

PUBLIC WEB MAPPING: PRELIMINARY USABILITY EVALUATION

Artemis Skarlatidou¹, Muki Haklay¹

¹Department of Geomatic Engineering, University College London
Gower Street, London, WC1B 6BT
Tel. +44 20 7679 2745
skarlatidou.artemis@gmail.com

KEYWORDS: HCI, Usability, GIS, WEB Mapping

1. Introduction

Public Web Mapping sites are not new phenomena any more. Since the introduction of Xerox PARC Map Viewer in 1993 (Putz, 1994), many applications that utilise the World Wide Web (WWW) have been developed and led to a significant change within the field of GIS. Today, many web mapping sites allow end users to interact with online maps in new and innovative ways. Yet, while the development of internet applications in the last decade and the increase in the number of the web sites has resulted in an increase in the number of web usability studies (Nielsen, 2003), the area of web mapping has received relatively little attention and there is no recorded evaluation of commercial web mapping sites. In this paper, we provide preliminary findings from the evaluation of commercial web mapping.

These web mapping sites are used by people that do not have specific GIS knowledge and even without much familiarity with such an interface. Therefore, it is likely that some obstacles regarding the usability of these sites, which was not examined in depth, are stopping users from exploiting these systems in full. Usability engineering (UE), which involves the examination and the evaluation of an interface as well as other Human-Computer Interaction (HCI) methods (Preece *et al*, 1994), can assist in improving the usability of such web sites.

This paper describes the examination and analysis of different web mapping sites by using the method of usability user testing, focusing on the perspective of a simple user without GIS knowledge and attempts to identify the users' needs and expectations that may suggest further improvements of these systems.

2. Methodology

The basic methodological tool used in this study was usability user testing, a common methodology in HCI studies (Preece *et al*, 1994). According to Rubin (1994), the overall goals of the usability testing is to identify the usability deficiencies and at the same time to create functional products that are easy to use. This method is very popular, since the best way to evaluate and understand a web site's usability is by watching people using it (Haklay and Tobón, 2003).

The user testing method was applied by organising two separate workshops. During the first workshop the web mapping sites of Multimap, Google Maps and Map Quest were examined, while in the second workshop were examined the web sites of MSN maps, Yahoo! (European) maps, ViaMichelin and StreetMap. In both workshops the participants did not have any GIS knowledge of exposure, while having different level of scientific background, age and nationality. The first workshop was based on 20 users while in the second one only 10 users were recruited. This is because of the findings during the first workshop that after the first 5 users, most of the identifiable usability errors and problems were recognised. The use of small group of participants is also a common recommendation in usability literature (Nielsen, 1994). In total, each participant performed 6-7 tasks, repeating them with all web mapping sites.

The data gathered during the study was both qualitative and quantitative. Qualitative data gathered through the “Thinking Aloud Protocol”, where the participants provide a verbal explanation for their actions, a pre test questionnaire and a post test questionnaire. The quantitative data was gathered by measuring the total time that the user was performing each task as well as the total number of clicks. The total time for performing each task is in strong correlation with the mental effort that the user spent in each web site and the number of clicks describes the number of steps required to obtain the desirable result.

In order to further compare the different web mapping sites the success rate was calculated. Success rate is defined as “the percentage of tasks that users complete correctly” (Nielsen, 2001). Therefore, if a user could not perform a task correctly, it was scored as fail and the user could continue with the next task. If the user completed the task and obtained the desirable results, this task was scored as successful. A partial credit was given in tasks that were partially successful. To estimate the final percentage of the success rate for each web site, a formula that was introduced by Nielsen (2001) was used:

$$(Ns(Nps*0.5)) / N \tag{1}$$

Where:

Ns: Total Number of Successful attempts

Nps: Total Number of Partially Successful attempts

N: Number of Total attempts

3. Results

The quantitative data analysed statistically and comparative graphs for the web mapping sites were created indicating the average, minimum and maximum time spent in each task as well as the average, minimum and maximum number of clicks for obtaining the desirable results. As the time spent is in strong correlation with the user’s mental effort, the web site where the user could satisfy the task’s objectives faster was considered as the most usable (Figure 1). Similarly the web site where the user could satisfy the task’s goal with less steps and therefore with the lowest number of clicks, was considered as the most usable web site.

