

## **Four Ways of Making Sense: Designing and Implementing Searchling, a Visual Thesaurus-Enhanced Interface for Multilingual Digital Libraries**

Paras Mehta, Faculty of Medicine, University of Alberta  
Amy Stafford, Department of English and Film Studies, University of Alberta  
Matthew Bouchard, Humanities Computing Program, University of Alberta  
Stan Ruecker, Humanities Computing Program, University of Alberta  
Karl Anvik, Humanities Computing Program, University of Alberta  
Ximena Rossello, Department of Art and Design, University of Alberta  
Ali Shiri, School of Library and Information Studies, University of Alberta

Conceived by Karl Anvik, Ali Shiri, and Stan Ruecker at the University of Alberta, Searchling is an experimental visual interface that allows users to leverage a bilingual thesaurus for query formulation and enhancement. The design of Searchling is based on theories of thesaurus-based interface design from Shiri et al. (2002, 2007), combined with the principles of rich-prospect browsing from Ruecker et al. (2003, 2006, 2007). To date, the Searchling prototype has undergone several stages of revision and an initial user evaluation, and the original interface design has been altered significantly as a result (Figure 1).

We are using the development of Searchling as a lens through which to view the process of interface design and implementation. More specifically, we are interested in analyzing the relationships between the contributors to an interface and the way those relationships shape and define the project. We posit that each member of an interface development team can be placed in one of the following four categories: conceptual supervisors, visual communication designers, implementers, and users. Conceptual supervisors (Anvik, Shiri and Ruecker, in our case) are the people who envision the project; they know what they want the interface to be able to do and they are responsible for guiding the other members of the team to ensure that their vision is realized. We believe that it is very important that conceptual supervisors work closely with visual communication designers (like Rossello), who are professionally trained in the art of information design, to help them visualize the interface. Programmers, or implementers (Mehta and Bouchard), are responsible for functionality. They interpret an interface design by writing the code to transform it into a functioning tool. Finally, users (represented by Stafford) need to test the interface and verify that they find it useable.

Each type of contributor is invaluable and the most successful projects will have at least one representative of each category involved throughout implementation. In the case of Searchling, for example, the original designer on the team (Rossello) completed her graduate work and went on to other projects, and was not replaced with another designer. The changes to the original design concept were probably more drastic and far-reaching than they would have been if the designer had stayed involved with the project, or been able to work more closely with the implementers and users in creating the original sketch. The fact that the designer was absent after the initial stages of the project meant that the implementers and conceptual supervisors needed to make many design decisions on their own during implementation, both in terms of realizing the specific attributes of the design, and in creating the behaviors and actions of the interface not visualized in that design. When the implementers came across parts of the interface that they could not implement as rendered, they were unable to consult with a designer and the project therefore moved further away from the original design with each iteration.

Although the project was not able to benefit from more designer-implementer feedback and interaction, Searchling's development was greatly improved by input from users. We conducted two small user studies during development, and both times the users immediately identified problem areas with the interface, which have been adjusted accordingly. The user feedback has therefore played a crucial part in shaping Searchling's latest version, and has not only influenced interface decisions, but has even forced us to consider changes to the original conceptual framework of the project (i.e. whether we want the "Thesaurus" feature to become more explicit or more implicit in future interface development).

Evaluating Searchling's development process has helped us define the optimal conditions for interface implementation. Ideally, implementers would receive a supervisor-approved design from the designer, along with an explicit style guide and behavioral specifications in the form of a screen-by-screen use case. In our case, the designer was only able to provide a single initial sketch of the interface, and the implementers were left to draw what explicit instructions they could from the sketch before looking elsewhere for development guidance. We have outlined below the other sources from which our implementers drew their instructions, the order in which they did so, and the results in terms of Searchling's development.

