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# UNIVERSITY COURSES AS GOODS: HOW TO OPTIMIZE PORTAL INFORMATION ARCHITECTURE USING FACETED SEARCH

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ABSTRACT:
The article deals with the issue of new information architecture for the main section of the Slovak universities' portal. This portal has existed for nine years and is based on traditional portal conventions: a broad structure and many services. Such features alone are insufficient for present-day browsing. These portals and their logic are thus definitely past their time as user behaviour has changed considerably. Two goals were defined in order to advance the concept. First, the information architecture had to be simplified in order to ease the process of locating published information. Second, the information architecture had to be easy to scale as developers were already planning additional expansions to services. The redesign was based on the results of user research. Research involved interviews with six secondary school graduates and open card sorting with further seventeen secondary school graduates. We explored the ways in which students obtained information about their upcoming studies and the manner in which they expected such information to be arranged on a Web site; we also observed the way they used the Web site in real life. This initial user testing confirmed the importance of remodelling the current information architecture as finding the desired information on the current site is quite difficult. The primary issues are: a) a complicated hierarchy that does not match the way in which users locate information; b) some important information is not found where users look for such information; and c) some pages are overloaded by too much information. The hierarchy of the new information architecture places emphasis on the role of searching. Taking a broader, more current perspective, we realised that university studies and shopping online may indeed share many similarities. The selection process demands a reduction in the set of potential results and examining and obtaining detailed information about promising options. Building the information architecture of an academic Web site using faceted search may be a smart way to minimise the number of steps required to access the desired information and to keep the current taxonomy of universities studies intact as well.

KEY WORDS:
higher education, faceted search, information architecture, usability testing

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# Introduction

It has been common knowledge since the end of the 1990s that users visit Web sites to access information and not for some kind of experience.[1] Therefore, Web site quality is largely dictated by how conveniently the user can access such information. The universities' portal (Portal VS) was created in 2005. It was presented to the Ministry of Education the following year (2006). The portal seeks to be the primary source of information for applicants to universities. It is also the gateway to national projects and other information systems such as KEGA, CREPČ and the Electronization of the University Application Process.[2] From the very beginning of cooperation with the Ministry of Education, it has been the only Web site of its kind to integrate these forms of cooperation. This means that the portal has the most up-to-date and official information related to tertiary education. Just like most portals, the Portal VS is composed of a number of sections: University Studies, the KEGA Project, E-Learning, Conferences and Register of University Employees. Other sections are contained in the plan. After ten years of existence, the portal's developers decided that the time had come for a more drastic remodelling of the portal. The optimised information architecture is supposed to be the foundation of the "reconstruction". In this – very early – phase of the project, our work group was contacted with an offer of cooperation. Our role was to remodel the current information architecture of the portal in order to simplify access to published information and to simplify scalability, given plans to expand the portal with additional modules in the future. The article more closely describes the process of optimising the information architecture of the main section of the portal, University Studies. It offers the results of the completed user research and proposes a new model of information architecture based on the principle of faceted search.

# Previous Research

Peter Morville and Louis Rosenfeld covered the issue of information architecture for the Web at the end of the 1990s. According to Morville, information architecture is used to "creation of a consistent and functional system for navigation, graphics, page layout and subtitle language so that users know where to go, what to do and are encouraged to come back."[3] Morville and Rosenfeld consider the primary elements of information architecture to be a) organisational charts used to organise information, b) a nomenclature used to represent information, c) a navigation system for moving between information, and d) searching to locate information.[4] In connection with their work, Gullikson et al. notice the influence information architecture has on Web site usability. They note that users use various routes to achieve their objectives and they prefer different methods for sorting data.[5] This should be reflected in the information architecture. Garret provides two potential ways to construct such architecture. It is possible to employ the "top-down" procedure, where categories are created in accordance with the desired objectives and requirements for Web site functionality, with subsequent grouping into subcategories. In this approach the created architecture provides slots for inserting content. The other approach, when content is available and should be preserved, is the "bottom-up" system. The categories and subcategories are created on the basis of a content audit and functionality requirements. Existing content (the lowest level) is grouped into categories, and these are classified into further (superior) categories, etc.[6]

1 NIELSEN, J.: *User Interface Directions for the Web.* In Communications of the ACM, 1999, Vol. 42, No. 1, p. 65.
2 TÓTHOVÁ, D., FABUŠ, J., MAGÁT, Ľ., DZIVÁK, J.: Portál VŠ – Súčasnosť a budúcnosť. In HAĽKO, P., KARNIŠOVÁ, Z. (eds.): *UNINFOS 2011.* Prešov : University of Prešov, 2011, p. 156.
3 GOTO, K., COTLER, E.: *Web Redesign 2.0: Workflow That Works.* Berkeley : New Riders, 2005, p. 88.
4 MORVILLE, P., ROSENFELD, L.: *Information Architecture for the World Wide Web.* Cambridge, Massachusetts : O'Reilly, 2006, p. 49.
5 GULLIKSON, S. et al.: *The Impact of Information Architecture on Academic Web Site Usability.* In The Electronic Library, 1999, Vol. 17, No. 5, p. 303.
6 GARRETT, J.: *The Elements of User Experience: User-centered Design For the Web and Beyond.* Berkeley : New Riders, 2011, p. 95.



