Enhancing E-Mail Marketing by Semantic Addressing

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***Abstract* – This paper presents architecture of the software system for semantic e-mail addressing. It explores the possibilities for creating and updating the knowledge base system about employers and job vacancies, which is created based on domain ontologies. It also describes in details the process of publishing database on the Semantic Web and plans for further updating and improving the existing knowledge base system. Due to specific kind of work, and necessity of automating communication with employers, the presented system is applied in the Employment Agency of Montenegro.**

***Keywords* – Semantic Web, Semantic e-mail addressing, mailing lists, RDF, FOAF**

1. Introduction

Nowadays, the Internet represents a valuable marketing tool. As it grows, the number of opportunities for company promotion on the Internet arises, as well as the possibility to tailor it to different individual needs.

As described in Dave Chaffey book [1], the best Internet Marketing techniques in practice are search engine marketing (SEM), banner ads on specific websites, email marketing, mobile advertising, affiliate marketing, and marketing through social media.

Email marketing appliance has a prominent place, because it is confirmed in practice for its successfulness and ease of use. According to a survey of Internet marketing development trends, which was initiated by the Strong Mail [2], a leading provider of online marketing solutions in the field of e-mail marketing and social media, most companies plan to increase the budget intended for e-mail social media marketing in 2012. year. The main tendency is to increase the budget intended for e-mail services, social media and web site optimization. Moreover, according to the same research, activities on development and updating of personalized and targeted mailing lists will grow together with databases integration for enabling "the supply of highly professional e-mail content to interested recipients."

Ryan and Allis have pointed out the ten recommendations of good practice for companies wanting to promote their products and services by using e-mail marketing in [3].E-mail marketing can be used for sales management, providing customer service and building customer relationships and trust. In order to achieve the best possible results and reach the target audience, it is necessary to build segmented e-mail list, so that each entry received only emails that interest him. Here comes the challenge of creating good and trustful emailing list where each offer should meet its needs and expectations. The new web technology such as Semantic web enables this process and significantly enhance the effectiveness of the email marketing.

In order to promote business and cooperation of the Employment Agency of Montenegro (EAM)and potential employers, a semantic based model and software application are developed to conduct e-mail marketing techniques. Due to the specificity of the particular job and various activities and interests of employers, the semantic addressing of e-mail messages is applied. Employers are allowed to be alone or check the mailing list and choose which category to belong and from which information will be given by the EAM.

2. Semantic e-mail addressing

Semantic e-mail addressing denotes that particular e-mail messages are sent to mailing list recipients that are recognized to be interested in receiving such information. Essentially, semantic e-mail addresses are logical descriptions of recipients rather than static lists of strings. Therefore, they allow sending (with the same description) e-mails to highly dynamic groups of people and at the same time ensuring, that the ”right” people (at this specific moment in time)

are addressed. Such semantic e-mails addresses are stable, whereas the group might change very frequently.

Such approach will enable the members of the mailing list an easy administration of their applications to various mailing lists. This way, addressing stands for the breaking of the complex applications to simple factors, a better understanding of the set of requirements, according to the rules defined by the ontology. In this way the knowledge we have about a particular element has been disassembled for the purpose of data reuse [4].

An interesting example of semantic e-mail addressing is described in [5]. The system sends e-mails to all participants of the seminar, in which they respond to potentially attend the evening and their individual choice from the dinner popup menu. Their responses are collected at the server side, shaped by the answers of the participants, and report is provided on dinner preparation details. Model also provides other features, such as a response to the time required for preparation of selected foods, optimal procedures, and so on.

The appliance of semantic email addressing has many advantages. Software system for e-mail marketing in the Employment Agency of Montenegro recognized the benefits of semantic addressing and applied it in the everyday company business.

Since the Employment Agency of Montenegro tags its employers by different attributes eg. organization, number of employees, organizational structure and interests about the cooperation with the Employment Agency, the proposed software application is the ideal solution to automate communication in the direction Employment Agency - employers. The conceptual model is described in detail in [6].