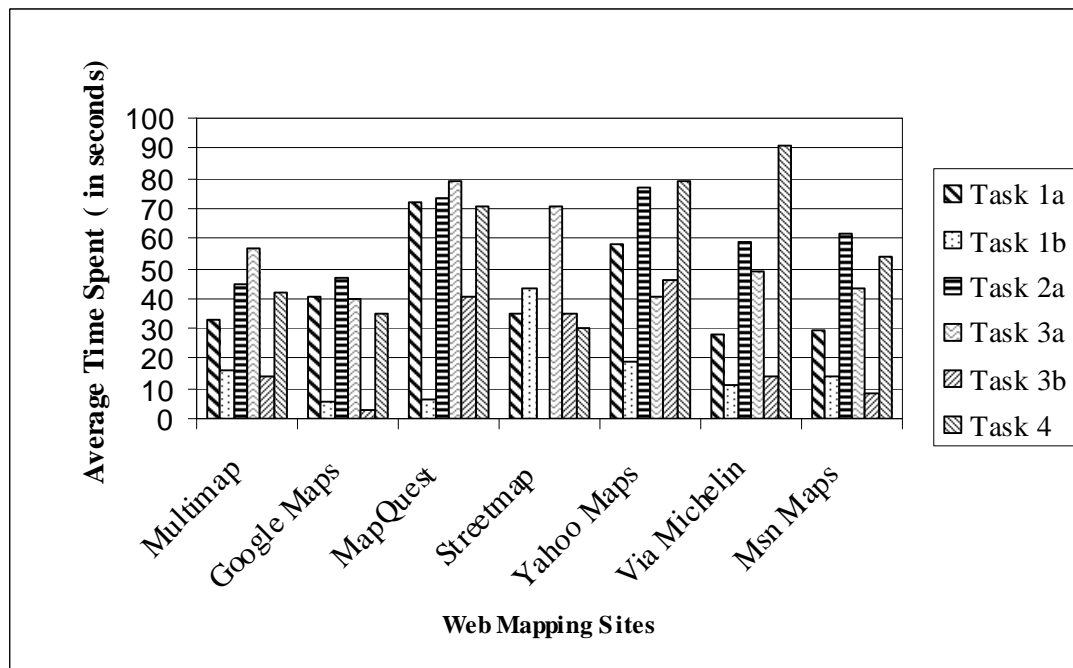


Figure 1: Comparison of the Web Mapping Sites based on the average time spent (in seconds) in each specific task.

Furthermore, the success rate was calculated and the web mapping sites were compared accordingly. The following graph indicates the most and less usable web sites, based on the observed user's performance during the workshops.

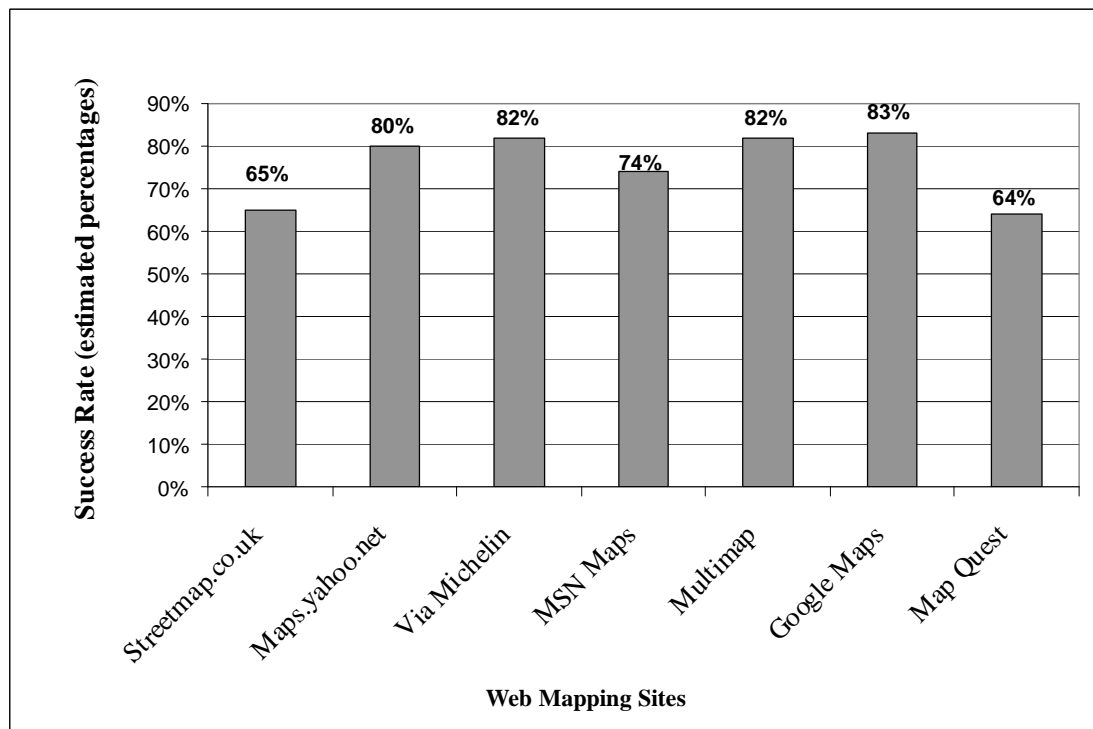


Figure 2: Comparison of the Web Mapping Sites according to the estimated Success Rate

As Figure 2 shows, Google Maps is the most usable as the users could easily obtain the desirable results and the lowest number of failures was observed. The less usable web site is MapQuest.