Well-designed information architecture is particularly important for large Web sites, such as portals. Pienaar defines this specific type of Web site as "a Web site that aggregates an array of content and provides a variety of services including search, directories, news, e-mail and chat rooms.",[7] which integrates them rather well with other types of Web sites. Nedeva and Zlatev attempted to summarise the factors influencing the overall quality of portals during work on a university portal. These factors include the facilitation of user experience, the usability of content, as well as the pertinence of information, content accessibility and user interactivity.[8] Morville and Rosenfeld note that portals, along with other types of large Web sites, place demands on navigation. In order to ensure usability and simplicity in locating content, they recommend supplementing the basic types of navigation (global, local and contextual[9]) by using accessory navigation: Web maps, indexes, guides and search. They emphasise that accessory navigation can play a key role in determining if the user gets the desired content or not.[10] The last consideration, search, has increased its importance over the past decade and has undergone a massive shift. Wei et al. identify a number of types of this navigation element:

*a. Simple key word search*
A simple text field is used to enter the key word used for search purposes. The results are shown in a simple list. This approach is used by most Web sites – Google, Yahoo, Bing and many others.

*b. Form-based search (also advanced v.)*
This method works with more complex interfaces, which enables the formulation of more complex queries. Compared to key word searches, the use of a number of fields in this kind of search is much simpler and flexible.

*c. Directory search*
This approach uses a monolithic taxonomy for search navigation purposes, where every data field is assigned to a single category of the monolithic taxonomy (also mono dimensional – see below). This approach is used by some directories such as Yahoo Directory or Open Directory.[11]

Wei et al. in the Survey of Faceted Search focus primarily on the fourth and final type, known as faceted search, which began to be used around 2007. An updating of the perspective of information architecture through adaptation to faceted classification was the prerequisite for its creation. Sacco and Tzitzikas explain that classic mono-dimensional taxonomies operate on a principle that one object belongs to one category. At a maximum, such taxonomies allow for one object to be a part of multiple categories, but they do mandate that such object is to be presented in such a manner that indicates its place in the hierarchy. Conversely, faceted classification, from the beginning, has had the ability for one object to belong to multiple categories with the hierarchy taking on less importance.[12] The combination of faceted classification and search interface has created a completely new method for obtaining information. A more detailed description of how such a system works can be found, for instance, in the work of Peter Morville: "The principle of gradual detection and constructing allows users to formulate sophisticated queries by using small simple steps."[13] In other words, the user provides attributes for the individual categories, or facets, which gradually narrows the specific request for what the client wants to see and thereby reduces the number of displayed results. Faceted search has quickly found uses in e-commerce, where it has become de-facto standard thanks to its clarity, efficiency and learnability. Current research into this area involves the optimisation of user interfaces (UI) and user experience (UX).

7 PIENAAR, H.: *Design and Development of an Academic Portal, International Journal of Libraries and Information Services.* In International Journal of Libraries and Information Services, 2003, Vol. 53, No. 2, p. 122.
8 NEDEVA, V., ZLATEV, Z.: *Quality of the Services Provided by a University Web Portal.* In Artte, 2013, Vol. 1, No. 3, p. 175.
9 MORVILLE, P., ROSENFELD, L.: *Information Architecture for the World Wide Web.* Cambridge, Massachusetts : O'Reilly, 2006, p. 122.
10 MORVILLE, P., ROSENFELD, L.: *Information Architecture for the World Wide Web.* Cambridge, Massachusetts : O'Reilly, 2006, p. 131.
11 WEI, B., LIU, J., ZHENG, Q.: *A Survey of Faceted Search.* In: Journal of Web Engineering, 2013, Vol. 12, No. 1&2, p. 44.
12 SACCO, G., TZITZIKAS, Y. (eds.): *Dynamic Taxonomies and Faceted Search.* New York : Springer, 2009, p. 47.
13 MORVILLE, P.: *Search Patterns: Design for Discovery.* Cambridge, Massachusetts : O'Reilly, 2010, p. 95.

