Enriching trustworthiness of Health Web Pages through the Semantic Web

Arnaud Gaudinat[1], Sarah Cruchet[1], Pravir Chrawdhry[2] and Celia Boyer[1]

[1] Health On the Net Foundation, SIM/HUG, 24 rue Micheli-du-Crest, Geneva, Switzerland

[2]JRC, Ispra, Italia

{arnaud.gaudinat,celia.boyer,sarah.cruchet}@healthonnet.org, pravir.chawdhry@jrc.it

Abstract. The Semantic Web appears to acquire new life thanks to the huge new meta-data more or less structured produced through the help of the collaborative paradigm of the Web 2.0. However, from the experience acquired from Web, particular attention must be paid to the qualitative aspect which could be very variable on the Internet. This aspect is all the more critical from the point of view of the user where the transparency is inversely proportional to the version number of the Web. We present here an experiment to enrich the automatic and manual content based on a simple and well known initiative in the field of the medical Web: the HONcode. The RDF format and Dublin Core were used to formalize this enrichment. While no complete evaluation of this experiment has been provided, this model of Trust is based on thirteen years of tested model for quality of health Web pages and was explored by the project PIPS within the framework of the use of a research tool where the automatic part, called the detector of quality criteria, obtained 76% of average precision.

Keywords: Trust model, health, Web search engine, P3P.

1 Introduction

The Semantic Web (SW) as presented by its initiator Tim Berners-Lee promises to be more structured where information is no more a string of words which can not be used by machines but only by humans. This structuring of the data and thus of knowledge offers enticing prospects concerning the precision for the services of such a system. However, the complexity of the task is such that more than 13 years have passed since the installation of the first principles of the SW by its author, an eternity when compared to the still youthfulness of the Web. Fortunately, during this period, the building blocks of the SW were set up, such as the definition of the RDF (language of the SW), OWL (ontology of the SW) and SPARQL (Query language for RDF).

However data resources are still missing until now. But more recently a breath of life came from the so-called Web 2.0, thanks in particular, to activities of collaborative tagging (Folksonomy) [1] or usage of semi-structured information from wiki (such as DBpedia triples from Wikipedia content), which seemed to give a new colour to the SW by offering a quantitative dimension to these ambitions. However, as in Web 1.0, the problems of quality of information still remain at the level of the SW, with a risk of amplification in a collaborative system with an insufficient control and traceability between the producer and the consumer of information.

Trust and quality are concepts that are difficult to define; Artz [2] gives a rather exhaustive outline of what is trust on the Internet and within the context of the SW. It should be noted that the concept of trust is definable only with difficulty because of a multitude of factors contributing to it; Gil [3] lists more than 19 different factors. In the medical domain, the HONcode, started in 1995 [4,5] is a set of ethical principles defined by the HON Foundation with a consensus of health information editors in order to assess the quality of on-line health information.

HONcode is not the only initiative to address the problem of the quality of health Web pages, Risk [6] and Boyer [7] give an interesting overview of the most important initiatives (such as URAC[8] for U.S, Hi-Ethics, WMA[9] for Spain, etc., see also [10]). Concerning the vocabulary used to describe the quality of health Web pages, the HIDDEL [11] language and the criteria of WebMedQal [12] are the more complete. More recently, the Powder protocol (protocol for description of Web resource) [13] seems to be a very promising language for interoperability purpose thanks to its generic aspect.

Here, we present an operational trust model based on the HONcode activity and results, with original parts such as the automatic generation of P3P policies and an automatic detection of ethical and quality principles. The developed protocol, based on RDF format, has no ambitions of standardization. HIDDEL was too complicated and not adapted to our needs, and Powder didn't exist at the time of the PIPS project. The described approach is only guided by two principles which are followed by HON since the beginning, 1/ keep it as simple as possible and 2/ be operational.

2 Method

2.1 Context

This research was carried out within the framework of the European project PIPS [14]. The ambitious goal of PIPS is to develop and pilot a Health & Life knowledge and service support environment [15]. That means a mobile healthcare service, to deliver patient personalised healthcare services at any time and place, with a real time evaluation of the patient's state. In this project a great effort was taken in relation to the trustworthiness of information and operational services (by using RDF), particularly in the

instantiation of a model of trust as well as for knowledge and internal services of PIPS and information from external sources.

