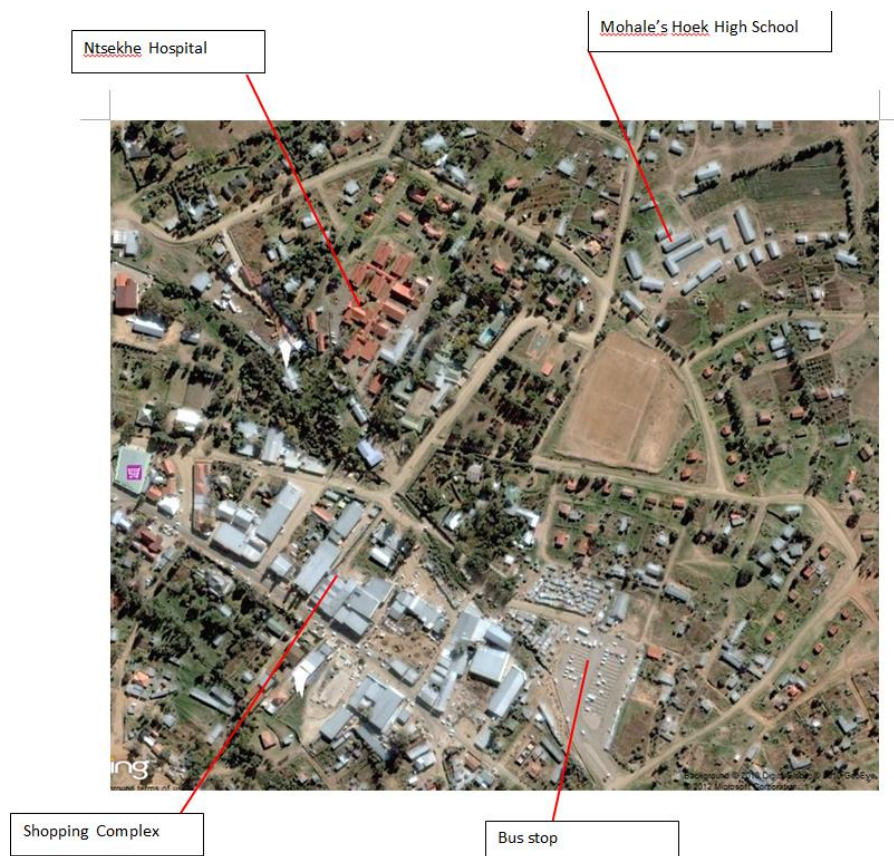
You will be asked to perform some tasks, as described below. Please relax and feel at home remember to ‘think-aloud’ and say what you are doing as you continue, if you find yourself stranded do not hesitate to ask. The test will take approximately 15 minutes.

Please read the instructions below carefully and remember to “think-aloud”.

Task 1: Editing the map details

As a user of OpenStreetMap (OSM) you are going to contribute to OSM by editing details of the map. OSM is already open on the computer. We are going to work on a small district called Mohale’s Hoek in Lesotho. Please go to this area.

- Please take at least 5 minutes to edit and trace some features in the map. Hint on what the buildings represent are given below. Please note that these are just hints and you are not restricted to these features only. You may, for instance, also trace the roads that connect these features to the main road (A2).



- When you have finished with your task save your edits as “edits, Mohale’s Hoek” and proceed to the next task.

Task 2: Contributing GPS points

For the second task you are going to contribute GPS points. The points were taken in the Netherlands in the city of Delft. Please follow the steps you would follow to upload the points.

The points you are going to use can be found on the desktop in a folder named 'OSM_Traces'. Please use the traces saved with your name.

After uploading the traces, please proceed to the next task there is no need to show/view the points on the map.

Task 3: Extracting data

In this task you are going to download data from OSM, this time we are using the area between 'Stationsplein' and the 'road Boddenkampsingel' in Enschede the Netherlands.

When the task is complete, please save the data (using your name) on the desktop in a folder named 'OSM_Data'.

END

Thank you for participating

We now continue with a short interview about the tasks you have just executed.

Appendix G Interview questions

After the test from the interview I will ask the questions below, and some additional questions may arise depending on how they respond.

Task 1 and 2

1. Did the task go as you expected?
2. Were there any other tools you needed to use but could not find?

Task 3

1. Did the task go as you expected?
2. Were there any other tools you needed to use but could not find?
3. Which data format did you select while extracting data?
4. Do you have any reason for the selection you made?
5. Have you ever tried to download data using other formats?

Thank you once again for participating.