The qualitative data gathered through both the questionnaires and most significantly through the "Thinking Aloud Method", encouraged the process of understanding the user's needs and expectations as it was possible to identify the users' beliefs and thoughts regarding each web site separately. The importance of the qualitative data gathered could be clearly proved with the following example. As it can be seen from Figure 2, the difference between the web sites of Multimap and Google Maps is relatively small, however it was observed that the preferable website from the user perspective was the web site of Multimap as it gave the impression of a better organised interface, with more links, functions and services.

4. Discussion

This project identified certain barriers to web mapping usability and explored how these can be addressed by using the method of user testing. When the users visit a web mapping site, they have a specific objective which must be satisfied rapidly, it is necessary to take into account aspects such as the buttons' design, the usage of the advertisement and the design of the web site's interface. Based on this project's findings we can conclude that users were failing because of a usability problem related to the web site's design.

By using the method of user testing it was demonstrated that the level of information provided by each web site's homepage, affects users' impression regarding how well it is organised. Also, the usability of each web site is in direct correlation with the size of the maps provided

and the web sites should provide detailed maps of big size. Almost all the users suggested that a big map size should be used as the predefined size for the initial results as they could identify more features around the place under search.

Interestingly, the number of the advertisement boxes does not seem to directly affect usability. This was demonstrated through a comparison of Google Maps, which does not display graphical advertisements, with Multimap, which includes several advertisement boxes. According to Figure 2, Google Maps appears to be more usable for only 1% compared with Multimap, which means that users ignore the advertisements (Nielsen, 2004). However, many users underlined that advertisements and especially the interactive, were very disturbing while they were trying to interpret the map. It should be also taken into consideration that a high number of advertisement boxes can easily increase the web site's size and therefore increase its download time, which, in turn, increases the frustration of users while waiting a new map tile to be downloaded.

The map presentation, the colours used and the features provided by each web site affect the users, in terms of how focused they become while interpreting them and can especially affect users with colour deficiency. Multimap and StreetMap use the same map presentation which the users' found to be the most usable. These are presented in a standard that the users are familiar with from A-Z products. Also, based on the comments of the only user with colour deficiency who participated in both workshops, the map presentation of these two web sites was the best one as the colours used were easily identified. Additionally, it was observed that users expect to understand the symbols displayed on maps without reading a map legend, as this increases their mental effort.

A very important aspect of web mapping sites is the level of functionality that dictates the level of interaction between users and the online map. The most functional web site was that of Yahoo, as a result of the use of a dedicated Java applet. However, it was demonstrated that the users avoid using a variety of functions. They prefer to view maps instantly, in a predefined scale that provides them all the necessary information. Regarding the functionality a very important element is also the presentation of the buttons referred to different functions. Almost none of the users identified the satellite imagery service provided by StreetMap as it was given by a word description. Generally it was observed that users prefer the use of images for the design of both the function and service buttons.

Finally, most of the users, although impressed, did not like satellite imagery as they found it not usable. Therefore, web sites which emphasize on high quality satellite imagery should run usability tests in order to identify how usable these services will be for the final users.

References

- Haklay, M., Tobón C.** (2003), Usability evaluation and PPGIS: towards a user-centred design approach. *International Journal of GIS* 17 (6), pp. 577-592.
- Nielsen, J.** (1994), Guerilla HCI: Using Discount Usability Engineering to Penetrate the Inimidation Barrier. http://www.useit.com/papers/guerilla_hci.html
- Nielsen, J.** (2001), Success Rate: The simplest usability Metric. (Alertbox, 18 February 2001) <http://www.useit.com/alertbox/20010218.html>
- Nielsen, J.** (2003), Usability 101: Introduction to Usability. (Alertbox, 25 August 2003) <http://www.useit.com/alertbox/9605.html>
- Nielsen, J.** (2004), Top Ten Mistakes in Web Design. (Alertbox, 2004 updated version). <http://www.useit.com/alertbox/9605.html>
- Preece, J., Rogers, Y., Sharp, H., Benyon, D.** (1994), Human Computer Interaction. (Essex, UK: Addison-Wesley Longman Ltd).

- Putz, S.** (1994), Interactive Information Services Using World-Wide Web Hypertext. *Proceedings of the First International Conference on World-Wide Web* (Geneva, May 25-27 1994)
- Rubin, J.** (1994), Handbook of Usability Testing: how to plan, design and conduct effective tests. (New York: John Willey & Sons).