2.2 Trust Model

The model of trust presented in this document is based on the code of conduct, the HONcode. The elements, components and description of this article are as follows:

- A manual certification based on the 8 principles of the HONcode
- An automatic detection of quality standards based on the HONcode
- A reinforcement of the principle of privacy by the automatic generation of P3P policies
- A selection of quality medical resources
- External indicators of selection, such as MedlinePlus[16] or CISMeF[17] (available in the metatag named 'Seal')

2.2.1 Manual Approach

The approach of the Trust model for the SW of medical information suggested in this article is based mainly on the code of conduct, the HONcode, which has been developed and used in the field of health since 1995. The 8 principles which govern this code are rules of universal transparency. The HONcode principles are a set of quality criteria, *i.e.* transparency, authority, complementarity, updating of information, authorship, reference, justifiability, sponsorship and advertising. Each principle is clearly defined by a guideline. Web sites applying for certification must clearly disclose an explanation of how they respect the eight principles. For instance, the privacy principle means that the website should disclose how confidentiality of data relating to individual patients and visitors to a medical/health Web site, including their identity, are managed, used and diffused. Web site owners undertake to honour or exceed the legal requirements of medical/health information privacy that apply in the country and state

where the Web site and mirror sites are located. The Web site must clearly state this (and other principles) in order to be certified, as the following excerpt demonstrates: “We respect and are committed to protecting your privacy. 1. We do not monitor individual usage of the Web site. 2. We collect site usage statistics from our server logs. This data helps us to manage and plan resource updates, which will be used as part of the evaluation of the site.”

However, HONcode certification is not only a code of conduct, this is only the visible part of the third party certification. Certification is also how we apply these rules (the procedure) and how we provide access to the results of certification to the end-user.

Furthermore, to remain efficient while the growth of online documents is accelerating, manual compliance reviewing needs to be complemented and systematically executed by automated means.

2.2.2 Automatic Approach

As with methods based on supervised training that are used to filter the spam of electronic mails [18], the idea is to use the many examples of the application of the HONcode principles, collected regularly by the reviewers of HON, as a database of training data. For example, the system can learn how to recognize a declaration of confidentiality from among all the pages of a Web site.

The use of supervised models for the categorization of text is generally very effective if they have a good corpus of training because they are able to capture and model events which an expert may not have identified (compared to the system based on rules) and to weight them in coherent ways.

The automatic control of quality criteria is a rather recent subject of research. Initiated in 1999 by Price [19], no publication in this specific field has been identified before 2006 when Wang proposed a rule-based approach [20]. More recently, supervised training was applied by Gaudinat [21] and also by Y. Aphinyanaphongs [22] in 2007. The HON approach is based on a rich model built on the 8 principles of

the HONcode, where the training data exists in several languages and is independent of the subject domain.

We showed for certain principles that it was possible to improve detection of the pages relating to the quality criteria by combining the contents of the pages and the URL of these pages [23,24].

The automatic control of quality criteria brings to us a quantitative measure of trust within our global model of trust. This detection is pre-calculated on the 7000 sites selected by HON which did not make a request for HONcode certification, and is accessible via the search engine used in PIPS in the form of filters and results (c.f. Results & discussions Fig 4.).

Indeed, the user can carry out a search by filtering only the pages of sites that contain, for example, the charters of privacy and information of authority.

2.2.3 Enriched Certificates

For the user, the HTML HONcode certificate provides page about the validity of the certification upon clicking on the HONcode seal "hosted" on the certified Web site. While here, the same certificate is available in the XML RDF format that makes it very simple to obtain information relating to the state of certification of a site. Table 1 and table 2 contain the information available in this RDF.

