E-Marketing Framework for Effective Promotion of Educational Services

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Abstract
Web technologies and e-marketing provide universities new opportunities to organize more effective interactions with consumers of educational services. The educational portal of the university becomes a single point for the interaction of the university with all categories of interested persons. Modeling of the educational web portal structure based on the analysis of user behaviors, perceptions and preferences become especially relevant. The aim of the study is to analyze the processes of the effective functioning of educational portals of higher education institutions, to model their structure, and to study the possibilities of using them to improve the quality of educational services promotion. A set-theoretical approach and Web Mining technics were used for evaluation of the educational web portal abilities for effective promotion of educational services.

Keywords: Educational Services Promotion; Educational Web Portal; E-Marketing, Analysis of User Behaviors.

1. Introduction

Nowadays the importance of marketing communications for higher education institutions cannot be overlooked (Maringe et al., 2012). Marketing communications, advertising and promotions became key activities for many higher education institutions due to increased global competition among institutions and the limit on the number of prospective students (Gibbs, 2001). Universities operate in an increasingly uncertain environment, with macro forces moving with increasing speed, complexity and risk (Chapleo et al., 2017). They have started to realize the need to operate more like a business, and use marketing communication strategies and web techniques more effectively (Chapleo, 2010). Higher education institutions marketing communications should move away from targeting the media to targeting the user, the student, with the help of website and a CRM system (Chapleo et al., 2011).

The widespread introduction of information technologies is one of the main development strategy of the university that provides a starting point to creating a single information and educational environment on the basis of an educational portal. The educational portal provides a solution for aggregating content, information systems and educational services of the university for presentation to the end user in the required format. However, the website of the university can be also an effective marketing tool to attract consumers of educational services and form positive University image. This is crucial for each institution to be reckoned with in conditions of high competition.

Web technologies and e-marketing techniques give universities new tools for interaction with consumers of educational services. The educational portal becomes a single point for interaction of the university with stakeholders: current and future students, teachers and employers. The results of research revealed that social media and websites positively affect students' decision-

making, which then significantly impact students' choice of a particular university (Jan et al., 2016). As a result, there is a problem of effective organization and online promotion of educational portals. Modeling the educational web portal structure based on the analysis of user behaviors, perceptions and preferences becomes especially relevant. The aim of the study was to analyze processes associated with the development and performance evaluation of educational websites and explore their abilities for effective promotion of educational services.

The quality of the website is quite important in generating customer satisfaction and loyalty. Therefore developing an evaluation framework for an education website becomes an essential requirement of a feedback loop for continuous improvement of marketing communications of the institution.

There are numerous studies that have primarily approached the problem of website quality from the service quality dimension on the SERVQUAL model. Parasuraman, et al. in (Parasuraman et al, 1988) developed a multidimensional research instrument SERVQUAL to capture consumer expectations and perceptions of a service along the five dimensions to represent service quality. It represents a model of service quality with 22-items, comprising four items to capture tangibles, five items to capture reliability, four items for responsiveness, four items for assurance and five items to capture empathy. Later on, Parasuraman et al. (Parasuraman et al, 2005) developed the E- S-QUAL as a scale to measure online service quality. E-S-Qual and later E-RecS-Qual were developed for assessing the full cycle of service quality for online B2C e-commerce Web sites. E-S-Qual is a twenty two item survey instrument used to assess electronic service quality. The instrument includes four dimensions: efficiency, system availability, privacy, and fulfillment. The E-RecS-QUAL scale contained three dimensions (responsiveness, compensation, contact) with an 11-item scale. The instrument was used to assess the quality of recovery services (e.g., product returns) associated with e-commerce.

Aladwani and Palvia in (Aladwani et al., 2002) developed a multi-dimensional scale for measuring user-perceived web quality. They introduced four dimensions of perceived website quality, comprising technical adequacy, specific content, content quality, and appearance. Cristobal, Flavián and Guinalíiu (Cristobal et al., 2007) refer that website quality is a multidimensional construct, including web design, customer service, assurance and order management. Website should also uphold sufficient security levels in communications and meet data protection requirements regarding the privacy. Lowry et al. in (Lowry et al., 2008) explores how less-familiar e-commerce Web sites can use branding alliances and website quality to increase the likelihood of initial consumer trust. They use the associative network model to explain brand knowledge and extend information integration theory to explain how branding alliances are able to increase initial trust and transfer positive effects to Web sites. According to Lowry et al. the dimensions of Web quality are responsiveness, competence, quality of information, empathy, Web assistance and callback systems.