# Defining the Problem

The current information architecture of the Portal VS reflects the trend of horizontal grouping that has been commonly used by portals since the end of the 1990s. In practice, this means that a tremendous amount of information is available in the form of documents located at the same level inside the Web site's structure. Depth only appears when the structure of the Web site copies the taxonomy used in the academic world. Unfortunately, when used this way, such a Web site structure ultimately serves as a detriment, as it complicates the process of achieving the desired outcome. The excessive use of previews that do not contain any real information, but rather a simple list of links that direct the user onward, is also problematic.[14]

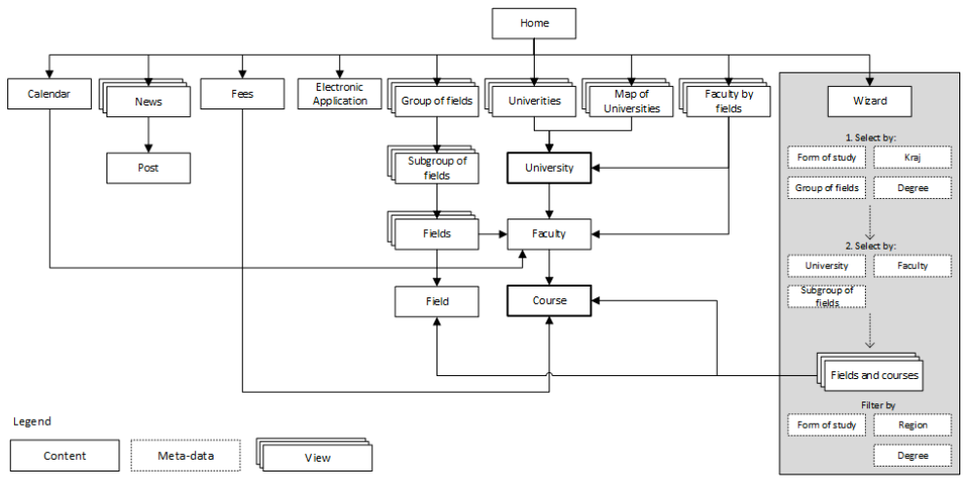


*Figure 1: Original, broadly-branched information architecture of the portal*
*Source: own processing*

While many experts focused on usability and UX say that the three-click rule is a myth since intuitiveness is more important than depth,[15] this case clearly indicates that the system is overly complicated. Students have to take a relatively complicated path to reach the actual study options through the given field of study: Main page > Fields of study (fields of study in individual groups) > List of fields of study in the specific group > Field of study> List of universities > Course. Another problem may be the excessively large number of links on the main page that lead to very similar types of outputs. Too many options complicate the decision making process and are contra-productive. The following objectives have resulted from such fact:

- *Primary objective:* Remodel the portal's information architecture (IA) so that published information is configured in an understandable manner to simplify the process of accessing published information.
- *Secondary objective:* Design an IA that is easily scalable as the planned expansion of the Portal VS includes adding new sections.

The entire process of evaluation and subsequent optimisation is significantly influenced by two factors: a) the relatively large volume of information, and b) the fragmented academic taxonomy, which must be fully preserved. As an illustration: There are approximately 2,700 courses classified into around 370 fields of study available in Slovakia. These are taught at around 40 universities and colleges. Each one of these is organised into faculties or scientific institutions. Some faculties even have their own detached workplaces. A large amount of – more or less important – information exists for all of these types of entities. Many of them can play an important role in defining access to the desired information, e.g. the offices of the faculty or the duration of studies. Such a diverse set of information creates a large number of relations and ways of accessing such information. The faculty's offices may also be a factual detail providing the physical location of the faculty as well as a taxonomical unit, a node through which information can be obtained as to what universities or faculties have offices at the given location. The same can be said about the level of studies, the form of studies, etc. The complexity of this task is based on the contradicting nature of requirements: simplifying access to a large quantity of information while preserving a rather complex taxonomy. This situation therefore raises a number of research questions. They involve habits related to using Web sites and understanding the ways people think about information regarding university studies.

- *RQ1:* What basis do secondary school students use to decide on which universities to send applications to?
- *RQ2:* How do students expect information to be configured?
- *RQ3:* What methods do secondary school students use to try and get the information they are looking for?

