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EVALUATION OF E-COMMERCE WEB SITES ON THE BASIS OF USABILITY DATA

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Introduction

Today increasing numbers of commercial companies are using the electronic forms of doing business. Globally, in 2012 the profits from online trade reached 1 trillion dollars[1]. The European online trading market gained a sales volume of 134,9 billion euro, and according to the analysts in Forester research its growth in 2018 would be 233,9 billion euro[2]. The considerable e-commerce growth rates are due to a multitude of advantages, brought about by this form of making deals, as well as the more advanced web systems used to handle it. Most companies dealing with online trade became aware that the website used for its implementation is an important tool, which can significantly contribute to sales growth, image recognition and finding new clients and partners.

The Internet retail systems are continuously being improved, so as to be able to achieve their main objective – selling goods and services, they initially have to assist in gaining clients' trust. That is the reason why these types of sites have turned into peculiar virtual offices, where the users share their pieces of advice for making purchases; they can also rely on help and communication in real time with a staff member. In order to improve customer relations and apply more flexible servicing and pricing systems, more and more attention is paid to the valuation of e-commerce sites, on the basis of data analysis of consumer visits and behavior.

The objective of the present article is to explain the main points of the process of e-commerce web site analysis on the basis of their usability and to put forward a system of website assessment indicators.

The process of implementation of e-commerce website analysis

The e-commerce sites are the main tools for making online purchases, therefore it is important to be well designed so that they could give complete and correct information about products and services and possess a good module for making purchases online. The owners pay greater attention on tools for analyzing them in order to enhance their success rate. In scientific literature the process of site measurement and traffic gauge is called web analytics (Web Analytics).

The association for digital analyses defines web analytics as a process of measurement, collection, analysis and reporting web data for purposes of understanding

[1] Ecommerce Sales Topped $1 Trillion for First Time in 2012. eMarketer // http://www.emarketer.com/Article/Ecommerce-Sales-Topped-1-Trillion-First-Time-2012/1009649, (31.08.2013).

[2] Beason, M. et al. European Online Retail Forecast: 2013 To 2018, http://www.forrester.com/European+Online+Retail+Forecast+2013+To+2018/fulltext/-/E-RES115752?isTurnHighlighting=false&highlightTerm=233,9, (7.07.2014).

and optimizing web usage[3]. An expert of world renown in this field – Avinash Kaushik explores this concept in a bit broader aspect, as a qualitative and quantitative analysis of data obtained from the website[4]. Besides, he estimates that this type of analysis will bring about changes in the way of doing business on the Internet[5], because measuring results from the online activity allows companies to evaluate site results and enhance effectiveness of their online initiatives.

We think that **web analytics has to be looked at not only as statistics about websites visits, but as a complex analysis of site usage, usability and content with the purpose to improve their success rate.**

In the present article we will only focus on web analyses which are based on data, obtained as a result of the use of Internet e-commerce sites.

The process of analysis of a particular e-commerce web site can be carried out by fulfilling the following steps (see fig.1):

1. Defining the analysis targets.
2. Defining the website measurement indicators.
3. Data collection and data integration
4. Processing data, estimating the value of the selected indicators, retrieving subordination.
5. Analysis of the obtained results and putting changes into effect.

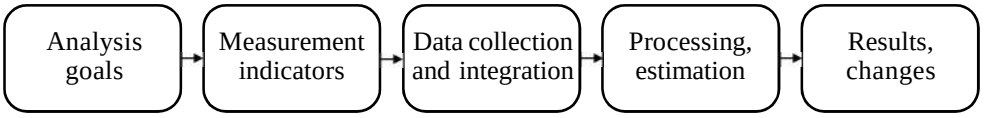

Fig.1. Website analytics process

The main purpose of web analytics depends on the reason for the site creation. Online shops are set up either by new companies which decided to deal with e-commerce as their core business, or well established companies developing e-commerce as ancillary activity. However, in both cases, the main goal of online shops is to sell more goods and services, making greater profit to their owners.

