# Evaluating the suitability of Web 2.0 technologies for online atlas access interfaces

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**Abstract.** Since the first online atlases, there have been many developments in Web technologies. One of the most obvious developments is the transition to Web 2.0 which enables users to participate and communicate in a collaborative manner. The vast majority of currently existing online atlases do not include functions of Web 2.0, which could enable users to participate and to communicate. Some of these Web 2.0 functions, which could be adapted to online atlases, are recommendations, user comments, tag clouds, blogs and RSS feeds. Before implementing these functions in an online atlas, it is essential to know how users could react to them and how useful they might be for an online atlas. This paper focuses on the suitability of these functions in an online atlas, especially on recommendations and user comments, and tries to find out users reactions to them.

**Keywords:** Online atlas, Web 2.0, recommendations, user comments

## 1. Introduction

Nowadays, there are many regional and national online atlases available and the number of them is constantly increasing. For existing online atlases, instead of having different technologies, there are two commonly used map accessing methods. One of them is executing a search by typing a keyword in a search box and accessing the map from the results of this search. The other method is selecting a map theme from a hierarchical themes list where every single map is listed under a more general topic, and users can access the desired map by following steps from general topics to more specific topics.

Additionally, many new developments emerged in Web technologies and concerning cartography, Gartner (2009) says that Web 2.0 brings out great

possibilities for cartography by offering new aspects of acquiring, gathering and publishing geographic information. In the concept of online atlases, these developments could provide more options for accessing maps and could also enable communication between users. Some of these functions, which could be adapted to online atlases, are map recommendations, user comments, tag clouds, blogs, RSS feeds etc.

Such methods are not commonly used in online atlases yet and the suitability and effects of the use of these developments' in online atlases are still being researched. This research concentrates mainly on "recommendations" and "user comments" functions of Web 2.0 technologies and aims to find out answers to the following questions: Do users of an online atlas use map recommendations? How do the recommendations effect the time users spend on an online atlas website? Do the users have a preference between recommendations which are separately prepared according to editors' advices and other users' activities? Do the comments of other users change the users' own activities? Do the users of an online atlas tend to write comments?

In order to answer these questions, an empirical evaluation was carried out. For that evaluation, an online atlas prototype was developed which simulates an online atlas running on a Web browser. This prototype was presented to test persons in PDF format and each test person had to complete five tasks on clickable PDF interfaces. There was also a questionnaire at the end of the testing to be filled out.

# 2. Web 2.0 opportunities for online atlases

## 2.1. Recommendations

Recommendations are getting more and more important for websites that offer variable domains such as e-commerce (e.g. amazon.com, ebay.com), video sharing (youtube.com), travel booking (tripadvisor.com), film choosing (jinni.com) etc. Schafer's (2005) definition concerning recommendations: "Recommendation systems incorporate data mining techniques which are used to find patterns in data and use these to build models, in order to make their recommendations based on the knowledge gained from behaviors and interests of users." Many of these recommendation systems use collaborative filtering which provides personalized recommendations by taking multiple users' information (derived from profiles, question-

naires, activity history) into consideration and thus finds similar products (Leavitt, 2006).

Basically an online atlas is a collection of maps. These maps are stored in databases and are accessed according to users' choices. Therefore, online atlases have similarity to the collection of items stored in an e-commerce website or a video sharing site. A recommendation tool, like it is used for e-commerce websites, can be included in an online atlas which provides more interesting maps to users, even some that they did not plan to look at. This can be done by analyzing users' previous behaviors (which map themes are interesting for them) or finding maps that have a similar topic to the one they are currently looking at. Such recommendations can be represented to the user on a map page below the current map as "these may interest you" which stands for system designer's recommendations.

Another way of recommending maps is to recommend maps other users visited after looking at a certain one, i.e. user A looks at map X and the system analyzes at which maps the other users looked at after map X and prepares its recommendations according to these analyses. Recommendations can be presented to the user as "other users also looked at these maps" below the accessed map.

This way, users can also access maps that they did not plan to look at before but may interest them. Also, seeing maps with similar topics under the current map allow users to access them directly on the current page without having to return to the home page or back page or make a new search.