Olsina et al. (Olsina et al., 2002) designed an instrument WebQEM which they used to evaluate sites in several domains, including academic websites. The authors consider Web site characteristics and attributes from a general visitor viewpoint. They focused on user-perceptible website features such as navigation, interface, and reliability rather than site attributes such as code quality or design. The evaluation process in WebQEM includes specification and aggregation of nonfunctional requirements subjectively based on human expertise and objectively measurable attributes such as broken links, orphan pages, and quick access pages. Liu and Arnett in (Liu et al., 2000) surveyed Webmasters for Fortune 1000 companies to ascertain the factors critical to website success with consumers. They identified the following quality factors: quality of information (which refers to relevant, accurate, timely, customized and complete information); service (measured by quick response, assurance, empathy, and follow-up); system use (including security, correct transactions, customer control over transactions, order tracking, and privacy); playfulness (typically enjoyment, interactivity, presence of attractive features, and flow or concentration); and design of the website (in terms of hyperlinks, customized search functions, speed of access, and

ease of correcting errors). Loiacono, Watson and Goodhue (Loiacono et al., 2002; Loiacono et al., 2007; Loiacono et al., 2014) designed an instrument WebQual™, later named as eQual 4.0, to evaluate retail website quality. The instrument includes three dimensions: usability, information quality, and service interaction. The instrument assessed 12 components of retail web quality: informational fit-to-task, interactivity, trust, response time, design appeal, intuitiveness, visual appeal, innovativeness, flow-emotional appeal, integrated communications, business process, and viable substitute. The authors have used the instrument to assess the quality of a number of different types of Web sites.

Harold W. Webb & Linda A. Webb in (Webb et al., 2004) developed a nine item survey instrument named SiteQual to assess e-commerce web site quality. The use of Web site quality factors for measurement of consumer expectations and perceptions, determining Web site requirements, and guiding the testing process was suggested. The instrument includes four dimensions: aesthetic design, ease of use, processing speed, and security. A factor analysis was conducted for these purposes. In Barnes and Vidgen (Barnes et al., 2001) a total of 380 student respondents evaluated online bookstores, using an instrument with 22 questions. Based on exploratory factor analysis, five dimensions were emerged: usability, design, information quality, trust and empathy. Wolfinbarger and Gilly in (Wolfinbarger et al., 2003) developed the instrument eTailQ to assess the quality of retail electronic commerce. They developed a valid scale for the measurement of online quality. The instrument includes four dimensions: website design (including information, order processing, navigation, and product selection), fulfillment/reliability, privacy/security and customer service. The analysis suggests that these factors are strongly predictive of customer judgments of quality and satisfaction, customer loyalty and attitudes toward the website. The aesthetic design of a website can also be regarded as an important attribute of a high-quality website. A website is required to be appealing so as to attract target users to explore the website (Ng, 2016).

2. Models and methods for educational portal quality evaluation

A set of factors critical to website success with consumers were observed in order to assess the educational portal quality as an effective means of promotion of educational services:

1. Content Requirements for the educational website: relevance of information to users queries, completeness and subject specialization (focus of information materials on the target audience), Uniqueness of educational information, utility and structure of content, currency, reliability, accuracy and correctness of the information available on the portal.

2. Website System Quality Requirements: accessibility, security, privacy, navigability, response time (download speed), structure (including information structure, site map, page size), usability (including design, ease of use and convenience of navigational tools, aesthetic qualities, etc.), Availability, the ability to use in all browsers and devices. Educational website design requirements are: website enriched multimedia presentation, brand-driven web page design.

3. Service Quality: reliability, search, responsiveness and feedback, adaptability and customization, SEO (semantic markup of HTML pages with microdata, Schema.org, tools of Web Analytics, log file analysis).