# Research Methodology

A combination of multiple methods was used in the creation and optimisation of the information architecture with most of these methods applied from the field of qualitative research. The most commonly used methods include sorting cards (several types), discussions and usability testing.[16] These methods were also used in the article. The investigated sample included seventeen students in their final year of secondary school studies from the Trnava, Trenčín and Prešov Regions. Six of them participated in the individual sessions in Trnava and in Trenčín. The remaining eleven students fulfilled their tasks online. In reality we worked with two samples. Sample 1 comprised all seventeen participants while Sample 2 contained only six participants from the Trenčín and Trnava Regions. This relatively unconventional solution was primarily selected due to the short amount of time available (only a week was available for this phase of the project) and in order to reach the specific group of students in their final year of secondary school studies. One of the advantages was that they attended different schools. The relatively low numbers of participants are completely legitimate, as Nielsen's more distant research determined that card sorting with fifteen participants was efficient thanks to the achievement of a correlation of 0.90. Correlation increased to 0.95 for a sample of thirty participants, and 0.98 for sixty participants, but these – relatively modest – gains require two to four times as many resources.[17] With respect to usability testing, Nielsen calculated that five people would uncover 75 % of errors.[18] Krug thinks that three users are sufficient for ordinary testing and that multiple rounds of testing with three users will be much more successful than a single round with fifteen users.[19] Rosati has a similar opinion. He notes that sample size depends greatly on the purpose of testing and on the level of inaccuracy we are willing to accept. A sample of up to ten participants, according to Rosati, makes sense if we need to approximately determine the primary errors in a Web site, presuming that preliminary testing within an extended Web site design process is involved and will be involved subsequently[20] – which is exactly the case here.

14 Previews, i.e. documents that do not contain any of their own content, are simply used as links to content (e.g. various directories). These are a common component of Web sites, but if there are too many, they slow down the user. They can even end up cycling users between them, hindering progress on achieving the given objective (completing the specific action).
15 Compare: NIELSEN, J.: *Prioritizing Web Usability*. Berkeley : New Riders, 2006, p. 9, p. 322; GARRETT, J.: *The Elements of User Experience: User-centered Design for the Web and Beyond*. Berkeley : New Riders, 2011, p. 96.
16 ROSS, J.: *Comparing User Research Methods for Information Architecture*. [online]. [2015-01-01]. Available at: <http://www.uxmatters.com/mt/archives/2011/06/comparing-user-research-methods-for-information-architecture.php>.
17 NIELSEN, J.: *Card Sorting: How Many Users to Test*. [online]. [2015-01-15]. Available at: <www.nngroup.com/articles/card-sorting-how-many-users-to-test>.
18 NIELSEN, J.: *Why You Only Need to Test with 5 Users*. [online]. [2015-01-01]. Available at: <http://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/>.
19 KRUG, S.: *Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability*. Berkeley : New Riders, 2014, p. 119.
20 TULLIS, T., ALBERT, B.: *Measuring the user experience: collecting, analyzing, and presenting usability metrics*. Amsterdam : Elsevier/Morgan Kaufmann, 2008, p. 17.

Content analysis and page visits were analysed in the first phase. Special software was used to generate a list of all links on the Web site and these were grouped by URL structure. Several links were opened in each group in order to determine the content involved. Average monthly traffic was then analysed using Google Analytics. The result of this phase was used for the next stage of research – open card sorting. This method is an easy way to determine information on the mental models of the target group and how they perceive relationships between individual pieces of information. The respondents were asked to arrange cards referring to Web site content into groups based on how they were related and were asked to name the groups. This method previously involved the use of face-to-face meetings, but the development of Internet technology facilitates its completion using special applications and even online communication. We used this option as well, which allowed us to obtain data from participants from various parts of Slovakia in a very short period of time.

In the next phase we completed a series of individual meetings with participants. These were conducted in empty school classrooms after speaking with school management. At the beginning of every meeting, we explained the purpose of the meeting and asked a number of informal questions to make the respondents more comfortable. We also received their consent to record the meeting. We continued with a structured interview or discussion involving the following topics:

- The way they searched for information about a university
- The key factors in deciding to submit applications to a university
- The arrangement of information on university-level studies
- Expected information and their relevance (which information is key and which is less important)

Card sorting followed once this part of the meeting was completed. The participants from Sample 2 fulfilled the following task online during the session in order to preserve consistency between the results and to simplify the process of evaluating participants. No additional information or specification of the task, with the exception of instruction on the Internet, was provided to ensure both groups had the same standing.

The last portion of the meeting was a short user testing session of the Portal VS Web site. The objective was to determine the first impression users had of the Web site and how people use the site in its current form. The respondents were assigned three simple tasks:

- Determine the date of the entrance exams for the specific university (we assigned the name of a school with a similar scope of activities as of interest to the users).
- Determine if the school you want to attend has an open house day. If so, when?
- Open the electronic application form for the university; you do not have to complete the form.

Respondents were then supposed to provide verbal commentary on the completion of each task. We did not interfere in the completion of the tasks. We took notes the entire time and recorded everything on a tape recorder to allow us to review the sessions later.