Meta Tag	Function	Example
dc:identifier	Site URL	http://www.medlineplus.gov/
dc:title	Site title	National Library of Medicine's MEDLINEplus
dc:description	Site desciption	Assists consumers in locating appropriate…
dc:type	Document type	Text/html
dc:format	Format type	Text
dc:language	Site languages	En, Es
dc:date	First review	06 Sep 1999
dc:subject	Keywords list	Vitamins, Diseases, Nutrition, Oncology, Pharmacy, Drugs, Emergency

Table 1: Dublin Core Tagging, concerning HONcode certificate.

Meta Tag	Function	Example	Possible values
honcode:pin	HONcode site ID	HONConduct166259	…
honcode:audience	Site URL	Individuals	Individuals, Medical Professionals, Healthcare Providers
honcode:status	Site status	Compliant	Compliant, under_re-exam, under_review, asking, bad
honcode:initialReview	Initial review	06 Sep 1999	…
honcode:lastReview	Last review	17 July 2008	…
honcode:townLocation	Town location	Bethesda	…
honcode:countryLocation	Country location	USA	…
honcode:mainContent	Main content	Links	Links, Description of services or products, Medical/Health information
honcode:siteType	Site type	Government	Individual, Commercial, Educational, Organization, government, network, military, Non-profit
honcode:siteSize	Size of the site	Big (Database)	1 Page, Small (< 10 pages), Medium (> 10 pages), Big (Database)

Table 2: Specific Tagging, concerning HONcode certificate.

2.2.4 P3P Generation

The Platform for privacy preferences (P3P) [25] is a standard for communicating the privacy policies of Web sites to clients (e.g. Web browser). With P3P, a Web client can retrieve a machine-readable privacy policy from a web server.

P3P is a good initiative to protect the privacy of net surfers. However, CyLab Privacy Interest Group of Carnegie Mellon conducted a study [26] and showed that, in fact, the majority of Web sites do not have a policy P3P (Out of 75 most popular Web sites of the study, only 23% have a P3P policy and in a random selection of 78 Web sites, only 11% had a P3P policy).

Thus, in spite of the fact that the P3P is available through the most popular Web browsers, it is not used much because of the complexity of its installation within Web sites and Internet users' ignorance of this security feature. However, within PIPS, P3P is used for all negotiations between the various actors (patient/professional) and internal services within the system.

In order to reinforce the pre-existent aspect of privacy with regard to found principle 3 during HONcode review and to promote the use of P3P, actions were taken. Which consist to automatically create the P3P policy by using the data obtained during HONcode certification process as illustrated in the figure 1.

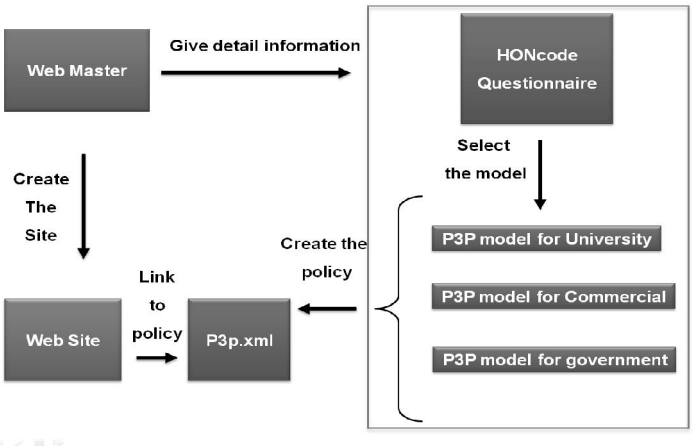

Figure 1: The P3P xml policy is automatically generated from the Questionnaire and the HONcode review process from among 3 policy models. The Web site could then link to this policy.

The policy currently generated is available through the results of the PIPS Trusted Search Engine and is identified using the unique code number, the HONConduct number (Fig. 2).

<**wrapin:p3p_policy**>
http://debussy.hon.ch/cgi-bin/P3P/P3P.pl?HONConduct=**HONConduct577616**
</**wrapin:p3p_policy**>

Figure 2: Link to the generated P3P policy from the trusted search results.

The advantage is the ability to avoid accessing Web sites that do not respect the confidentiality policy before even reaching the site [27,28]. After the information has been collected during the request for certification, only three sections of the policy are dynamically created; *Entity*, *Dispute* and *Statement*.

