# Usability Analysis of Agricultural Portal eAGRI in Terms of the General Public

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## Abstract

Nowadays simple usability is one of the key tasks of web portals, especially if these are main information portals of the government. The aim of this paper is to evaluate the usability of a web portal eAGRI (eagri.cz) in terms of unregistered users. This means in terms of general public in particular. The main purpose of the testing is to highlight the issues that users may encounter on this portal and determine the level of portal usability. Our usability testing was focused on a public part of the portal. The main idea of eAGRI portal is to create a central access point to information resources of the Ministry of Agriculture of the Czech Republic and its subordinate organizations. Qualitative research methods were applied. Specifically, we used Heuristic evaluation as a usability inspection method and three methods of usability testing: 5 second test, 30 second test and Formalized think-aloud test.

## Keywords

Usability analysis, eAGRI portal, heuristic evaluation, user testing, 5 second test, 30 second test.

## Introduction

Usability deals with an individual's ability to accomplish specific tasks or achieve broader goals while "using" whatever it is the individual is investigating, improving, or designing - including services that do not even involve a "thing" like a doorknob or web page (Reiss, 2012). Matausch et al. (2014) states that the implementation of information that is easy-to-read and easy-to-understand and easy-to-navigate on the Web is crucial to enable the broadest user group to make use of information that is presented on Web pages. Moon Hee Jung (2015) describes that more than before, the design is being tailored to fit end user needs.

Behavior of users on the web changed rapidly during last 20 years. Users are focused on their needs and get easily frustrated if they cannot achieve these needs in simple way and really quickly (Krug, 2006). Users also take impressions and mental models from previous experiences (Page et al., 2012). Credibility of website is important too (Roghanizad, 2015). Several studies have documented that a lack of usability of user interface has an impact on actions of the users (e.g. Cervone, 2005; Tolliver et al., 2005; Clemmensen, 2009).

It is also necessary to assess if the application meets the requirements on user interface, especially in the area of applicability and User Experience of the respective platform. The UX approach is suitable for testing usability of web information sources in agrarian sector and related fields (Šimek et al., 2015).

Usability testing is a technique used in user-centered interaction design to evaluate a product by testing it on users. This can be seen as an irreplaceable usability practice since it gives direct input on how real users use the system. Usability testing usually involves systematic observation under controlled conditions to determine how well people can use the product (Nielsen, 1993).

The aim of this paper is to evaluate the usability of a large web portal eAGRI (eagri.cz) in terms of unregistered users. This means in particular in terms of the general public. The main purpose of the testing is to highlight the issues that users may encounter on this portal and determine the level of portal usability.

## Materials and methods

Our usability testing was focused on a public part

of web portal eAGRI. The main idea of this portal is to create a central access point to information resources of the Ministry of Agriculture of the Czech Republic and its subordinate organizations. Qualitative research methods were applied. Specifically, we used Heuristic evaluation as a usability inspection method and three methods of usability testing: 5second test, 30 second test and Formalized think-aloud test.

### Heuristic evaluation

A heuristic evaluation is a usability inspection method for computer software that helps to identify usability problems in the user interface (UI) design. It specifically involves expert evaluators examining the interface and judging its compliance with recognized usability principles - the "heuristics". Usability inspection is the name for a set of methods where an evaluator inspects a user interface. This is in contrast to usability testing where the usability of the interface is evaluated by testing it on real users (Nielsen and Mack, 1994). The list of heuristics created by Nielsen (1991) was used for evaluation. The evaluation was performed by one evaluator. Ten rules were considered during the evaluation: The rules are summed up in Table 1.

A heuristic evaluation should not replace usability testing. Although the heuristics relate to criteria that affect usability of tested, the issues identified in a heuristic evaluation are different than those found in a usability test (Molich and Nielsen, 1990).

As a complement for Heuristic evaluation, which is usability inspection method, we used three methods of usability testing. Nielsen and Mack (1994) describes usability testing as a technique

used in user-centered interaction design to evaluate a product by testing it on users. This can be seen as an irreplaceable usability practice since it gives direct input on how real users use the system.