## 2.2. User comments

Concerning e-commerce sites, Kim et al.'s research shows that interactions between online consumers have great influence on consumers' choices and comments impact their intentions directly (as cited in Chen, 2012). Chen's (2012) study shows that comments and recommendations have an influence on online shopping consumers and can give them positive shopping experience and improve their shopping satisfaction. A study supported by TripAdvisor.com (a website assisting customers to organize their travels) and carried out by Gretzel et al. (2007) shows that nearly all (97.7%) of the respondents who took part in the experiment within this study read other travelers' online reviews and nearly all of them predominantly or somehow agreed on the influence of other users' online reviews during learning about a travel information (94.6%), evaluating alternatives (91.9%) or avoiding

places which they may not enjoy (91.8%). This study also showed that 83.0% of the respondents feel motivated to post online travel reviews.

In the case of online atlases, comments of other users on maps may change the users' behaviors during using the atlas as well. They might read them to find other maps that may interest them, but which they did not plan to look at before. Another possible effect is that they might change the layer parameters in order to achieve a better view due to other users' reviews. Besides changing behaviors, such a comment option can enable users to exchange their views on maps or rate maps which are prepared by other users (in case of having maps from users that are products of idea of sharing own data).

### 2.3. Blog, Tag cloud and RSS feed

Other than above mentioned two opportunities, blog, tag cloud and RSS feed can also be useful opportunities for an online atlas. A blog in an online atlas can improve the feeling of being part of a community for users where authors share news, announcements, ideas or articles that users can also comment and complete bi-directional communication principle of Web 2.0.

In addition to a blog, a tag cloud can be used in an online atlas to present topics and sub-topics in different sizes and colors. That is calculated according to a topics' popularity among the users or the number of existing maps under these topics. Due to their attractive presentation, a tag cloud can be an alternative to a hierarchical list and could enable users to directly select a different map topic while looking at another one.

RSS feed system can also be useful for online atlases in order to keep users informed of updates, news or announcements without needing to visit the site regularly.

## 3. Empirical Evaluation

Within this research, the suitability of new opportunities for online atlases which are related with the Web 2.0 concept was evaluated by applying a usability test on test persons.

In order to do that, a prototype of an online atlas was developed which simulates almost all functions of a typical existing online atlas, except map navigation tools. In contrast to existing online atlases, it includes new opportunities such as map recommendations, user comments, blog, tag cloud and RSS feed. The usability test tasks were prepared in order to understand the impacts of recommendations and user comments. During the test, test persons' reactions to the blog, tag cloud and RSS feed were also evaluated. In addition to the tasks to be completed with the prototype, a questionnaire was prepared so to get an idea about test persons' opinions on the test and the tested functions.

### 3.1. The online atlas prototype

The prototype of this research was simulating an online atlas website. The pages of the prototype were prepared with the OpenOffice Draw package which lets users prepare pages with graphics and diagrams and provides an option to link pages. After preparing the pages, the file was converted into PDF file format for its full screen usage opportunity and further links (Previous / Next view) were created with Adobe Acrobat 9.0, which could not be done with OpenOffice Draw package. The maps that were used in the prototype were taken from the ÖROK Atlas website by exporting each map as a PDF file. Because of having limited area of work in Draw package, each map had to fit into a reserved place for it and was used as PNG image format. The general appearance of the prototype is as shown below in *Figure 1* and an example of the interface in *Figure 2*.

*Map recommendations* are positioned below the map views. In order to make them more attractive for users, they have different background colors. Recommendations are presented in two groups, each including three maps. One of these groups is system's recommendations, which are generally calculated with the users' previous behaviors in a website or their answers to questionnaires etc. This group of recommendation is presented to the test persons as "These may interest you". The other recommendation option recommends maps which are also visited by other users after the current map on the page, like in e-commerce websites "users who bought this item also bought these". This recommendation group is shown as "Other users looked at these maps after the current one".

In order to prevent that the position of recommendations influences the decision making of the users, the position of other users' recommendations

and system recommendations was changed within the recommendation field, i.e. in one case, the systems' recommendations are on the top whereas in another case, the other users' recommendations are on the top. In the prototype, the recommendations are virtual and they were prepared as graphics for each map page because the aim of the test is not to find out a suitable algorithm for recommendations but to evaluate users' reactions to recommendations and comments in an online atlas.

