

Designing an Internet Search Engine on disability issues: results of a survey of the users' information needs

Renzo ANDRICH¹ and Serafino TUTINO

Polo Tecnologico Fondazione Don Carlo Gnocchi Onlus, Milano Italy

Abstract. In the latest years, the Internet has been playing a growing role as information source on disability-related issues. According to the ICF model, access to information is a contextual factor that may act as facilitator in helping the person's functioning in society. In this view, we developed a specialized search engine named Bussola, expanding the possibility for persons with disabilities and their care-givers to find relevant and reliable information, and to better exploit the opportunities provided by the Web. The work involved first a survey of the users' information needs (based on interviews), then the creation of a documents analysis tool based on semantic processing technology, and eventually the development of the search engine.

Keywords. Information needs, Internet, Search Engines.

1. Introduction

The ICF [1] considers disability as a universal human experience that goes far beyond its former 'medical' or 'biological' definitions. According to the ICF model, contextual factors yield significant impact on the person's functioning. Information services that help people find out data and guidance useful to solve their problems, are among such factors. In particular, the ICF contextual factor e560 (Media services, systems and policies) refers to *systems and policies for the provision of mass media communication, including radio, television, newspapers and internet*, highlighting the role of *facilitator* that public access to information and the media access may yield for people.

Nowadays, for many people – including persons with disabilities – the Internet is a major information source in relation to various aspects of life: finding services and resources, getting in touch with people (e-mailing, social networks etc.), accessing knowledge and culture.

A wealth of websites exist in Italy that are specialised on disability issues. Most of them focus on specific topics, such as assistive technology, accessibility, legislation/rights, advocacy; some such sites are very reliable, effective, and successful in terms of audience and user satisfaction. However, no system exists today that allows the user to browse the whole spectrum of topics related to disability within a single search, and to get back the exact information he or she really needs in response to his/her query. Today's mainstream search engines (Google, Yahoo etc...) return a wealth of information, often poorly related to the precise user's need and with no

¹Corresponding Author. Renzo Andrich. Polo Tecnologico, Fondazione Don Carlo Gnocchi Onlus, via Capecelatro 66, 20148, Milano, Italy. E-mail renzo.andrich@siva.it

evidence of reliability. Based on these considerations, the Don Carlo Gnocchi Foundation started a project aimed at developing a search engine specialised in disability issues – named *Bussola* (an Italian term that stands for “Compass”) – able to guide people towards the exact information they need, sorted according to effectiveness and relevance.

2. Method

First, we carried out an investigation on the information needs and the Internet perception of persons with disabilities and their care givers. The findings led to the creation of a list of themes of interest, provided an insight of the personal representation of the proposed search engine, and guided the development of the knowledge base of the search engine.

2.1. Information needs: the interviews

In order to understand in detail the information needs of people with disabilities, a semi-structured interview was designed to capture such needs, to explore the prospective usefulness of such a search engine, and to get a picture of the possible user expectations towards it.

Although some instruments exist to assess needs in this area, such as the Impact on Participation and Autonomy [2] or the Southampton Needs Assessment Questionnaire [3], the interview approach was preferred to capture grass-root experiences from people and get a first idea on how disability knowledge could be clustered round categories.

The interview was administered to 60 people (30 persons with disabilities and care-givers, and 30 health or social care professionals), scattered throughout the Lombardy region. The professionals interviewed included both persons with managerial role in health/social care and persons directly providing care to people with disabilities.

The first result was that all respondents considered *Bussola* useful and interesting. On the basis of a semantic processing of the free answers, we identified the themes they consider most relevant. The category analysis suggests that major interest exists on the topic *rights of people with disabilities*, especially *fiscal benefits*, which many people declare to be hard to find. Major interest was detected also in the categories *Contacts* (links with association, local organization, institutions etc.) and *Health information* (medical examinations, health centres etc.). The full list is shown in Fig. 1.

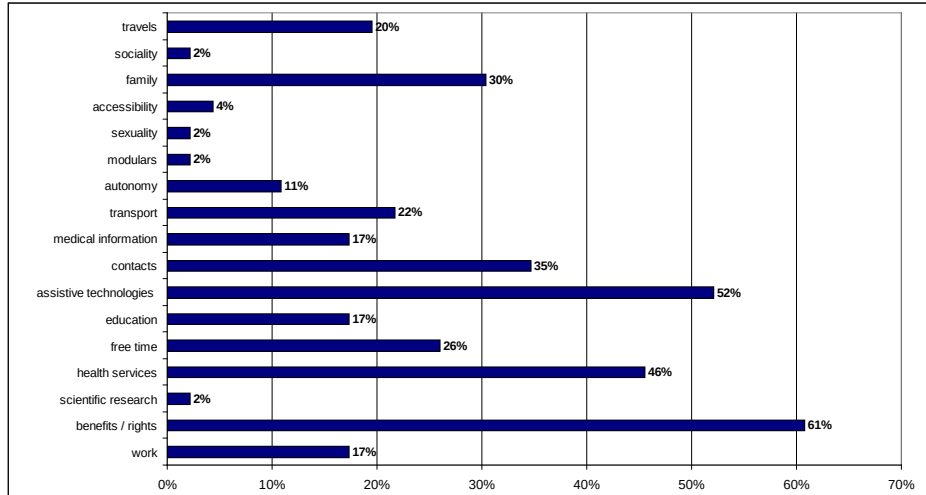


Figure 1. Information needs.