# Results

Analysis of the discussions showed that external references play a tremendous role in the decision making of secondary school students when selecting a university. They very much respect the choices of their classmates or older friends who are already studying. Many of the participants' responses directly (2) and indirectly (2) made note of the quality of universities. Some of them (2) for instance expressed a desire to study at a Czech university as they perceived Czech universities to be higher quality. Most respondents answered affirmatively to the question of if the ratings provided for every university helped them make their decision. Some (2) doubted the credibility of the rating. A portion of the participants (3) expressed the desire to find information on preparations for the entrance exams such as literature that had to be studied or courses organised by the university. Another interesting suggestion from one participant was that the portal was lacking information for applicants without entrance exams, which, given everything else, may be interesting for a specific group of students: "Just in case. If they [medical school] don't accept me."



The results of the second, open card sorting technique were subjected to term cluster analysis. The output from this process has the shape of a tree that expresses the proximity of the individual terms (Figure 2). A more exact expression of the relations between terms is expressed by the matrix of similarity (Table 1). A higher number indicates a stronger connection between two terms. As is clear, participants most often associated courses and fields (index 78 or 61). A high level of similarity was exhibited by Form of study and Course (index 70), Faculty and Field (index 61), Application deadlines and Electronic application (index 61), Course and Strand of study (index 61) and Professor ranking and Alumni reviews. This means that the given terms should be close to one another according to the participants.

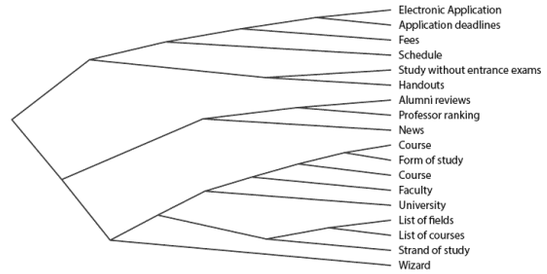


*Figure 2: Results of cluster analysis*

*Source: own research*

*Table 1: Matrix of similarity of terms*

| | Electronic application | Application deadlines | Fees | Schedule | Study without entrance exams | Handouts | Alumni reviews | Professor ranking | News | Course | Form of study | Fields | Faculty | University | List of fields | List of courses | Strand of study | Wizard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Electronic application | | 61 | 47 | 25 | 21 | 41 | 21 | 13 | 9 | 9 | 13 | 9 | 17 | 6 | 13 | 13 | 13 | 13 |
| Application deadlines | 61 | | 47 | 36 | 21 | 30 | 9 | 13 | 17 | 6 | 9 | 6 | 9 | 13 | 3 | 3 | 3 | 13 |
| Fees | 47 | 47 | | 17 | 25 | 47 | 17 | 21 | 9 | 17 | 25 | 17 | 17 | 6 | 13 | 13 | 13 | 6 |
| Schedule | 25 | 36 | 17 | | 25 | 21 | 13 | 9 | 25 | 6 | 9 | 6 | 3 | 13 | 13 | 13 | 9 | 17 |
| Study without entrance exams | 21 | 21 | 25 | 25 | | 47 | 9 | 6 | 13 | 3 | 9 | 13 | 17 | 13 | 13 | 6 | 6 | 21 |
| Handouts | 41 | 30 | 47 | 21 | 47 | | 17 | 17 | 3 | 9 | 13 | 13 | 13 | 3 | 13 | 13 | 13 | 9 |
| Alumni reviews | 21 | 9 | 17 | 13 | 9 | 17 | | 61 | 21 | 17 | 13 | 17 | 17 | 9 | 17 | 17 | 17 | 21 |
| Professor ranking | 13 | 13 | 21 | 9 | 6 | 17 | 61 | | 21 | 30 | 25 | 21 | 25 | 17 | 13 | 17 | 17 | 13 |
| News | 9 | 17 | 9 | 25 | 13 | 3 | 21 | 21 | | 6 | 6 | 6 | 9 | 21 | 9 | 9 | 6 | 30 |
| Course | 9 | 6 | 17 | 6 | 3 | 9 | 19 | 30 | 6 | | 70 | 61 | 47 | 41 | 41 | 54 | 61 | 13 |
| Form of study | 13 | 9 | 25 | 9 | 9 | 13 | 13 | 25 | 6 | 70 | | 54 | 41 | 41 | 36 | 47 | 54 | 13 |
| Field | 9 | 6 | 17 | 6 | 13 | 13 | 17 | 21 | 6 | 61 | 54 | | 61 | 36 | 47 | 36 | 54 | 9 |
| Faculty | 17 | 9 | 17 | 3 | 17 | 13 | 17 | 25 | 9 | 47 | 41 | 61 | | 47 | 30 | 21 | 41 | 17 |
| University | 6 | 13 | 6 | 13 | 13 | 3 | 9 | 17 | 21 | 41 | 41 | 36 | 47 | | 17 | 21 | 41 | 36 |
| List of fields | 13 | 3 | 13 | 13 | 13 | 13 | 17 | 13 | 9 | 41 | 36 | 47 | 30 | 17 | | 78 | 47 | 25 |
| List of courses | 13 | 3 | 13 | 13 | 6 | 13 | 17 | 17 | 9 | 54 | 47 | 36 | 21 | 21 | 78 | | 54 | 30 |
| Strand of study | 13 | 3 | 13 | 9 | 6 | 13 | 17 | 17 | 6 | 61 | 54 | 54 | 41 | 41 | 47 | 54 | | 21 |
| Wizard | 13 | 13 | 6 | 17 | 21 | 9 | 21 | 13 | 30 | 13 | 13 | 9 | 17 | 36 | 25 | 30 | 21 | |