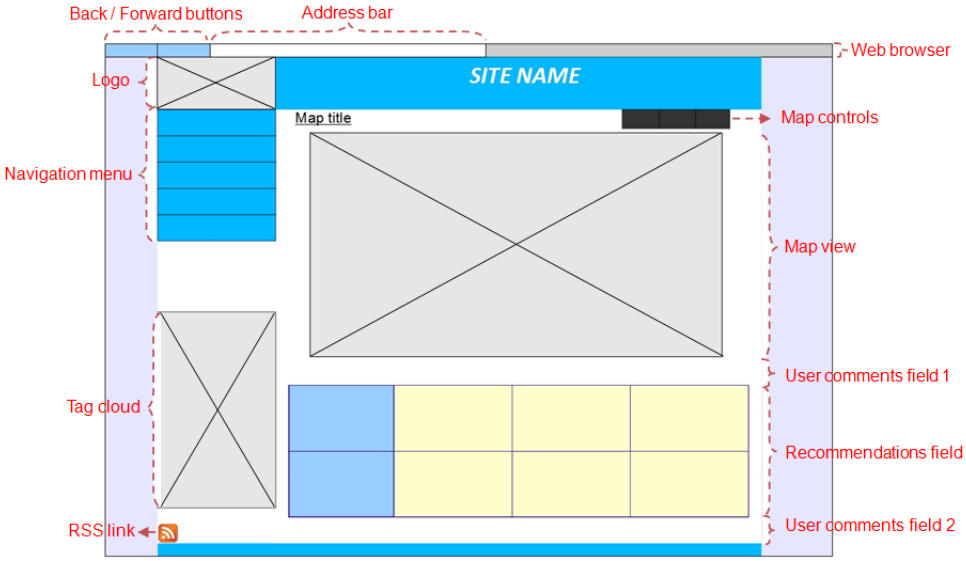



**Figure 1.** The general appearance of the prototype.

There are two *user comments fields* below the map view. These fields contain comments done by other users (virtual as well) and a field for test persons to write their comments. The user comment field-1 is between recommendations and the map view and the user comment field-2 is under the recommendations. There are two user comments fields to understand whether the positions of comments and recommendations play a role in users' decisions or not. In order to evaluate this, there were different interfaces prepared for different tasks. In some interfaces, the user comment field is above the recommendations field and in some below.

## 3.2. Application of the test

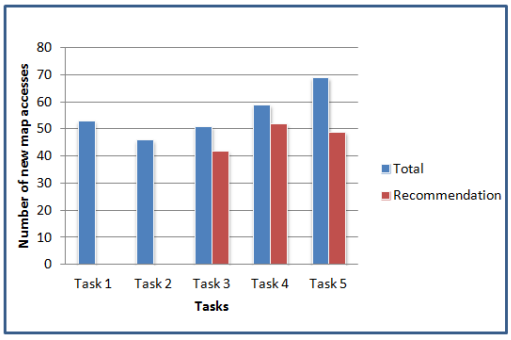
30 test persons (15f/15m) took part in this testing with an average age of 25.4. Each test person had to complete five tasks within different interfaces. Each task consisted of two parts: In first parts, test persons were asked to find a certain map and in second parts, they were left free to access as many further maps as they wanted. After completion of the tasks by using the

prototype, users were also asked to fill out a questionnaire. It consisted of questions about the map recommendations and the user comments in the prototype. Test persons were asked if these functions attracted their attention and if they used them, how they rate their usefulness and which one attracted their attention more etc.

# 4. Results

## 4.1. Usage of map recommendations

In order to understand the usage of map recommendations, all test persons' behaviors are taken into account during the completion of second parts of the tasks. As mentioned before, interfaces included different contents and map recommendations were contained in interfaces which were used for 3rd, 4th and 5th tasks. For each task, the total number of map accesses and the portion of recommendations for these accesses are shown below in *Chart 1*. It is seen that the usage of map recommendations was 79.89% of all further map accesses when 3rd, 4th and 5th tasks results are combined. In the questionnaire, test persons were asked how they rate the helpfulness of the map recommendations and their answers for this question can be seen below in *Chart 2*.