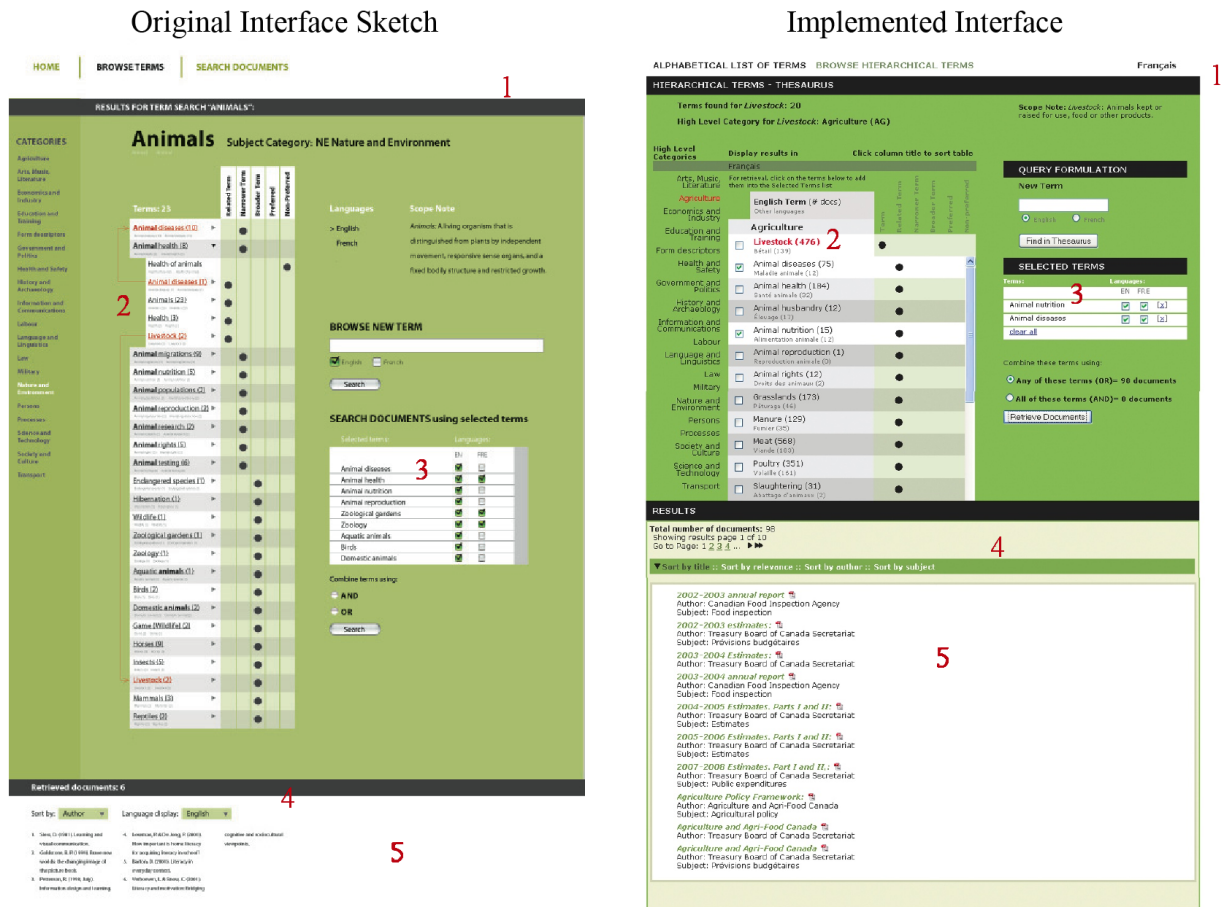


Fig 1. Original sketch of Searchling compared to current Searchling prototype

## 1. Explicit Instructions

The Searchling interface provides the user with three persistent spaces within a single screen: the query space on the right for formulating search statements, the thesaurus space on the left and in the centre for browsing and navigating the thesaurus, and the document space at the bottom for viewing document representations. The general layout (i.e. position of the three spaces on the screen) and color scheme (i.e. green with black borders and red type face for selected terms) of the interface design were explicitly defined in the initial sketch and hence implemented with relatively little clarification. These are the core features of the design, and it is not a coincidence that these are also the only components of the original design that survived to the final version with little or no modification.

## 2. Implicit or Analogous Instructions

In the absence of explicit instructions for a particular element in the interface, implementers will try to draw implicit instructions from what is made explicit by the designer. In this case, the implementers made an attempt to interpret implicit instructions in the thesaurus term table. The numbers in parentheses next to the thesaurus terms are not explicitly defined in the initial sketch, and it is unclear what the numbers refer to. The implementers assumed from the nature of the table (which is thesaurus-centered) that it represents the number of synonyms in the thesaurus for the key term, but in that case the numbers don't appear to be consistent within the table. Upon iterative review of the implementation, we clarified that the number in fact was intended to refer to the number of document results for the key term. Not only was that clarification applied to the implementation, but it also triggered an addition to the design -- the term legend at the top of the chart, which directly ascribes the number in parentheses so that users will not make the same mistaken assumption.

## 3. Supervisors' Instructions

The original sketch of Searchling did not include any behavioral specifications, which means that the implementers had neither explicit nor implicit instructions about how the different spaces of the interface should interact with each other. The selected terms list, for example, needs to respond to the users' selection of terms from the thesaurus list, but it is not even clear that the thesaurus list is selectable in the sketch since there are no checkboxes next to the terms. The implementers also needed to animate the appearance of terms in the selected terms list and provide users with the means to remove individual rows or "clear all" of their selections. All of these tasks were explained and worked out over the course of several direct conversations with the conceptual supervisors.

## 4. Implementers' Choice

In the absence of any kind of instruction, implementers must apply their own judgement to interface development. For example, details about the document space of the interface were intentionally deferred in initial planning stages for various reasons and the sketch of the space was therefore very vague. As the project progressed, time and document set limitations required that the implementers design it from scratch, without input from the supervisors or designer.

## 5. User Input

The user study was invaluable in helping us refine the interface. The users' suggestions for the document space were particularly helpful; this was probably the most neglected section of the interface but the users reminded us that to them, it is the most crucial part of a search tool since they need to be able to quickly and efficiently evaluate their results. Thanks to user feedback, the area is now visually connected to the rest of the interface and behaves in a manner that users find more familiar and easy to use.

Although the development process for Searchling was often less than optimal, the experience has helped us formulate a strategy for interface implementation. It has also helped us analyze and evaluate the role of each contributor in the implementation process. It is clear that collaborative decision-making and feedback throughout the process between conceptual supervisors, designers, implementers and users are the ideal conditions. Obviously, we have also confirmed that having a designer involved at every stage of the process is the best way to preserve a design's continuity. Since we were not always working in such optimal conditions, however, we were also able to examine and define the steps that implementers will take to implement a design if they need to rely on their own interpretations in the absence of explicit instructions. Finally, Searchling's implementation depended to a significant extent on user feedback, which has proven to us that user studies during early stages of interface development have the potential to improve the implementation process dramatically.

## References

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