Different indicators can be used to evaluate a website. They help us know if the site is visited, the most often browsed pages, which page visit the site is being left from, the order in which the pages are usually browsed , which other sites the customers visit, the number of pages the typical customer browses, the normal duration the customer stays in the site, etc. There is a multitude of research, regarding data

[3] The Official DAA Definition of Web Analytics // http://www.digitalanalyticsassociation.org/?page=aboutus, (29.08.2013).

[4] Koshik, A. (2013) Veb-analitika 2.0 na praktike. Tonkosti i luchshie metodiki. Dialektika. Moskva, p. 28.

[5] Ibid., p. 23.

analysis for site usability in literature[6]. The authors refer to different combinations of measurement indicators, but they do not give an explicit answer about the choice of indicators. Besides, indicators which are based on researching and detecting hidden links and interdependencies between data are not used. Hence, defining a system of measurement indicators, to our view, is one of the most important elements of the analysis, because, currently, in this field there are a lot of unsolved problems.

The next step in the analysis process is the data collection. As a main source of data, obtained as a result of the Internet sites use for online trade, can be specified:

- log files – text files, also called journals or logs. They help record data about visits in the online shop on the server. They differ in their format, according to the type of the server. They contain the following main data: user's IP address; the moment of site loading; the user's location; the type of browser and operational system, used by the customer, etc. Some of their advantages are: neither site changes are required, nor additional software installation for the log files design; they can pile and analyse large amount of data, including data from past periods; they contain information about visits from search engines.
- data collection through JavaScript tagging method. It represents embedding JavaScript programming code, which is activated with the visit on the respective page from the online shop. The use of this technology allows all visits to be counted in contrast to the log files, which at cache from the proxy server or browser do not register visits. The so called " cookies" are used to identify users.
- additional tools for collecting greater amount and more accurate data, such as the technology of measuring the banner sessions – Web beacons and the special hardware packets for monitoring the traffic – Packet Sniffing.

Having in mind that each method has its advantages and disadvantages it is often required that the enumerated technologies should be used in combination. We think that data integration, collected through the methods mentioned above, would help to obtain more detailed and more accurate information, which would later be used for better personal servicing and generating more precise recommendation for clients, flexible pricing and accomplishing rational deliveries.

For **processing** the collected data specialised programming tools can be used, which process logfiles and data, obtained as a result of particularly developed Java Script codes. For some indicators data obtained from the database of the respective online shops is needed. Moreover, in order to obtain more extensive results, we think, the technologies, based on techniques and algorithms in the field of extracting knowledge from web resources (Web Mining) should be used in data processing. In this way hidden data, dependencies, knowledge that have been unknown before but useful for business in many cases, could be found and studied.

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[6] Jansen, B. et. al. Handbook of Research on Web Log Analysis, Pub. Information Science Reference, Hershey, USA, 2009, pp. 143–164. Kaushik, A. Web Analytics. An Hour a Day, Wiley Publishing, 2007. Melihov, D., I. Sarmatov. (2010) Veb-analitika: shag k sovershenstvu. Kiev: Analitik intellect servis.

The result analysis is an important step, too. It helps to find out why the respective events have happened, to discover trends, to make associations between similar cases, to study the behaviour of each customer or the common behaviour of a large number of customers within the time frame of a certain period. The obtained results represent new knowledge, which grants the opportunity to implement such important elements for e-commerce as individual servicing of each client, better management of customer relations, flexible pricing, reasonable deliveries, working out forecasts for future development and as a whole it is conducive to sales promotion and rise of profits from the trade activity.