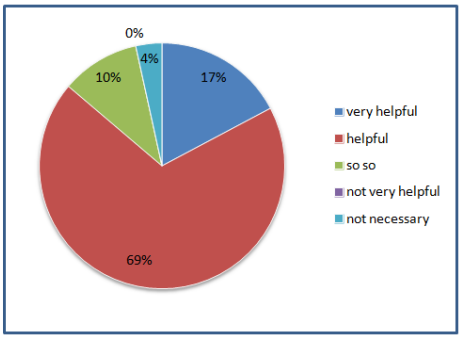



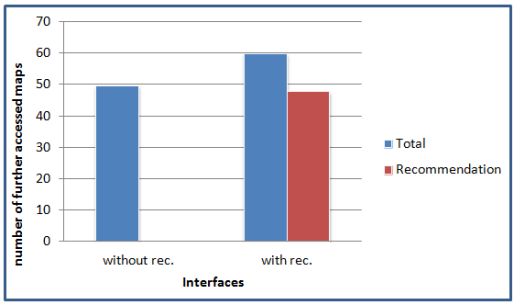

**Chart 1.** Usage of map recommendations. **Chart 2.** Test persons' ratings about the helpfulness of the map recommendations.

## 4.2. Increase in spent time

In order to compare the periods of time users spent on the online atlas, the average of the total number of new map accesses in Task 1 and 2 (interfaces without map recommendations) were calculated. Additionally, the average of the total number of new map accesses in Task 3, 4 and 5 (interfaces with map recommendations) were calculated as well as the average of the usage of recommendations in these tasks. The average number of new map ac-

cesses in interfaces with and without recommendations can be seen below in *Chart 3*. After comparing these averages, it is seen that test persons accessed 20.54% more maps in an interface with map recommendations than an interfaces without them.

On the other side, test persons were asked if they think the recommendations led them to look at more maps than they thought before. Their answers are shown below in *Chart 4*.



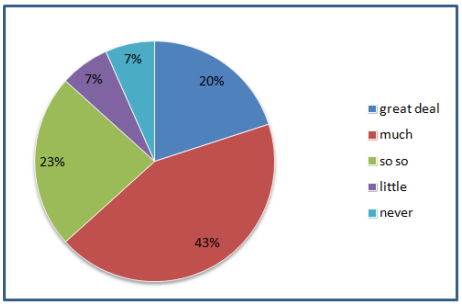
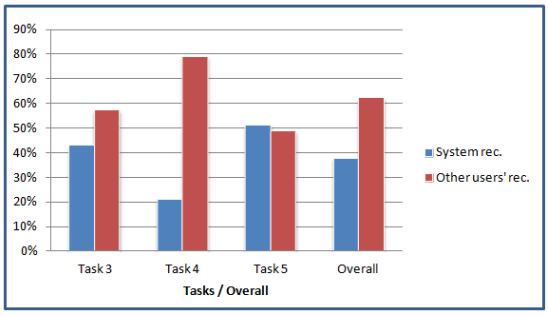




**Chart 3.** Average number of new map accesses in interfaces with and without recommendations. **Chart 4.** Test persons' opinions about increase in map visits.

## 4.3. Preference between different types of recommendations

In order to understand if users would have a preference between two types of recommendations, their usage is compared. This comparison was done by counting the number of usage of these two types of recommendations separately for accessing new maps. This counting was carried out for each task and for all test persons. The results are as shown below in *Chart 5*. Overall results indicate that 62.24% of the selected recommendations were the ones prepared according to other users' activities and 37.76% according to editor's advices. Test persons' preferences during the test between these two types of recommendations were asked in the questionnaire and answers are shown below in *Chart 6*.



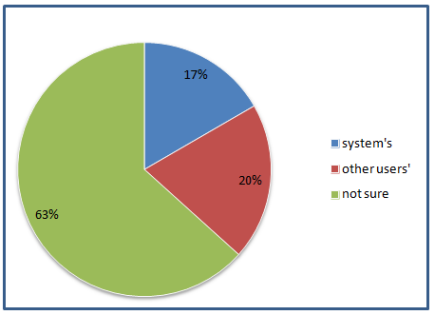



**Chart 5.** Usage of different types of recommendations. **Chart 6.** Test persons' map recommendation choices.

The qualitative information gained from the questionnaire clarifies the indecision of test persons about their preference. Some of the test persons mentioned that they did not pay attention on whose recommendation it is, but selected maps which they found more interesting than others. Other test persons also said they did not even realize that they were different types of recommendations and they just selected one out of six recommendations below the map view.