For the Entity part, we add a link to the human readable privacy statement identified during the HONcode review process and also add some public information about business contacts (Fig. 3). All other information stays confidential.

```
< ?xml version= “1.0” encoding=”utf-8 ?>
<?meta name=”GENERATOR” content=”XML::Smart/1.6.9 Perl/5.008” ?>
   <POLICIES xmlns=http://www.w3.org/2002/01/P3Pv1>
   <POLICY name=”PrivacyPolicy” discuri=http://www.docdoc.com/privacypolicy.htm>
      <ENTITY>
         <DATA-GROUP xmlns=http://www.w3.org/2002/01/P3Pv1>
            <DATA ref=”#business.name”>DocDoc</DATA>
            <DATA ref=”#business.contact-info.postal.stateprov”>Texas</DATA>
             <DATA ref=”# business.contact-info.postal.city”>Houston</DATA>
             <DATA ref=”# business.contact-info.postal.country”>USA</DATA>
        </DATA-GROUP>
      </ENTITY> …
```

Figure 3: Beginning and entity part of the automatically generated P3P policy.

For the *Dispute* part, we provide a link to the HONcode certificate as well as the description of certification. The goal is also to offer a means of solving any queries of the user by using the HON complaint system.

2.3 XML RDF and Dublin Core

XML and RDF [29] are the current and de facto standards for establishing semantic interoperability on the Web, but XML addresses only document structure. RDF facilitates interoperation better as it provides a data model that, for example, can be extended to address sophisticated ontology representation techniques. The Dublin Core Metadata Initiative (DCMI) [30] is a metadata element set intended to facilitate the discovery of electronic resources. Originally conceived for author-generated descriptions of Web resources, the DCMI is now used by museums, libraries, government agencies, commercial organizations and some search engines. We have selected both these standards to allow interoperability between PIPS and the HON trusted search engine and also to possibly distribute our services on the SW.

Meta Tag	Function
dc:creator	Creator of the results
dc:identifier	URL of the WRAPIN query
dc:language	Language of the result
dc:title	Title of the results
dc:format	Format of the result page
dc :type	Type of the result page

Table 3: Dublin Core Tagging at the results page level

With regard to DC, we maximized the use of its meta-tag (in table 3 and table 4 respectively for results according to page level and document level) when possible, but those too specific to our application appear below in table 5 by the identifier WRAPIN (Name of the search engine used [31]).

Meta Tag	Function
dc:title	Title of the document
dc:identifier	URL of the document
dc:source	Database that provided the result
dc:description	Description of the document
dc:subject	MeSH keyword
dc:lang	Language of the document
dc:type	Document type

Table 4 : Dublin Core Tagging at the document level

In the last two tables (Table 4 and 5), the grey areas indicate the meta-tag related to the quality of information such as the Source, Seal, policy P3P and the indicator of Trust. This last is composed of the name of the code of the principle (h1: authority, h3: privacy…), of the URL where it is possible to find the declaration and the score. The score is the indicator of content relevance of the URL to a given principle. Therefore, the URL identified automatically by the system, could gives access to trust information for the end-user.

Meta Tag	Function	Level
wrapin:nbPages	Number of relevant pages found	Results
wrapin:sites	Collection of relevant sites according to the query	Site
wrapin:rank	Rank of the site	Site
wrapin:site	Contain information about a site	Site
wrapin:pages	Collection of relevant pages (*i.e.* documents) according to the query	Site
wrapin:page	Contains information about a page	Doc.
wrapin:pageScore	Page score, according to the query	Doc.
wrapin:seals	Collections of seals for this page	Doc.
wrapin:seal	Seal such as HONCODE, MEDLINEPLUS or CISMEF	Doc.
wrapin:sealName	Seal name such as HONCODE, MEDLINEPLUS or CISMEF	Doc.
wrapin:sealImage	URL of the seal logo	Doc.
wrapin:readability	Estimation of the readability level for this page	Doc.
wrapin:rdbFog	Fog numerical equivalence for the readability level	Doc.
wrapin:p3p_policy	Reference to the default p3p policy made by HON automatically during the review Process	Doc.
wrapin:trusts	Collection of detected quality criteria statement	Site
wrapin:trust	Name of the detected principle (H1 to H8), detected URL &score	Site