### 5 second test

The first usability testing method we used is a first impression test. As the name suggests, the 5-second test involves showing users a single content page for a quick 5 seconds to gather their initial impressions. The reason for five seconds is important because of research studies which demonstrate that website visitors take a very short amount of time, in some cases a fraction of a second, as little as 50 milliseconds, to judge the quality of a website (Lindgaard et al., 2006).

Five seconds may not seem like a lot of time, but users make important judgments in the first moments they visit a common web page. As well as Doncaster (2014), we used this kind of test to ask users whether they know where they are and let them to simply describe what they saw and are able to find on the portal.

### 30 second test

We used 30 second test to enable users to scroll and navigate the home page of the eAGRI portal briefly and get more detailed information about the portal. Then we asked them the same questions after a 5-second test.

### Formalized think-aloud test

Nielsen (1993) indicates this test as the single most valuable usability engineering method. This method is used to gather data in usability testing in product design and development, in psychology

| No. | Description | Recommendation |
|---|---|---|
| 1. | Visibility of system status | provide a feedback of the system in reasonable time |
| 2. | Match between system and the real world | use language familiar to the user, information in a natural and logical order |
| 3. | User control and freedom | help user to deal with mistakes and turns, support undo and redo |
| 4. | Consistency and standards | follow the convention, use consistent styles and actions |
| 5. | Error prevention | eliminate errors and prevent problems, ask for confirmation before complicated tasks |
| 6. | Recognition rather than recall | make options visible, don't force user to remember information about different parts of a dialogue |
| 7. | Flexibility and efficiency of use | system with options for inexperienced and experienced user |
| 8. | Aesthetic and minimalist design | only insert important and relevant information in dialogues |
| 9. | Help users recognize, diagnose, and recover from errors | indicate the problem and suggest a solution |
| 10. | Help and documentation | provide help and documentation with the easy access to information and logical structure |

Source: Nielsen (1991), adapted by author

Table 1: The list of ten heuristic rules.

and a range of social sciences for many years. The think-aloud method was introduced in the usability field by Clayton Lewis (1982). The method has a host of advantages. Most important, it serves as a window on the soul, letting to discover what users really think about the design of the web. In particular, it is possible to hear misconceptions of users which usually turn into actionable redesign recommendations: when users misinterpret design elements, it is necessary to change them. Even better, it is possible to learn why users guess wrong about some parts of the user interface and why they find others easy to use. Being cheap and robust are huge upsides of qualitative methods such as Thinking-aloud method is, but the flip side is that the method does not lend itself to detailed statistics. (Nielsen, 1993). The principle of this method is really simple. Users which are testing the system saddles loud their thoughts on the application while executing a set of tasks. During this test we also observed time consumption of each task. This was evaluated using the following scale:

- 0 = user did not complete the task (> 3 min);
- 1 = user completed the task in a very long time (> 90 sec and ≤ 3 min);
- 2 = user completed the task slowly (> 30 sec and ≤ 90 sec);
- 3 = user task completed quickly (≤ 30 sec).

All observed results were subsequently summarized into the table (Table 2).

**Process**

Our user testing was attended by a total of 5 users (testers), four men and one woman. 3 users were aged 20-30 years, two aged 30-40. Neither of the users had previous experience with eagri.cz web portal. Testing was conducted individually with sufficient time allotment. So users could not being stressed by performance of others. Therefore the age diversity also had no significance. Possible stress factors which indicates Sonderegger et al. (2016) were thus been eliminated. Users also did not know that their assessment will be marked as invalid, when using more than three minutes on a task or even how their testing is going to be evaluated. The Heuristic evaluation was performed by one expert evaluator. All users used the same PC with MS Windows 7 operating system, Google Chrome web browser and 1920x1080 pixel screen resolution. After completion of the whole testing, we conducted a group sessions with all testing participants, so all the users and usability expert. The aim of the session was to summarize the findings and feelings of testing and the eAGRI portal as a whole.