## 4.4. Impact of other users' comments

During the analysis, it was aimed to reveal the impacts of other users' comments on users' behaviors and users' tendency to write comments in an online atlas. Interfaces with the tool "user comments" were used for Task 2, 4 and 5. In each task, the position of user comments was different so to see if it has any effects on users' behaviors.

Deciding whether user comments changed test persons behavior or not was done in two ways: observing if they clicked the highlighted link for a new map in another user's comment or in case they did not clicked the link but accessed that map on their own, by asking their reason for this access during the test. During the test, it was clear that some users accessed the map mentioned in the other user's comment because of the comment, but not by using the link in the comment. For such cases, these test persons were also considered to be impacted by other users' comments.

In *task 2*, where user comments were positioned below the map view and there were no map recommendations, 8 (26.67%) of 30 test persons were impacted by other users' comments and changed their behavior according to these comments. In *task 4*, where user comments were positioned below the map view and between the map view and map recommendations, 5 (16.67%) of 30 test persons were impacted by other users' comments and changed their behavior according to these comments. In *task 5*, where user comments were at the bottom, below the map recommendations, none of the test persons were impacted by other users' comments.

In the questionnaire, test persons were asked if they think that other users' comments had an impact on them during the test and their opinions about that are presented in *Chart 7*.

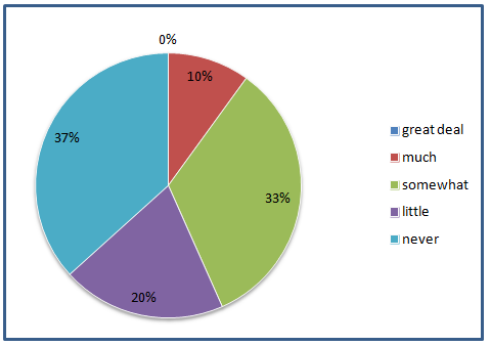



**Chart 7.** Test persons' opinion about the impacts of other users' comments.

2 of 30 test persons wanted to write comments and one of them actually wrote a comment. The other test person stopped writing the comment because of a phone call while writing and then continued completing other tasks. Reasons of that low tendency to write comments can be gained from the answers obtained from the questionnaire where many of the test persons said they did not know/notice that they could write comments. Some of the test persons also mentioned that they were concentrated on tasks and did not want to lose time by writing comments although there was no time limit.

## 4.5. Results about blog, tag cloud and RSS feed

It was observed that 17 (56.67%) of 30 test persons used the tag cloud tool at least once during the test. In these cases, the frequency of using this function varied from 1 to 10 per person.

12 (40%) of 30 test persons checked the blog page. What test persons did there was very different. Some of them only wanted to check what it is, some of them were interested in user comments in blogs, some of them clicked map links in blogs etc.

4 (13.34%) of 30 test persons clicked the RSS feed link but none of them clicked the option "subscribe" on the next page.

## 5. Conclusion

This research's focus is to evaluate the suitability of Web 2.0 technologies for online atlas access interfaces. Recommendations and user comments are the major Web 2.0 technologies whose suitability is evaluated. A usability testing with test persons was carried out for this evaluation and the results were presented. In addition to recommendations and user comments, the suitability of Tag cloud, Blog and RSS feeds was also observed within this empirical evaluation.

According to the results of the empirical evaluation of this research, it is seen that the usage rate of map recommendations is high and they increase users' spent time in an online atlas. Test persons' opinions (gained from the questionnaire) support this claim as well.

Test persons' overall activities in usability testing support the claim: Users prefer recommendations according to other users' activities over recommendations according to editor's advices. However, their activities in different tasks show that they actually do not have a significant preference between these two recommendations types. Their opinions also demonstrate that they are not sure which one of these recommendations they used the most.

It is observed that the test persons do not tend much to write comments in an online atlas. Nevertheless, other users' comments attract their attention and have an impact on their behaviors. In addition to that, the position of the user comments field is very important regarding its attraction for users; it is best when the comment is positioned below the map view.