Table 5: Specific Tags at different levels

3 Results & Discussion

With the combination of more than 6,800 Web sites certified and the usage of quality criteria detector on 7,000 selected sites (not HONcode certified), this trust system is currently used within the PIPS search

tool. This system enables to reach with better confidence quality resources (Fig. 4). Meta-information obtained is either employed during the display of the research results or to verify the adequacy of the sources as compared to the confidentiality profiles of the user. Here, the user has selected two ethical/quality filters (*Authority* and *Privacy*) and the prototype search engine gives access to a resource (non-certified) where the system has detected claims of *Authority* and *Principle* on the same site. Then the user can easily check these claims by following the link given by the search engine.

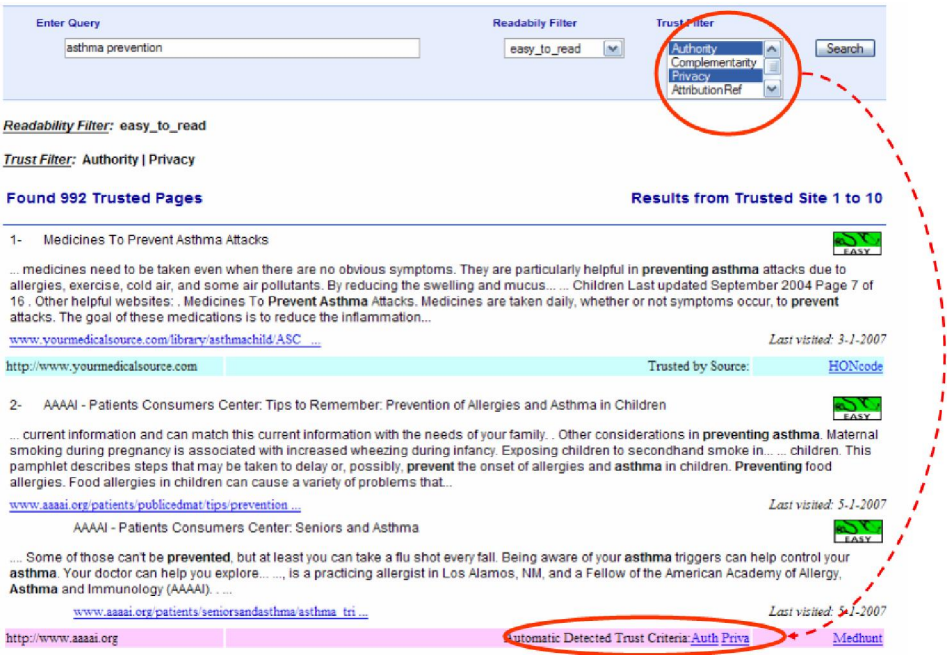

Figure 4: Prototype of the PIPS Trusted Search engine with quality filter facilities. In this example, the user is able to have access to the detected statements of authority and privacy.

Concerning the system of automatic detection of principles, it is still too early to conclude regarding its viability within a search engine in production. In our previous study, which was based on a corpus of manually reviewed HONcode websites composed of text samples of each principle (total of 16,615

samples), our system obtained 76% for the detection of principles (except the h4-ref. and h5-justifiability) with a SVM learning approach in a 10 fold cross-validation evaluation (see [21] for more details). However, despite these good results, a user evaluation using the search engine remains to be done. Furthermore, we do not claim that an "automatic accreditation" is possible (it rings like a non-sense), and we prefer to argue that the automatic approach will contribute to the assessment of the quality of Web pages.

The automatic generation of P3P remains a good means of its own promotion in the field of the medical Web with the proviso of having up to date and detailed information concerning the Web site. The charter of confidentiality accessible by reviewers during the process of certification is less detailed as compared to the P3P policy on the site. So, the automatically generated P3P is certainly less detailed than the manual one. On the other hand, the HONcode review is performed once a year, so the automatically generated policy is more updated than the manual one. The 3 schemes implemented in this study are certainly insufficient, but can serve as a good starting point for the sites that could extend the policy P3P generated by our system.