Performance indicators are one of the most important university web portal quality criteria. The following educational website performance indicators were analyzed:

1. Performance indicators related to user behavior before the acquisition of educational services (the time the user spends on each page of the site and in general; the time the user searches the information interesting for him on the site; the number of clicks on the website of the user; the number of pages per visit of the user).

2. Website performance indicators (website traffic, the number of site errors from the user's point of view; boot time, response time, number of failures, speed, etc.).

3. Error indicators relating to the linguistic aspect of the website quality (matching the names of menu items and fields are the user's expectations; the ability to fill accurate data; the relevance of the information on the website, etc.)

4. User interface quality indicators (the quality of the location of the various components of the screen of the site, the color and styling of the site, the optimal location of elements of the site interface, the effectiveness of the site structure, the search efficiency, the amount of text and graphics on the page, the organization of the dialogue with the user; the presence of the site map of the educational site etc.)

5. Target indicator that assesses whether the users reach its target on the website (de facto). This indicator is checked with the help of questionnaires, mailings, or expert evaluation of the site.

As a result of analysis a hierarchical structure of Educational Portal Quality Model has been developed (see figure 1):
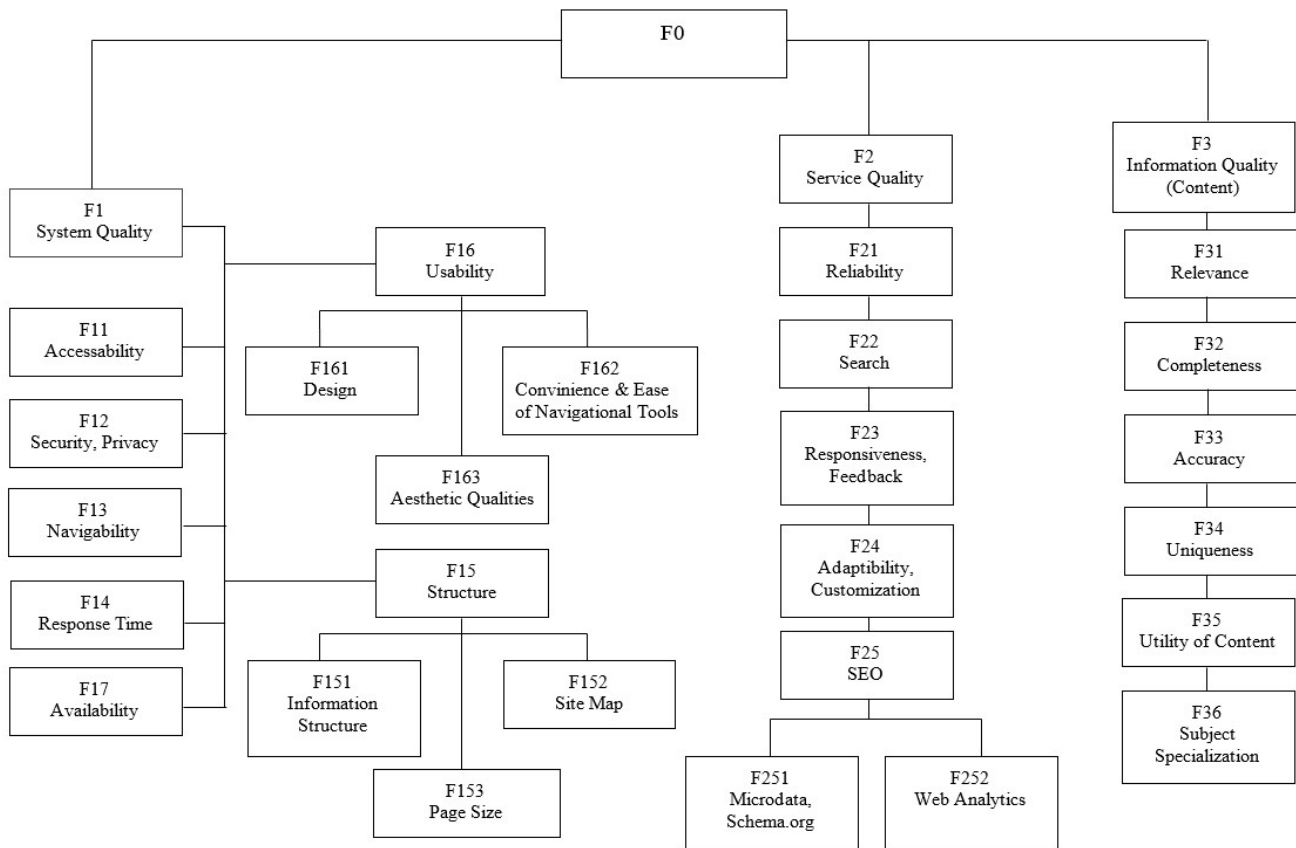