In the past, communication via e-mail messages in the Employment Agency of Montenegro was carried through the mail client software by creating separate interest groups of employers depending on the EAM needs. This way, the same employer could join two or more groups, depending on his interests. Such communication took place in one direction, e.g. EAM sent e-mails according to the organization of its mailing lists, but not upon the real employer's requests. This method of communication proved to be complicated for EAM employees and also inefficient for employers since they did not receive mails on demand but rather emails according to the personal judgment of EAM personal responsible for this task. Since the user always expect to obtain clear information relating to his right profile and his interests, he would consider such emails as spam messages. All those issues indicate that communication campaign of EAM should be much improved.

3. Semantic email addressing software system ASEA

The programming team of Employment Agency of Montenegro has developed ASEA software application for our own e-mail marketing purposes to solve the previously stated problems. ASEA is a based on Active Server Pages (ASP) with on-line database creation tool for MS SQL Server 2000/2005, Skins using Cascading Style sheets. ASEA has many powerful and easy setup tools and options, making it simple to create Newsletters, E-mail Marketing Campaigns, Templates, RSS News Feeds, and lots more.

ASEA is designed for the Windows hosting environment, and use the Windows IIS web server with ASP enabled. Database is SQL Server 2000. TCP/IP connections to the SQL Server must be enabled. One of the following e-mail components needs to be installed on the web server in order ASEA to send e-mails: *CDOSYS*, *CDONTS*, *W3 Jmail*, *Persist AspEmail*, *SeverObjectsAspMail*. SMTP server that ships with MS IIS also needs to be installed.

Some of the main ASEA features are the following:

- Sending unlimited number of e-Newsletters and e-mails;
- Unlimited number of subscribers and categories;
- RSS News Feeds; Personalized Newsletters;
- E-mail marketing;
- Subscriber import tools - import lists from CSV/Text files and databases;
- Rich Text Editor - WYSIWYG e-Newsletter and Template Writing Editor
- E-mail activation of new subscriber account (optional);
- Personalized e-Newsletters with member name, e-mail, company name, address, etc.;
- Web-based Subscriber Management Centre for changing members settings and subscriptions;
- Opt-in e-mail confirmation (optional);
- Create, save, edit and delete, unlimited number of e-Newsletter Templates;

- Image and file uploads supported
- Online web frontend for viewing News Bulletins and Newsletters (optional)
- Change the look and feel by creating new skins, or select from a number of built in Skins;
- E-Newsletter Statistics; Admin Control Panel;

The Subscriber Management Centre has the following characteristics:

- Category Subscription Management to change which categories the user is subscribed to;
- Subscribe to unlimited number of Newsletter Categories;
- Update Name, E-mail Address, Password, Company Name, Address, etc.;
- HTML or Plain Text e-Newsletter option (only if admin has allowed plain text e-Newsletters);
- Resend activation confirmation e-mail, if subscriber has not confirmed their opt-in subscription; Remove account option.

4. ASEA system for semantic email addressing

ASEA system consists of interconnected modules, with the central ASEA application. The architecture of this system includes several components as shown in Figure 1. It provides sending semantically addressed e-mail messages, and also, it defines ontology for publishing certain information on the Semantic Web. The main role of the system architecture is to organize the storage, accessing and manipulating of the knowledge in the employment domain, so such presented knowledge can communicate with other systems and easy to reuse.