Based on this survey, the α -version of the “Bussola” search engine was developed. Currently it is being further exploited thanks to the suggestions and cues of a sample of persons with disabilities involved in the α -version evaluation. Interactivity was assumed as a key feature of the Bussola engine: the system has been designed in such a way to gradually learn from the users’ experience and thus become more and more instrumental to the users empowerment process. This includes the possibility to find out appropriate social networks or virtual communities, within the perspective that a person with disabilities may prefer to achieve a goal using a personal ability (i.e. finding information on his/her own) rather than depending on others’ ability [4].

2.2. Knowledge base: the semantic network

Based on a survey of the most used web search technologies available on the market, we opted for a semantic analysis technology, able to understand natural language in a similar way as humans do. The chosen software package is COGITO® Semantic Search from Expert System, Modena, Italy. This technology is composed of distinct modules (software), each performing a specific function. Fig. 2 depicts the process we adopted to customize the starting modules (in **bold**) and their functions (in *italic*).

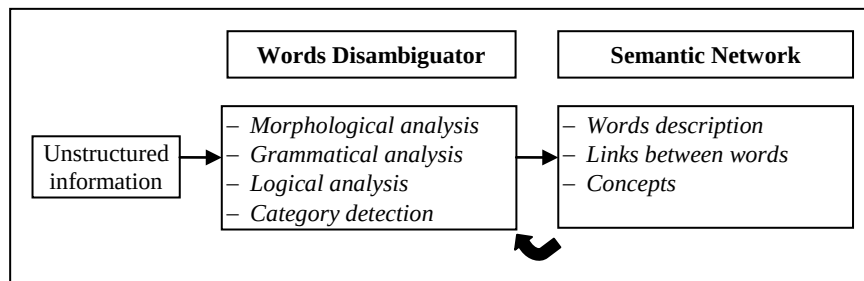


Figure 2. Modules and Function: customization of the semantic analysis technology.

We inserted several documents (such as web and books texts on disability issues) in the Words Disambiguator: the morphological, grammatical and logical analysis produced allows us to capture the meaning assigned to every single text word and the consequent classification of the arguments. This function is made available thanks to its reference to the Semantic Network, a sort of conceptual representation of the language. Here, each word is linked to others in hierarchical way, thus forming a cluster of interconnected networks where each concept is linked to the others by semantic relationships, hierarchically organized. In this way, the Words Disambiguator is able to 1) show what meaning of a polysemic word was assigned in text analysis 2) to highlight words who yield no meaning and 3) to suggest the main concepts included in the document. The customization of the Semantic Networks consisted of fine-tuning some word variables – such as use frequency (of the meaning) or categories to which they may belong – or inserting absent words that are clearly linked with others in the semantic network. After every change, we iteratively re-insert the previous documents until we reach a reliable result.

The web search based on semantic analysis is a big step forward, compared to traditional techniques based on just keywords. For example: entering the words “bus” and “disabled” in a traditional search engine would return only pages where these words are present. Conversely, semantic analysis would return also pages with words as “person with disability” and “transport”, because they belong to the concepts of the initial request.

2.3. Technological approach: building the tags

Documents classification is another function provided by the semantic analysis software. Through the construction of category rules, we assigned tags to the documents selected by the search engine: such tags generate correspondences with the categories we built on the basis of the information needs survey. Category rules are created by means of Boolean operators: each rule assigns each documents to a precise category, seen by the user as a tag at the end of the document.

The selection of the tag at the end of each found document also allows to obtain a new list of documents containing only those with the same tag. In this way it is possible to look up easily all the pages dealing with the category of interest. By following the structured pathways provided by the tags, the user is guided in a simple way to find the information she or he needs.

3. Results

Our work was aimed at creating a search engine able to drive users in finding useful, relevant and reliable information in the Net. Maximising effectiveness in the use of the Internet should be considered an opportunity for greater autonomy for persons with disability, if we define autonomy as “*the ability to enter into relationship with others and together actively participate in the construction of society*” [5].

From a technological viewpoint, the choice to use a semantic analysis system showed effective because it allows to process search-words not only as sequences of characters or keywords, but mainly as conceptual/semantic elements. The documents classification feature also showed important: each document resulting from a search is

marked by a tag – a kind of assigned category which could eventually be used as filter for subsequent selections.

The semantic analysis approach requires continuous tuning of all websites that are gradually identified and indexed, by personnel that knowledgeable in the disability domain. Indeed, each website uses different terms to identify similar concepts: for instance, if “mobility” and “transportation” are sections of two distinct websites which deal with similar concepts, in the sites identification process we need to make them converge into the same category. The creation of a common linguistic code is the key for browsing the whole spectrum of issues, in different sites, within a single search.

Bussola should be considered a search engine which “speaks” the disability language. It is intended as a twofold tool for persons with disabilities, their family members and their care givers: 1) a information gateway able to guide to the solution of individual needs and 2) an interactive way to participate in social life and to share one’s own knowledge with other people within a common project.

In this perspective, we will involve users in improving the *Bussola* α -version (which will be ready in early August 2009), bringing their knowledge and suggestions before the final *Bussola* launch in early 2010.

Concerning possible further exploitation, it would be reasonable to think about other new facilities, such as a FAQs section based on the most frequent questions (captured through interviews and internet browsing), and the possibility to receive alerts containing updated information on selected themes of interest.

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