Figure 1. Hierarchical structure of Educational Portal Quality Model

The following methods were used for the evaluation and improvement of the educational portal performance indicators:

1. Analysis of statistics using web analytics systems Yandex Metrics, Google Analytics, etc. For this purpose, page counters were installed on the educational site web pages.

2. Organization of feedback through surveys, questionnaires and user forms in order to obtain the information about visitor satisfactions with their visit experiences.

3. Testing the ergonomics and usability of the site based on Google Website Optimizer, Yandex Webmaster.

4. Using the web analytics tools such as Google Analytics, Yandex Webvizor, Yandex Metrica for tracking, analyzing and processing all user actions on web pages of the site.

5. Using information from log files to analyze data about the visitor behavior on the site (statistics on downloadable content, website traffic, etc.).

6. Using SEO techniques for website performance improvement.

A technical audit of different university websites was carried out to assess their abilities to use e-marketing methods for educational services promotion. The following features of the competitors' websites have been analyzed: traffic sources panel, website advertising tools, most popular searches and pages, bounce rate, characteristics of the target audience, keyword frequency, website indexing, website positions in search engines, site traffic, registration of a site in search catalogs, the page speed insights, search engine optimization (SEO), the presence of microdata markup like Schema.org or Open Graph, the presence of web counters on the site (Google Analytics, Yandex Metric, Open Stat, Live Internet, etc.), social media presence index (SMPI), the presence of a mobile version of the site, relevance, latent semantic indexing of keywords (LSI), level of trust (authority, citation) of the web in search engines (TrustRank or Web of Trust (WOT), etc.). Web analytics systems define keywords and queries of competitors' websites only at the time of analysis, so the original tool has been developed for parsing data from competitors' websites.

The set-theoretic analysis has been performed for the assessment of the universities website ability to use e-marketing tools for educational services promotion. The results of analysis you can see in figure 2.

The methodology (Khubaev et al., 2017) involves the assessment of the educational portals e-marketing abilities in comparison with "reference" system, which describes user requirements. Let matrices IS_i and IS_k denote functionality of educational portals (systems),

where $IS_i = \{x_{ij}\}$ and $x_{ij} = \begin{cases} 1, \textit{if system i includes function j} \\ 0, \textit{else} \end{cases}$

Let indicators: $P_{ik}^{11} = |IS_i \cap IS_k|$ denote cardinality of intersection of sets (systems) in respect of the functions used;

$P_{ik}^{01} = |IS_k \setminus IS_i|$, $P_{ki}^{10} = |IS_i \setminus IS_k|$ denote cardinality of set difference between the respective systems.

Let s_{ik} be a measure of mismatch between systems IS_i and IS_k: $s_{ik} = P_{ik}^{01}/(P_{ik}^{11} + P_{ik}^{10})$;

let h_{ik} be a measure of set inclusion for systems IS_k, IS_i: $h_{ik} = P_{ik}^{11}/(P_{ik}^{11} + P_{ik}^{10})$;

let g_{ik} be a measure of similarity between systems IS_i и IS_k (Jaccard Similarity Coefficient) : $g_{ik} = P_{ik}^{11}/(P_{ik}^{11} + P_{ik}^{10} + P_{ik}^{01})$.