Nielsen and Landauer (1993) and Krug (2006) both discuss the benefits of testing with a smaller number of users. Nielsen and Landauer (1993) show that testing with five users should find approximately 85 percent of the problems, and that testing with 15 users should find 100 percent of the problems. Generally, it is more Website redesign with a usability consultant cost-effective to test fewer people and have more tests than to test a lot of people just once (Krug, 2006; Nielsen and Landauer, 1993).

About 80%, of usability issues are observed with the first five participants (Lewis, 1994; Nielsen and Landauer, 1993; Virzi, 1992). One of the most important ways to figure out how many participants are needed in a usability test is to measure $p$, or the probability of a usability issue being detected by a single test participant – Probability of detection. It's important to note that this p is different from the $p\ value$ used in statistical tests of significance. The probabilities vary from study to study, but they tend to average around 0.3, or 30% (Tullis and Albert, 2013).

Virzi (1992) outlined a Predicted probability formula $1-(1-p)^n$ where $p$ means the probability of detecting a given problem and $n$ refers to the sample size.

Number of usability problems found in a usability test with n users by Nielsen and Landauer, (1993) is adapting the formula of Virzi (1992):

Problems found = $N\ (1-(1-L)^n)$

where $N$ is the total number of usability problems in the design and L is the proportion of usability problems discovered while testing a single user. In a seminal paper, Nielsen and Landauer (1993) found an average probability of 31% based on 11 different studies. This basically means that with each participant, about 31% of the usability problems are being observed.

Figure 1 shows how many issues are observed as a function of the number of participants when the probability of detection is 30%. After the first participant test, 30% of the problems are detected, but the difference between zero and even a little bit of data is astounding. The second user does some of the same things as the first user, so there is some overlap in findings, but the second user adds some amount of new insight, but not nearly as much as the first user did. The third user does many things that was already observed
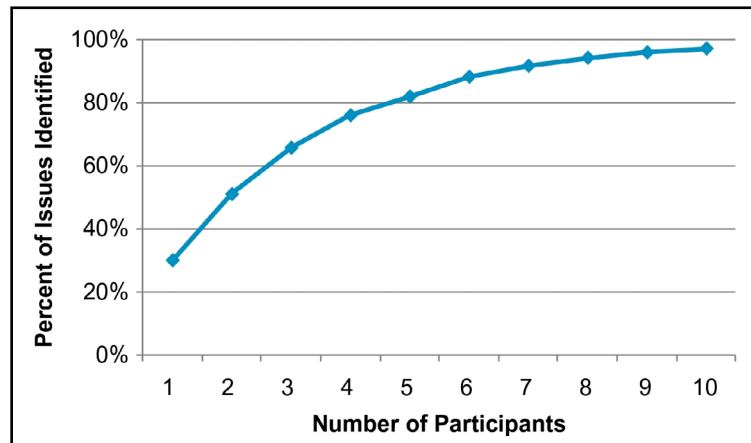
Source: Tullis and Albert (2013)

Figure 1: Example showing how many users are required to observe the total number
of issues in a usability study, given a probability of detection.

with the first user or with the second user and even some things that have been already seen twice. Plus, of course, the third user will generate a small amount of new data, even if not as much as the first and the second user did. After the third participant, about 66% of the problems are observed. After the fifth participant, about 83% of the problems have been identified. Many web usability professionals only test with five or six participants during an iterative design process. In this situation, it is relatively uncommon to test with more than a dozen, with a few exceptions. If the scope of the product is particularly large or if there are distinctly different audiences, then a strong case can be made for testing with more than five participants (Nielsen and Landauer, 1993; Tullis and Albert, 2013).

## Results and discussion

In our study, we focused on testing of first impressions of users who have no previous experience with eAGRI portal. Furthermore, we conducted user centered usability testing in terms of a few simple tasks. As part of the testing there was conducted an evaluation by the expert evaluator who evaluated the portal in terms of unregistered and unknowing users. Results of applied testing methods are shown below.