*Source: own research*

The sum of values in each row says a lot with respect to the importance of the specific content. If a high index of similarity indicates that specific information should be in close proximity to other information, then a high sum of these indices mean that the given item has a strong relationship to many other items. The more specific types of information we expect near others, the larger the role we assign them. Conversely, low similarity indices speak to the fact that the specific item is not similar to other information or does not need to be published nearby. An item that is only important in the context of a limited number of other items is therefore less important. The highest sum of indices of similarity were clearly Course (491), Form of study (478) and Strand of study (470). The smallest of these were News (220), Schedule (260) and Study without entrance exams (268). These results correspond to the information obtained from the meetings with participants, except for study without entrance exams. At the same time, we can see that information regarding study without entrance exams must be looked at a bit sceptically, as the respondents did not expect that it would have a strong connection to the other information.

The following are the most important findings from this usability testing: With the exception of one respondent, all others considered news on the main page to be unnecessary and counter-productive, making the Web site more difficult to navigate. The list of universities was often cited (6) as a problematic element on the Web site. Large logos, a large number of items (schools) and limited space in the site layout result in a list that is too long, preventing easy navigation on the page. Many participants attempted to simplify the list in different ways. They clicked in an attempt to narrow the number of schools by location (5), or attempted to use the search function (4). The actual logos were perceived in a more negative light by many participants along the lines of: "Jeez, there is so much here!" Another problematic element is the notification link with respect to completing electronic applications to universities. While the Important information link is located just above the University Application button, it is large and red and none of the participants clicked on it. When asked "Why?", participants either answered that they were not sure if they should click on it or they did not notice it. They searched around for a link that would lead them to the electronic application and – consciously or unconsciously – ignored the other links. This experience was confirmed by traffic analysis. The click rates for this link were only 13 % according to Google Analytics. Another finding involved the City category and its importance in terms of information value and navigation. It was shown that City primarily functions as an accessory category. Users clicked on it primarily when they needed to narrow the range of choices. It is noteworthy that the "By city" ink had the highest click rate on the main page of the portal at 19 %. To compare this click rate to the click rates of nearby links: Faculty by field = 15 %, Wizard 3.2 %, Field of study = 6.3 %. Taking into consideration the results from meetings, where it was shown that students did not consider, a priori, within the bounds of cities when selecting universities but rather within the bounds of fields or specific schools, portal users are looking for the most efficient way to access this specific information. The last important finding is that when users (6) want to determine the deadlines for the specific university, they do not click on the calendar link on the main page; rather they go to the profile page of the specific school or faculty as they expect such information to be provided there. The same applies to fees for studies.

# Implementation

The research results clearly show that information architecture of the Web site requires major modifications. It should be simple to use but also respect the involved organisation of university-level studies. This finding seems to be important in spite of the fact that it is desirable to avoid copying the actual taxonomy of university-level studies to ensure quick access to courses; rather, the focus shall be on the manner in which specific categories are merged together or eliminated.

The fundamental problem with taxonomy is resolved using a non-linear method of obtaining information. The first step in achieving this objective is significantly reinforcing the role of search and basing it on the use of autofill capabilities. The users of this type of search will be familiar with this process from using the Google search engine and other services and will clearly understand the principles of its operation. The required phrase should be searched for in quantities a) of the names of universities, b) fields, c) courses, and d) cities. In order for the suggested results to be comprehensive, they should contain complementary meta-data such as city, level of study or school.

The next step in the implementation of a non-linear approach to information should be the implementation of faceted search.