According to given indicators, the following matrices $P = \{P_{ik}^{(01)}\}, S = \{s_{ik}\}, G = \{g_{ik}\}, H = \{h_{ik}\} (i, k \in \overline{1,n})$ must be calculated and then transformed into logic matrices: $P_0 = \{p_{ik}^0\}, S_0 = \{s_{ik}^0\}, G_0 = \{g_{ik}^0\}, H_0 = \{h_{ik}^0\} (i, k \in \overline{1,n})$, whose elements are determined as follows:

$$p_{ik}^0 = \begin{cases} 1, \textit{if } P_{ik}^{(01)} \leq \varepsilon_p \textit{ and } i \neq k \\ 0, \textit{else} \end{cases} \qquad s_{ik}^0 = \begin{cases} 1, \textit{if } s_{ik} \leq \varepsilon_s \textit{ and } i \neq k \\ 0, \textit{else} \end{cases}$$

$$g_{ik}^0 = \begin{cases} 1, \textit{if } g_{ik} \leq \varepsilon_g \textit{ and } i \neq k \\ 0, \textit{else} \end{cases} \qquad h_{ik}^0 = \begin{cases} 1, \textit{if } h_{ik} \leq \varepsilon_h \textit{ and } i \neq k \\ 0, \textit{else} \end{cases}$$

where ε - selected limit values.

By means of logic matrices it is possible to assess the degree of similarity between the compared systems IS_i and IS_k: a share of common tools used simultaneously IS_i и IS_k systems in a total volume of tools IS_i (matrix H); a number of different tools in IS_i and IS_k systems (matrix P_0); number of common tools in the total volume of tools in IS_i and IS_k systems (matrix G).

Systems similarity graph (G0) and inclusion graph (H0) in relation of the available tools result from the calculation of the program. By setting different thresholds of the degree the systems meet the users' requirements, we obtain different groups of educational portals according to their abilities to use e-marketing tools. Figure 2 shows the results of the comparative analysis of the educational portals ability to use e-marketing tools in relation to the user's requirements (IS_{10}). According to figure 2 the portals IS_7 и IS_8 are preferable, more suitable for the promotion of

educational services as their set of e-marketing tools mainly correspond to the user's requirements (system IS_{10}) and comprises the tools of all other systems.
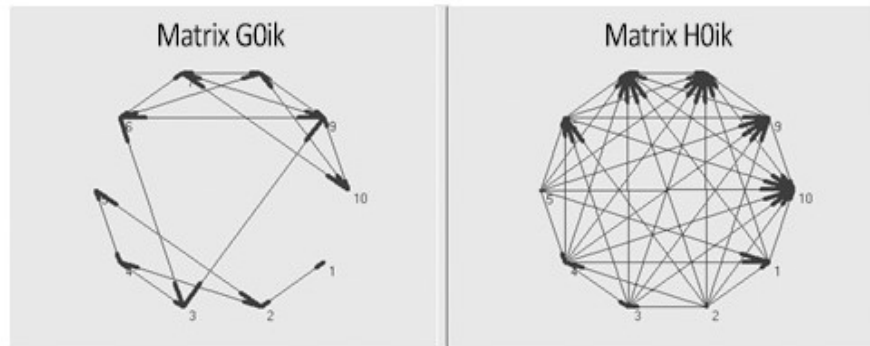

Figure 2. Comparative analysis of the educational portals ability to use e-marketing tools

3. Models and methods of educational portal quality improvement

A mathematical model has been developed to analyze and improve the educational portal structure. This model describes the dependence of user behavior and preferences from the structure and content of the educational portal.

The data on educational website user behaviors has been collected with the help of Yandex Metrics, Webvisor, and specially developed custom script. The data includes the total visit duration and the time spent on a specific web page for each user.

The model of the educational portal user behaviors is as follows. Let the given matrix $U = (U_{ki})$ be the matrix containing the data on the time spent by k-user on i – page,

where $k=1,...K$, and K is the number of users in the database,

$i=1,...m$, and m is the number of website pages.

The multiple linear regression equation is shown below:

$$Y = C_0 + C_1 \times U_1 + C_2 \times U_2 + \ldots C_i \times U_i + \ldots + C_m \times U_m, \qquad (1)$$

where $Y = (y_1, y_2, ..., y_k)^T$ is the time spent by k-user on the landing page.