The method and principles presented here within the framework of health Web sites are, of course, generalisable to other types of Web sites. And even if the HONcode principles are critical with regard to medical information, it's obvious that any serious site has to publish information related to their transparency. And in the event of the absence of involved actors such as HON, automatic solutions should at least be considered.

With the growth of folksonomies and its possible use for "collaborative trust" (i.e. manual tagging by web 2.0 user, see Web of Trust [32]), it is reasonable to question whether the older model of trust are still viable. We believed on the one hand that the model presented still has its place due to its generality and also its ability to outdo the new collaborative models by adding a more rigorous framework whose details of interaction remains to be defined.

While it is important to speak the same language, we think that the challenge is not really the vocabulary used to describe the quality of health Web pages (it is not so very important to compare number of labels, coverage or granularity of a vocabulary). Even well designed, systems such as P3P or HIDDEL are not, in fact, used. Obviously, complexity for both producer and end user is certainly one of the main limitation factors. However, concerning labelling and third party certification, the limitation is certainly the cost and the heaviness of the task in terms of size and dynamism (how to maintain updated descriptions of the changing Web).

4 Conclusion

We showed that it was possible to re-use a model of trust of Web 1.0 from a point of view of the SW. Though far from perfect, this model allows the instantiation of the fundamental principles related to the trust on the Internet with some original elements. The access to the elements of this model is done via a prototype of search engine and the RDF format.

We saw that automatic approaches could play a more important part in the future to address the problem of uneven quality and dynamism of the Web. While not yet fully evaluated, the use of a trusted search engine as an intermediate can be a reliable solution in order to avoid reaching the resources directly and analyzing them a posteriori. In this direction, the filters proposed by the trusted search engine make it possible for the user to profile his research according to the detected principles of the HONcode.

However enriching information of trust by automatic and manual ways is not sufficient. One should not forget the educational component in the trust issue. Alongside the HONcode, is also a continuous discussion thread that makes it possible to develop the critical spirit of the Web producer and the consumer (as shown by S. Adams [33]).

Like the Web Page Rank, the concept of “collaborative trust” is another clue to measure the quality of a source, which has the advantage of offering a coherent and systematic model. However, is it sufficient to address the problem of unevenness of quality on the Internet? This is less obvious. And only a rigorous evaluation will make it possible to clarify the forces and the weaknesses of this new paradigm. What is certain is that it is urgent to use all the sources of possible information related to trust in order to guarantee a trustworthy Health Semantic Web.

Acknowledgments

This work has been realised as part of the PIPS (Personalised Information Platform for Life & Health) project funded by the European Commission programme Information society technology, contract number 507019.

References

1. Golbeck J., Hendler J.: Accuracy of Metrics for Inferring Trust and Reputation in Semantic Web-Based Social Networks - Engineering Knowledge in the Age of the Semantic Web: 14th, 2004.
2. Artz D., Gil Y.: A survey of trust in computer science and the Semantic Web. Web Semantics: Science, Services and Agents on the World, 2007.
3. Gil Y., Artz D.: Towards content trust of web resources, Web Semantics: Science, Services and Agents on the World Wide WebVolume 5, Issue 4, World Wide Web Conference 2006 Semantic Web Track, December 2007, Pages 227-239.
4. HONcode: Code of Conduct for Health Web site: http://www.hon.ch/HONcode/ Conduct.html 2009 June.