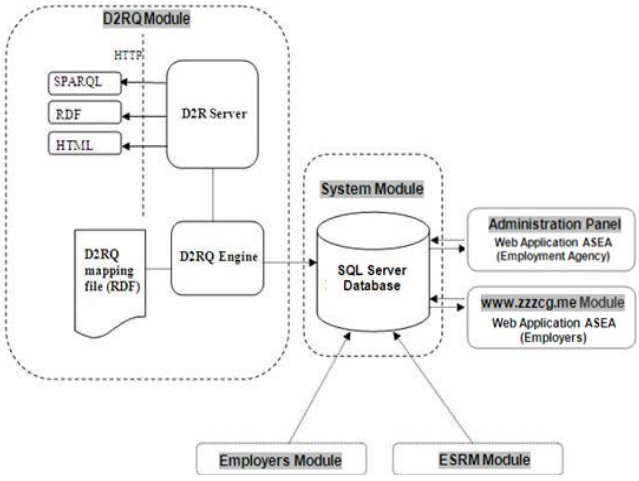

Figure 1.ASEA system architecture

ASEA architecture contains six modules:

- Module employers - Application for generating and maintaining data on employers.
- Module www.zzzcg.me - Website of the Employment Agency.
- System module - a module to update the database ASEA.
- The administration panel - to generate user profiles, maintaining customer data, and send a semantically addressed e-mail messages.
- Module ESRM (records of vacancies) - the application for generating and maintaining data on job vacancies.
- D2RQ module - a module for the publication of selected data on the Semantic Web.

Mapping relational databases is essentially a presentation of these databases for machine-readable data processing. RDF/XML is an XML syntax for RDF data. Today, there are many programs for database direct mapping, depending on the type of the database, compatibility and the need for certain capabilities of the program that performs the mapping. The process of mapping relational databases in the ASEA was conducted using D2RQ platform, components from which it consists. D2RQ platform enables treating non-RDF Databases as virtual RDF graphs. D2RQ is a declarative language to describe mappings between relational database schema and OWL/RDFS ontologies. The D2RQ Platform uses these mapping to enables applications to access a RDF-view on a non-RDF database through the Jena and Sesame APIs, as well as over the Web via the SPARQL Protocol and as Linked Data. The D2RQ Platform consists of:

- the D2RQ Mapping Language, a declarative mapping language for describing the relation between an ontology and an relational data model.
- the D2RQ Engine, a plug-in for the Jena and Sesame Semantic Web toolkits, which uses the mappings to rewrite Jena and Sesame API calls to SQL queries against the database and passes query results up to the higher layers of the frameworks.
- D2R Server, an HTTP server that can be used to provide a Linked Data view, a HTML view for debugging and a SPARQL Protocol endpoint over the database.

The D2RQ Engine is implemented as a Jena graph, the basic information representation object within the Jena framework. A D2RQ graph wraps a local relational databases into a virtual, read-only RDF

graph. It rewrites Jena or Sesame API calls, find() and SPARQL queries to application-data-model specific SQL queries. The result sets of these SQL queries are transformed into RDF triples or SPARQL result sets that are passed up to the higher layers of the framework. The D2RQ Sesame interface wraps the D2RQ Jena graph implementation behind a Sesame RDF source interface. It provides a read-only Sesame repository interface for querying and reasoning with RDF and RDF Schema.

D2R Server is a tool for publishing relational databases on the Semantic Web. It enables RDF and HTML browsers to navigate the content of the database, and allows applications to query the database using the SPARQL query language. D2R Server builds on the D2RQ Engine [7].

The reasons for the mapping certain data from the database of the ASEA in this system was that to use a D2R server it is enough to have installed Java 1.4 or newer, then the ease of mapping SQL database, and compatibility with other databases, as SQL database is not only in the company, detailed instructions on the use of this program, and many forums dedicated to the topic about D2RQ platform

The process of obtaining an appropriate RDF file is the following [7]:

- Download and extract the archive into a suitable location.
- Download a JDBC driver from your database vendor. Place the driver's JAR file into D2R Server's /lib directory. A list of JDBC drivers from different vendors is maintained by Sun. Also take note of the driver class name (e.g. org.postgresql.Driver for PostgreSQL or oracle.jdbc.driver.OracleDriver for Oracle) and JDBC URL pattern (e.g. jdbc:mysql://servername/database for MySQL) from the driver's documentation. Drivers for MySQL and PostgreSQL are already included with D2R Server.
- Generate a mapping file for your database schema. Change into the D2R Server directory and run: generate-mapping –o mapping.n3 –d driver.class.name –u dbuser –p dbpasswordjdbc:url… (mapping.n3 is the name for the new mapping file)
- Start the server: d2r-server mapping.n3

D2R Server uses the D2RQ Mapping Language to map the content of a relational database to RDF. A D2RQ mapping specifies how resources are identified and which properties are used to describe the resources. The generate-mapping script automatically generates a D2RQ mapping from the table structure of a database. The tool generates a new RDF vocabulary for each database, using table names as class names and column names as property names. The mapping file can be edited with any text editor. D2R Server will automatically detect changes to the mapping file and reload appropriately when you hit the browser's refresh button.

Besides, mapping of the certain data of employers and vacancies that they have announced is the first step towards using Semantic Web application in the IT system of the Employment Agency of Montenegro. As there are several private agencies for employment mediation in Montenegro besides Employment Agency of Montenegro, with appropriate published documents in RDF file about employers and job vacancies advertised by all agencies, it is possible to make a semantic search engine which will support searching of this data. Relief in the formation of this browser is that the employer ontology and occupations are clearly defined and thus greatly facilitated search of certain data.

To begin this initiative in the RDF employer file are published only those data that are also available through the website of the Central Registry of the Commercial Court: Name, Address, PostCode, Municipalities, ActivityCode, Activity, DateEstablishment, E-mail. Since the vacancies are advertised three times a week, the service will start in the same terms and it will publish newly created RDF file on the Internet. In this way data about employers and advertised vacancies from Employment Agency of Montenegro database become part of the global knowledge base, ready for reuse as a part of the Semantic Web.

ASEA bases its operation on a predefined mailing list because the group to whom e-mails are sent is already known and registered in the local database. These are employers registered in Montenegro, which still do not have a FOAF [8],[9] file published on the Internet. So, their first appearance on the Semantic Web will be by mapping database of the ASEA.

ASEA is open in the sense that it can be easily upgraded with option to send an e-mail to certain persons who have announced their FOAF file on the Internet. The further development of ASEA would be adding the ability to send a semantic addressed e-

mail using the FOAF mailing lists, which provides an opportunity to send e-mail to anyone on the Web by not knowing his e-mail address, and whose attributes defined in the FOAF file suit selected attributes of the sender. FOAF is a document in which a person keeps some personal information such as name, e-mail address, homepage and friends. This file links to other FOAF file and so the network expands. The new upgraded procedure would be: read the FOAF data, imports into a repository, and by selecting create the mailing list, which would be imported into the database server.

5. Conclusion

The recognized problems of organizing and tailoring emails to the target potential clients in the Employment Agency of Montenegro are solved by developing ASEA software application based on semantic web technology.

The main advantage of this automation process of communication with employers is to save time, ease and effectiveness in informing employers of different interests, send personalized messages to selected clients, all aimed at accelerating the process of recruitment of persons from the register of unemployment. Within this program there is a statistic for monitoring the status and interests of the employers on the mailing list, which for the Employment Agency presents the direction in which to develop and improve their services. Because of the possibility that the e-mail is sent only to registered persons with known attributes, the possibility of spamming is practically reduced to a minimum. Semantic e-mail addressing is especially important in business communication, as in this case the recipient does not need to think whether he received spam or not. The results of ASEA appliance will be monitoring over the time, and concrete enhances will be published later.

The further development of the application will be in towards improving the search for FOAF files application to upgrade application so it could send messages addressed to someone who has published his FOAF file on the Web. Since this is the first application applied in Montenegro dealing with semantic e-mail addressing, it is expected that this method of sending personalized messages will popularize ASEA, as well as the process of publishing information on the Internet in the form of Semantic Web.

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