In the process of constructing a multiple linear regression the regression coefficients C_0, C_1, C_2, … , C_m are determined. Thus we obtain a numerical estimation of the influence of every web page quality (content, design, usability, service, etc.) on the time spent by the user on the educational portal landing page. The numerical values of the coefficients give the estimates of the website structure and web pages content from users' point of view and therefore, their influence on the system target. The information obtained allows to rank the factors according to their weights and remove or reorganize unimportant pages and hyperlinks of the site structure. Figure 3 presents the results of the regression analysis.
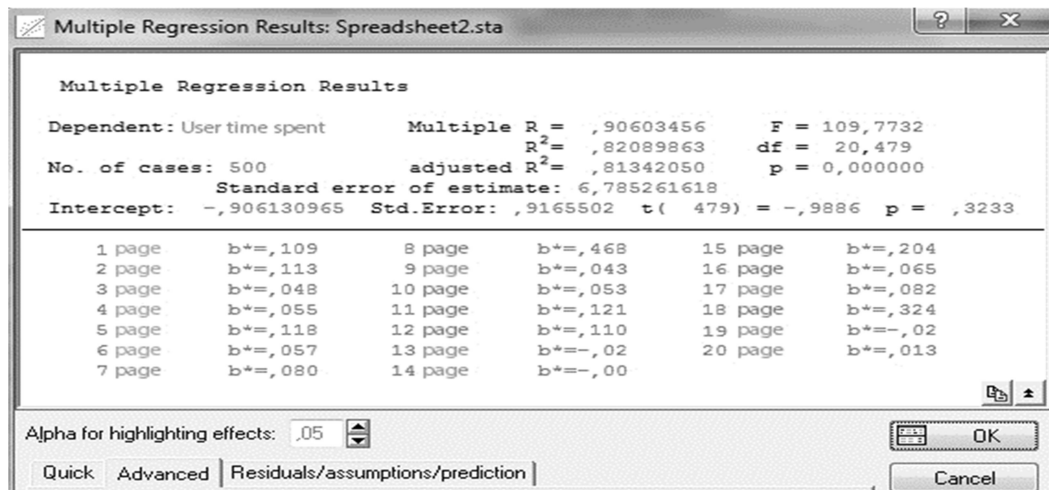
Figure 3. The results of regression analysis

The proposed approach allows to coordinate the website content about educational services with the interests of users, that is necessary for effective promotion of educational services. This information is used to reconfigure the structure of the portal in order to attract a larger audience of people who would be interested in the educational services.

To ensure the educational portals ability of promoting educational services, the new method was developed to determine the semantic core of the portal. This method allows you to optimize portal structure in accordance with the requests of its potential users. To ensure the relevance of the pages of the educational portal for the search engines, it is necessary to find a match between the subject of the educational portal and a set of search queries.

A set of keywords was obtained with the help of Yandex Wordstat by analyzing user search queries about the educational services. The results of the analysis formed the semantic core of the portal, which subsequently have been used to improve the website structure by relinking of resource pages. If the links of the pages will be from a list of keywords, then the quality of internal linking will be improved significantly. In addition to the possibilities of improving the site structure, semantic core may be used for media advertising of educational services. In this case the keywords for displaying ads are selected from a semantic core and the same search phrases are included in the text of the ads.