5. Boyer C., Baujard V., Scherrer J.: HONcode: a standard to improve the quality of medical/health information on the internet and HON's 5th survey on the use of internet for medical and health purposes. In 6th Internet World Congress for Biomedical Sciences (INABIS 2000), 1999.
6. Risk A. Dzenowagis J. Review of Internet information quality initiatives. Journal of Medical Internet Research. 2001; 3(4):e28.
7. Boyer C., Gaudinat A., Baujard V., Geissbuhler A.: Health on the net foundation: assessing the quality of health web pages all over the world. Stud Health Technol Inform. 2007;129:1017-21.
8. URAC American Accreditation Healthcare Commission, authors. Home page. http://www.urac.org. 2009 June.
9. WMA: http://wma.comb.es/eng/home.php. 2009 June.
10. Childs S., "Judging the quality of internet-based health information",Performance Measurement and Metrics, vol. 6, no. 2, pp. 80-96, 2005.
11. Eysenbach G., Köhler C., Yihune G., Lampe K., Cross P., Brickley D. A metadata vocabulary for self- and third-party labeling of health web-sites: Health Information Disclosure, Description and Evaluation Language (HIDDEL). Proc AMIA Annu Fall Symp (JAMIA Suppl). 2001:169–173.
12. Provost, M., Koompalum, D., Dong, D., Martin, B.C. (2006), "The initial development of the WebMedQual scale: domain assessment of the construct of quality of health web sites", *International Journal of Medical Informatics*, Vol. 75 pp.42-57.
13. Powder: http://www.w3.org/2007/powder/, 2009 June.
14. PIPS project Web site: http://www.pips.eu.org/, 2009 August.
15. Melgara M., Romano L., Rocca F., Sanna A., Marino D.: Innovative Healthcare Services for NomadicUsers - LNCS, 2006 – Springer.

16. MedlinePlus portal: http://medlineplus.gov/ 2009 August.

17. CISMef portal: http://www.cismef.org/ 2009 August

18. Carreras X., Màrquez L.: Boosting trees for anti-spam email filtering. In: Proceedings of RANLP-01, 4th International Conference on Recent Advances in Natural Language Processing, Tzigov Chark, BG. 2001.

19. Price S.L., Hersh W.R. Filtering web pages for quality indicators: an empirical approach to finding high quality consumer health information on the world wide web. Proc AMIA Symp 1999:911-5.

20. Wang Y., Liu Z. Automatic detecting indicators for quality of health information on the Web. Int J. Med Inform. 2006 May 31.

21. Gaudinat A., Grabar N., Boyer C.: Machine learning approach for automatic quality criteria detection of health web pages. Medinfo. 2007;129:705-9.

22. Aphinyanaphongs Y., Aliferis C.: Text categorization models for identifying unproven cancer treatments on the web. Stud Health Technol Inform, 2007.

23. Gaudinat A., Grabar N., Boyer C.: Automatic retrieval of web pages with standards of ethics and trustworthiness within a medical portal: What a name page tells us - 11th Conference on Artificial Intelligence in Medicine (AIME 07) - 07-11 July 2007 Amsterdam, The Netherlands.

24. Gaudinat A., Grabar N., Boyer C.: Combination of heterogeneous criteria for the automatic detection of ethical principles on health websites. AMIA 2007.

25. W3C portal for P3P: http://www.w3.org/P3P/ 2009 August.

26. Cranor L. F., McDonald A. M., Egelman S., Sheng S.: 2006 Privacy Policy Trends Report. http://www.chariotsfire.com/pub/cpig-jan2007.pdf 2007 December.

27. Egelman S., Cranor L.F., Chowdhury A.: An analysis of P3P-enabled web sites among top-20 search results. ACM, Proceedings of the 8th international conference on Electronic commerce, 2003.

28. Byers S., Cranor L.F., Kormann D.: Automated analysis of P3P-enabled Web sites. ACM, Proceedings of the 5th international conference on Electronic commerce, 2003.

29. w3c portal for RDF: http://www.w3.org/RDF/ 2009 August.

30. Dublin Core Metadata Inititive Portal: http://dublincore.org/ 2009 December.

31. Gaudinat A., Ruch P., Joubert M., Uziel P., Strauss A., Thonnet M., Baud R., Spahni S., Weber P., Bonal J., Boyer C., Fieschi M., Geissbuhler A. Health search engine with e-document analysis for reliable search results. Int J Med Inform. 2006 Jan;75(1):73-85.

32. WOT, Web Of Trust, http://www.mywot.com 2010 January.

33. Adams, S. A., de Bont A.A.: More than just a mouse click: Research into work practices behind the assignment of medical trust marks on the World Wide Web. Int J Med Inform. 2007 Jun;76 Suppl 1:14-20. Epub 2006 Jun 23.