### Heuristic evaluation

Because of the eAGRI portal size a large percentage of users might use the search option. Search results are clear and well organized. There is an option to change the number of results on page, but it is limited to 3 variants – 10, 20 and 50. Links to next pages are on the top and on bottom of a page. On the other hand search results also include

breadcrumbs navigation, title of paper and a short excerpt from the article. That make list of results unclear.

An option for language change is placed on the top of page. Icons of flags are missing. This is only cosmetic problem, but fixing it would help users find this option easily. But the fundamental problem is that after the transition to the English version, the portal does not show the same or at least about the same translated content. Rather the web of the Ministry of Agriculture is displayed, but in the Czech version, this web is only sub-portal of the main eAGRI portal. By the language change the user is also moved to the inner part of the portal, but the user is not able to realize it.

Inexperienced users should have a problem finding the category they are looking for by "eAGRI guidepost". The "eAGRI guidepost" represents a major problem in usability of this portal. It is going to be major problem not only for inexperienced users but also for regular users when they try to find something new or returning after an extended period.

Feedback of the system and undo and redo functions are supplied by internet browser. The portal does not provide any information about redo and undo functions. eAGRI portal supports feedback by changing the style of the activated links.

The main page of the eAGRI portal includes specific on page areas - boxes with contact information how to reach the Czech Ministry of Agriculture and how to connect it on the social networks, news and actions, etc. This information are visible only on the main page, but most of the user never visit the main page. On the other hand this kind of information should be achievable on the Ministry

sub-portal, but there is none. From this perspective, it is not clear whether the eAGRI portal is the web portal about Czech Ministry of Agriculture or complex portal of agricultural sector of the Czech Republic. These two lines of information are still blending each other on the main portal and also on sub-portals, but it is not clear where that belongs and where it is headed.

Language used on the portal is easily comprehensible considering the thematic focus. Texts in links, in menus and in the header are short and fitting. eAGRI portal provides an error page with information in Czech and English language and with help to user of how to recover from a mistake. There are options – "go back", "try the search page" or contact administrator. The portal has a site map to help users in orientation on the portal, but it is placed on the bottom of page only, so many users will not find it.

Logo of the eAGRI portal becomes smaller after accessing the page of resort organization or section of the sub-portal included in the "eAGRI guidepost" and a new link is added in the header. Color and background picture of the header is changing as well.

The eAGRI portal uses breadcrumb navigation.. It is placed between the header of the page and the menu and the main part of a page and it is used on each level of navigation, but there are serious problems in the navigation and structure of eAGRI portal itself. E.g. complete database of employees of Czech Ministry of Agriculture and agendas of other resort organizations are included in the portal. This amount of information and pages has impact on the navigation. Constant changes in the layout for different parts of the portal make work with the portal and looking for information very difficult. User must remember the complete way of how to reach the information they are looking for.

### 5 second test

Before the first view of eagri.cz web site users did not even know what site they will test. So, users have the first contact with this web during 5 second test. After a 5 seconds on eagri.cz portal all participants said they noticed the eAGRI logo. Two users said that they are familiar with this abbreviation and they know that it is a portal of the Ministry of Agriculture. Three users who do not know the abbreviation, stated identically that it was probably a website dedicated to healthy eating in schools. The reason is the fact that on the eagri.cz alternates several different images with news within

the main banner and this images are exchanged just after 5 seconds. Therefore users were able to see just the first image with the information: "The Ministry of Agriculture project "Honey breakfast" this year involved 40schools." In addition, the image showed girlish face at breakfast.

Consequently, users noticed photo of Marian Jurečka. Two users correctly identified man in the photo as Minister of Agriculture. But three users considered him as Secretary of State, because this information is presented on the website next to the minister photo.



Source: **http://eagri.cz** (November 2016)

Figure 2: Screenshot of the website – part with the image of minister.