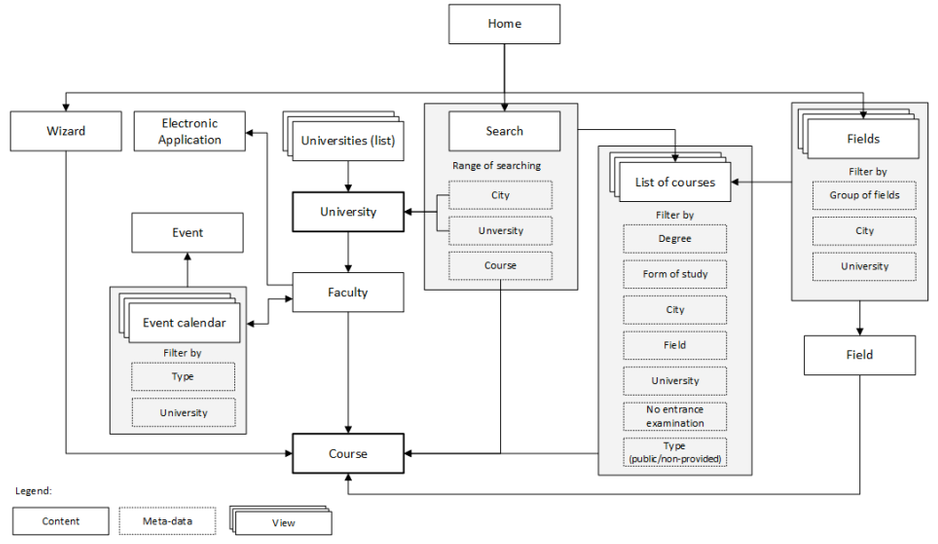


*Figure 3: Proposed information architecture based on faceted search*

*Source: own processing*

The reworked version of the Portal VS infrastructure is illustrated in Figure 3. The manner in which university education is organised remains untouched, but its hierarchy is used much less. It is assumed here that the user will primarily use the search function and filtering of results to locate information. This understandably requires fundamental visual changes in the layout of the main page. This method can be used to decrease the number of steps required to a maximum of four steps, which, in most cases, should actually only require three steps for users: 1) entering a key word, 2) filtering the relevant results, and 3) opening the selected document. The recommended meta-data for clarifying the results should be: Level of study, Form of study, City, Field, University, "Without entrance exams" and Type of school. If needed, this could also include the Sub-group of fields. The search results for the individual courses should also consider complementary meta-data: Type of study, University and City.