A promising direction of the educational portal improvement is an application of Semantic Web technologies for organizing effective storage and retrieval of data. For these purposes the model of portal knowledge base was created. The model is presented in the form of Web ontology that describes the structure of the educational portal information resources. For modeling the ontology of the educational portal the ontology editor Protege 4.3 was used. Figure 4 shows the ontological model of the University educational portal.
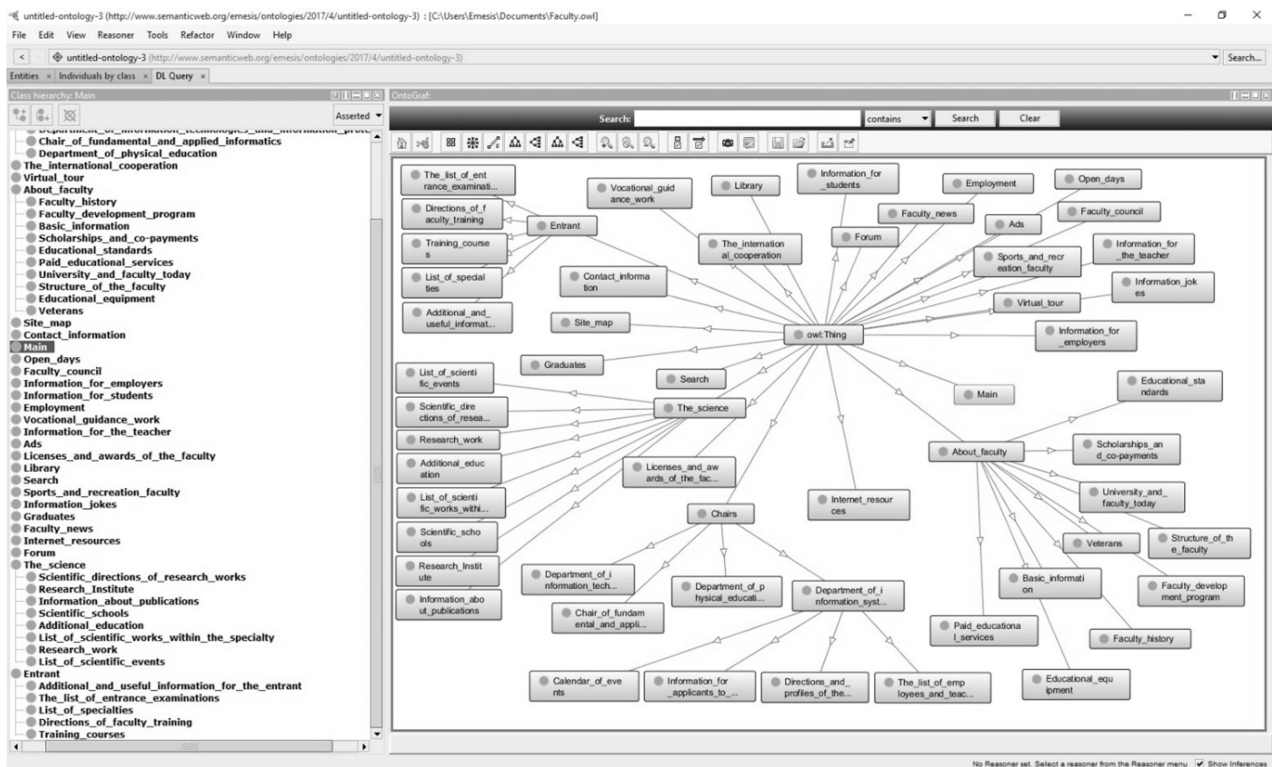
Figure 4. The fragment of the university portal ontology

The created ontology corresponds to the most extent to the knowledge structure of the domain of the educational environment that ensures the relevance of the information search queries. The architecture of the information system based on ontologies is open to additions of new ontologies. Changes in one component do not cause major changes in other components. This architecture of the educational portal allows the development of separate sections, fill them with content independently, make quick changes and add new functionality to the system.

4. Results

Analysis, testing and usability evaluation helps to improve the educational web portal in accordance with the selected quality indicators. The proposed approach allows to coordinate the website content about educational services with the interests of users, which is necessary for effective promotion of educational services. This information is used to reconfigure the structure of the portal in order to attract a larger audience of people who would be interested in the educational services.

The result of our research was the development of a software tool "PROMO-2017" as a means of promotion of educational services for educational institutions. The program modules of the tool can be integrated into the web portals for collection and analysis of statistical data about user behavior in the dynamic mode, for automatic grouping of users with the aim of applying to them the common strategy of marketing communication.

5. Conclusion

The advantages of the new approach for assessment and improvement of education portals for effective promotion of educational services are the following:
Minimization of organizational and financial costs for the promotion of educational services on the base of website.
Dynamic analysis of user needs depending on their online activity and queries, automating the collection and processing of users data.
Adjustable user interface and portal structure according to the user requests and activities.

Effective development and improvement of the educational portal based on the processing of expert assessment, quality indicators and on the evaluation of user satisfaction with portal.

Instant collection of information on applicants and employers, and flexible response of the system would help higher education institution to adapt to changing education markets and consumer preferences.

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