### 30 second test

After 30 seconds, which the participants were able to spend on portal pages, they all stated that the portal is called eAGRI and focuses on the complex issues of agriculture and the most likely this web site is managed by the Ministry of Agriculture of Czech Republic. Within these 30 seconds, only two users clicked through to another portal web pages. Specifically, there were "Contacts" web page where user verified who manages this portal. In the second case it was a web page "About the portal" where the second user tried to find the same information like the first one, but this user chose the preferable solution which is in addition essentially hidden in the footer.

After completing the 30 second tests, users were asked whether they have previous knowledge of the tested portal. All responded negatively.

### Formalized think-aloud test

As a part of this testing we presented to each user 7 tasks they had to fulfill. During the addressing these challenges users described aloud their activities

and feelings. The scenario in the form of individual tasks and most distinctive findings of users is described below.

### Task 1

You have to attend a business meeting at the Ministry of Agriculture. But you are unsure where the Ministry is housed. So, you use web Search Engine with "MZE address" keyword and you follow the link to web site eagri.cz. Are you able to find specific address of Ministry of Agriculture on this web?

*Result:*

Most users quickly and easily clicked in the main menu on "Contacts" menu item where they found the address of the Ministry of Agriculture. Among other findings, in the list with the address, there is also mentioned www address of the ministry which is eagri.cz. Only one user has solved this task in 42 seconds. The reason was the fact that the user scrolled down on the web page slightly and was unable to see the top menu.

### Task 2

You are a resident of Prague 6 - Suchdol. On land adjacent to you, there was a significant fertilization applied. The smell bothers you and you have decided to find a number, and the owner of the land, so you can complain at the municipal office. This is the land among the streets "Kamýcká", "Dvorská" and "Na Parcelách". Can you find detailed information on these lands, or at least their numbers, at the eAGRI portal?

*Result:*

None of the users was able to solve this task in 3 minutes. Three users gave up this task after about 6 minutes. Two users were able to find this information after the 7 and 11 minutes. The reason is the fact that the general public does not know the term LPIS. Both users who fulfilled this task were able to find proper information in complicated way by internal search of the portal.

### Task 3

You are looking for internship at the Ministry of Agriculture. What internships Ministry of Agriculture currently offers?

*Result:*

Two users were unable to find this information in 3 minutes and were frustrated. Another two users found this information by clicking the portal navigation on the edge of the time limit. The last user managed this task in about a minute. After several

failures he used internal search with keywords "MZE internships". The user clicked subsequently on the first search result, but that has concerned the evaluation of research program and was wrong. The user used the "Back" button of the web browser and subsequently clicked on the fourth search result that has finally led to the desired information.

### Task 4

You would like to find a general report on the state of agriculture in the year 2015. Can you find it?

*Result:*

One user was not able to trace this document within the time limit. It was a user who frequently used internal search of the portal during testing. In this case the user was unable to find proper keyword which may lead to the needed information. This user was really upset by this situation and gave up the task after 7 minutes. Other users found the information at the edge of time. One user managed the task under 90 seconds.

### Task 5

As an enthusiast of Agriculture you would like to be regularly informed about the news. You decide to subscribe the newsletter of eAGRI portal. Where you can subscribe the newsletter? If there is an alternative to this action, how it can be realized?

*Result:*

Two users were unable to solve this task. The reason is the fact that to simply subscribe to the newsletter of eAGRI portal is not possible. The other three users know the RSS technology which is offered by the portal and can be used as an alternative to the newsletter subscription.

### Task 6

You represent a company that would like to participate in the public tender for the implementation of the Nitrates Directive. Where you can find detailed information about this public contract?

*Result:*

Only one user was able to find this information in 3 minutes. The main problem of navigation was the fact that most users clicked on the top menu at the "Public Procurement" and then click on the menu on the left hand side of the portal. But in this manner users got constantly into blind alleys. Only one user noticed that the link to the Public procurement system is included in the main content of the portal web page within the text about the Contracting entity profile. This

link is therefore really hidden.

*Task 7*

In television news you saw a brief information about the changes in Ministry of Agriculture approach to the issue of Property settlement with the churches. You decide to trace the detailed information on the eAGRI portal. Can you find this information?