Tag cloud and Blog are also useful opportunities of Web 2.0 technologies which are often used by users and can be included in an online atlas whereas RSS feed does not seem to be particularly interesting for users.

## 6. Discussion and further research

After the analysis of the usability testing, it is seen that there are some points which could have been prepared better. One of them is the design of the recommendations field in the online atlas interface. Visually, both recommendation types were the same in the test interfaces. This can also be a

reason for why users feel unsure about their preferences between the types of recommendations and select any map recommendation from the recommendations field. Within an interface where different recommendations types are visually recognizable, users could become more aware of their opinion in terms of whose recommendations they prefer.

Additionally, test persons mentioned that they did not know or notice that they could write comments although they were informed about that before the test. In order to eliminate this lack of knowledge, the opportunity of writing comments could have been underlined before the test. The design of fields for user comments could have been prepared in a similar way to existing websites so to improve their noticeability.

Using a prototype running on PDFs in testing possibly slightly decreased the sense of reality for users. A prototype running on a Web browser could have been more beneficial and could have increased the usage of some tools in the online atlas interface.

Within this research, it is observed that recommendations and user's comments are promising opportunities of Web 2.0 technologies for an online atlas. In order to get more precise results for each of these tools, a similar usability test can be carried out with improved visual interfaces and a separate examination of each of these tools in the future.

Carrying out this test on the Internet can be more beneficial, especially in a case where these tools are included in an existing online atlas. Such a test could be presented to actual registered users of an online atlas on the homepage as "*Test version*" and they could be asked to try it. Testing with actual registered users of an online atlas, interest in Blog and RSS feed can also be expected to be higher.

Apart from that, some other techniques can also be used in testing such as eye tracking method, which can give efficient feedback by analyzing users' behaviors and visual effects of interfaces.

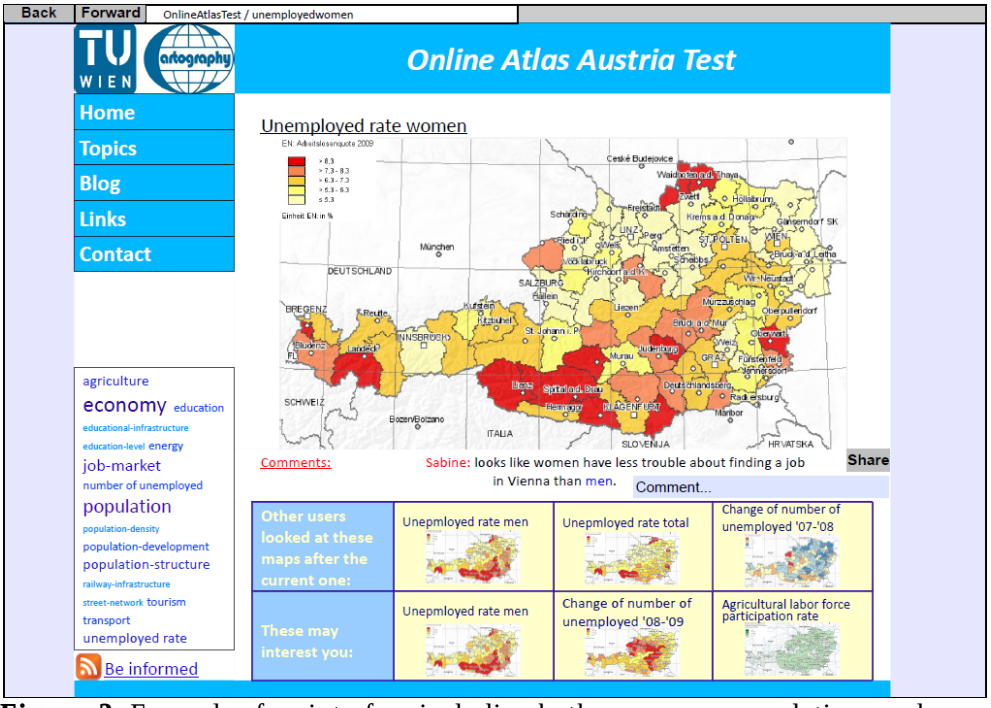



**Figure 2.** Example of an interface including both map recommendations and user comments (Map is taken from ÖROK Atlas website).

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