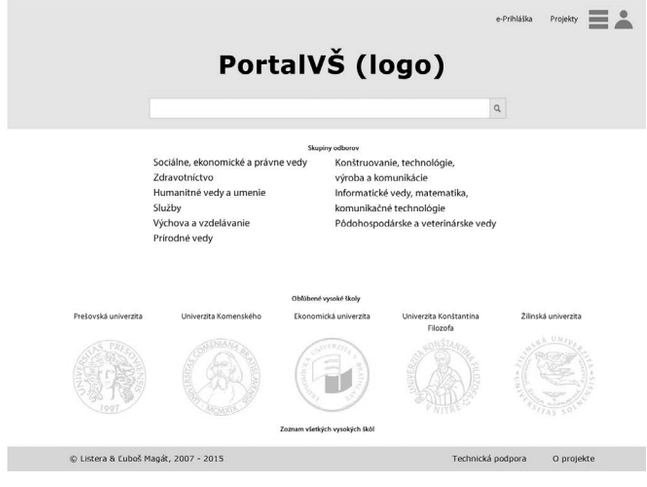


*Figure 4: Wireframe of the portal's remodelled main page*

*Source: own processing*

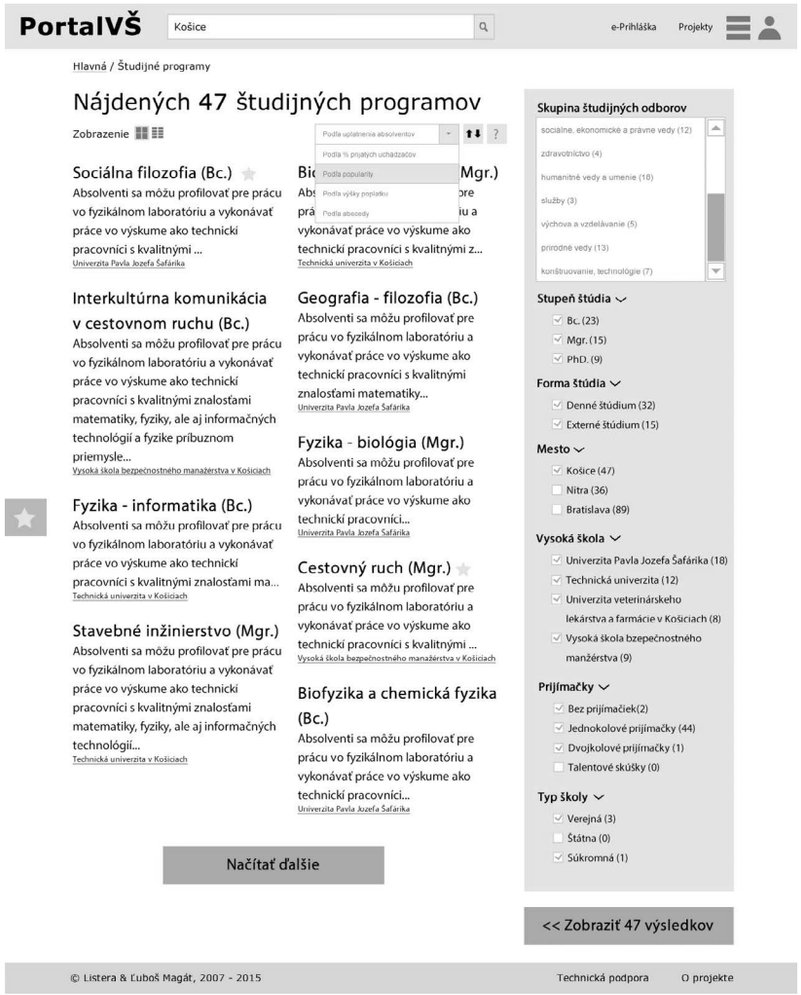


*Figure 5: Wireframe depiction of faceted search results*

*Source: own processing*

The need for changing the concept of the wizard for selecting a university is also logical given these circumstances. The current wizard only works if the applicant has a specific idea related to the focus and form of their studies. Such tool is superfluous – given the fact that the implementation of faceted search using the principle of a gradual narrowing of search criteria is already contained in the basic functionality of the Web site. This wizard simply has to offer more in order to serve any purpose. The discussions with participants indicated that many students did not have an exact idea of what they wanted to study in the autumn term. This would suggest that the wizard could be used as an aid to initially direct students towards those areas that they may want to study. Such a wizard would evaluate the particulars and academic preferences of potential students by considering favourite subjects, activities, ways of thinking, etc. Inspiration could include the tool used on the Czech Jobs.cz jobs portal or the Slovak Emiero.sk Web site.[21]

21 The tool available on Jobs.cz recommends a university based on preferred secondary school subjects while Emiero.sk evaluates work habits using MBTI methodology.



# Conclusion

User research confirms that optimisation of the information architecture of the Portal VS is urgently needed. The current version of the portal is configured in an unwieldy manner. It does not correspond to current habits when searching for information and is based on obsolete principles from the 1990s. Locating the desired information requires a great deal of effort and patience in relative terms. Important information is missed simply because it is located in areas where users would not expect it (e.g. the calendar on the main page). In other cases, the information is formatted in such a way that it is overlooked (information on submitting electronic applications) or information overload hinders this process (list of universities). The research confirmed all of the investigated questions.

- **RQ1:** What basis do secondary school students use to decide on which universities to send applications to?

  Quality and external references are important factors in selecting a university.

- **RQ2:** How do students expect information to be configured?

Students expect that the information will be located on the profile pages of the individual schools. A good example in this case is information on news or fees. Most of the respondents headed to the profile pages with links on the main page in order to get this information. This conclusion is confirmed by Google Analytics statistics, which showed that these links had click rates of less than 1 %.

- **RQ3:** What methods do secondary school students use to try and get the information they are looking for?

Students try and navigate to the profile sites of a university or specific faculty. They click on the City link on the main page to navigate to a list of universities or the Faculty by field to reach a list of individual faculties. The Field link is important for a specific group of students as well.

The proposed solution to the new information architecture shifts the hierarchy to the background and increases the prominence of search. This should be based on two key competencies: a) autofill, and b) faceted search. Such concept should significantly reduce the number of steps needed to obtain the desired information while fully preserving the university taxonomy and facilitating its exploitation to filter results. This is absolutely in line with the requirement to simplify navigation as much as possible, which is a very strong trend and one of the basic prerequisites for Web site usability, including on mobile platforms.

The following recommendations are based on other research results: 1) reconsider continuing the publication of news, as participants consider such news to be unimportant and bothersome; 2) refocus the wizard used to help select a university on a completely different principle; 3) highlight high-quality universities.

From a broader perspective, the results of this user research speaks to the fact that faceted search does not need to be restricted to e-commerce, where it is commonly employed; rather it can also be used to great effect to simplify access to any large set of elements with very different traits and characteristics. The project is currently in the phase of user testing of the functional prototype. The improved version will then proceed to graphically processing and then on the final testing phase of the finished version of the portal.

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