*Result*

One of the users was not able to find this information. Two users found this information fairly quickly using the internal search. Two users clicked gradually through the eAGRI newsletter where they had noticed the menu on the left hand side previously. This menu contains a link named "Property settlement with the churches."

Complete results of testing are illustrated in the Table 2.

To verify that the user testing by 5 users was adequate we need to adapt the formula of Virzi (1992). The aim is to determine how many people are needed for a 90% chance of finding errors. Based on our research, we found that average proportion of task failure is 0.429. Thus our users failed on average in 3/7 tasks. The procedure is as follows:

0.9 (likelihood of error detection) = $1-(1-0,429)^{n}$;

$0.9 = 1-(0.571)^{n}$;

$0.1 = 0.571^{n}$;

$\log(0.1) = n(\log(0.576))$;

$n = \log(0.1) / (\log(0.576))$;

$n = 4.174$.

The result proves that the use of five users for our testing of eAGRI portal is sufficient.

### Group session

During a group discussion all users and the expert who carried out the heuristic analysis, agreed on several findings:

eAGRI portal does not shows to the first coming user what is this web site about. A user have to find this information on his own or understand this information from the context of the portal.

Users not "land" necessarily on the eagri.cz home page, but on any other sub-sites. For that reason they have little chance to realize that they are at the one large and a single portal. The reason is that in a subsequent clicks they may come to a different part of the portal which varies significantly in appearance which is confusing.

Internal search of the eAGRI portal is functional and transparent, but often does not lead to the desired result even if the user frequently changes the keyword of intended phrase.

Usability experts said that "eAGRI guidepost" is very difficult to use and confusing. Users subsequently described their experience when they basically were not use the "eAGRI guidepost". No one could accurately determine the right reason. During solution of test tasks, users have created their own schemes for the use of the portal and "eAGRI guidepost" was not included. This navigation solution is not spontaneously used by users.

The structure of the portal is really complicated and the user, despite the use of breadcrumb navigation, is often lost. Especially, he is not able to remember how he got to the page he is. The most of users are blindly clicking on "Back" button of the web browser or click on the eAGRI logo to reach the home page and start his search again.

## Conclusion

This paper describes the results of a usability study focused on agrarian eAGRI portal. The results show that the usability of the portal in terms of unregistered user, thus the general public, does not reach a sufficient level. Performed Heuristic analysis revealed several weaknesses. Subsequent user testing, especially Formalized think-aloud test method, confirmed this result. The main problem

|  | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 | Task 6 | Task 7 | Proportion |
|---|---|---|---|---|---|---|---|---|
| **User 1** | 3 | 0 | 2 | 0 | 1 | 0 | 1 | 0.429 |
| **User 2** | 3 | 0 | 1 | 2 | 1 | 0 | 0 | 0.429 |
| **User 3** | 3 | 0 | 0 | 1 | 1 | 0 | 2 | 0.429 |
| **User 4** | 2 | 0 | 0 | 1 | 0 | 0 | 2 | 0.571 |
| **User 5** | 3 | 0 | 1 | 1 | 0 | 1 | 1 | 0.286 |
| | | | | | | | **Average proportion** | **0.429** |

Source: Own research

Table 2: Complete results of the Formalized think-aloud test.

is the extensiveness of the portal and hence its complex structure. Placement of information into different segments or sub-segments of the portal that do not have a unified concept is also confusing. Searching for information on the portal is highly complicated. The user is not able to easy navigate the portal and use of internal search, despite the fact it is functional and uncluttered, is often not able to help the user. Based on the think-aloud test results we can indicate the time, what user needs to trace searched information on the portal, as catastrophic. Measured value of modus is 0. Therefore in the largest number of cases the user was unable to find the information in 3 minutes. Value of median is 1. In half of the cases users spent more than 90 seconds searching for information. If the one

of the aims of eAGRI portal is to inform general public about news and issues related to agrarian sector, it will be necessary to apply fundamental changes in the logic of the portal as a whole.

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