After introducing the stages of the analysis process it should be noted, that, when analysing e-commerce web sites it is important to comply to the success rule, defined by Kaushik -10/90, according to which only 10% of the budget is spent on analysis tools whereas 90% - for human resources, which would put the process into effect[7]. The human factor - web analysists are expected to define the basic analysis parametres, to apply innovative approaches and to integrate the selected tools into the entire company analytic information system. In our view, one of the most important task of the web analysists is to **select the appropriate indicators for analysis, which will best expose the strong and weak parts of the website as a basic tool for carrying out the business activity.**

A system of indicators for e-commerce sites measurement, based on data of their usage

As it was stated, one of the primary and unsolved problems in the process of analysis is the classifying of indicators for online shops measurement on the basis of the data about their usability. In different Internet studies one can come upon a wide range of metrics, which refers to all types of websites or take into account the particular business organization[8]. The most popular indicators used for analysis are: number of visits, unique visits and exits, duration of visits, the most popular pages, etc.

There are studies focused particularly on e-commerce, where, according to some authors[9], the most significant indicators are the ones which are explicitly relevant to the activity; the average value of purchase; the average rate of a visit; customer loyalty; percentage of specific clients groups and clients who left. In some other studies on the topic, the indicators are grouped in different categories and the focus is again on the commercial activity, such as sales, marketing and customer service[10] or company profile, product catalogue and promotions, transactions, customer service, smooth use

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[7] Kaushik, A. Web Analytics. An Hour a Day, Wiley Publishing, 2007, p. 81.

[8] Kaushik, A. Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, John Wiley & Sons, New York, 2009, pp. 35-74.

[9] McFadden, C. Optimizing the Online Business Channel with Web Analytics, rchive.today/NRQf1#selection-681.0-681.57, (9.07.2014). Jansen, B. et. al. Handbook of Research on Web Log Analysis, Pub. Information Science Reference, Hershey, USA, 2009, p. 150.

[10] Hayes, M. 32 Key Performance Indicators (KPIs) for Ecommerce, http://www.shopify.com/blog/7365564-32-key-performance-indicators-kpis-for-ecommerce, (9.07.2014)

of system and use of innovative technological solutions in the commercial activities[11]. Besides, it should be noted, that in the quated studies the measurement indicators are measured mainly by mathematical and statistical tools, using primarily data which is obtained from orders to the data basis and seldom data received from log files and javascript codes. As already mentioned, we think, that in order to obtain more accurate results, as well as the characteristics of the subject matter – e-commerce, it is necessary to include indicators, the value of which is gained after data processing and by the methods for extracting knowledge from the Internet resources.

What has been said gives us good reasons to propose a system of indicators for evaluating online shops, based on the collected data for their use. It consists of metrics, calculated in different ways, using plain mathematical and statistical formulae or methods for knowledge extraction. The metrics proposed can be classified in two major groups:

1. Common indicators – the ones, which are significant for e-commerce, but are reliable for most websites, too. The most important ones are:

- Number of visits;
- Unique visitors;
- Repeat visits;
- Duration of site visits;
- Exit rate;
- Number of pages, viewed by one visitor;
- The most popular pages;
- Exit pages;
- Countries of registered visits.

The meaning and the method the indicators are measured is shown in details in Table 1.

2. Specific indicators – the ones which are imposed by e commerce. The most important are:

- Average rate of a visit
- Rate of a visit respective to clients types ;
- Rate of visits respective of countries;
- Clients' loyalty;
- Reviewed goods, which are a good source of profits;
- Successions of connected events and goods, which are purchased together;
- Exceptions and risk control;
- Effectiveness of advertising campaigns.

The meaning and the method the indicators are measured is shown in details in Table 2.

[11] Elliot, S. et. al. Towards a framework for evaluation of commercial Web sites, http://www.ibrarian.net/navon/paper/Towards_a_framework_for_evaluation_of_commercial_.pdf?paperid=133659, (8.7.2014).

Table 1

Common indicators for online shops evaluation on the basis of their usability

Indicator	Method of measurement, significance
Number of visits	It indicates the visitor session for a particular time period. The activation of the online shop in the browser is considered the beginning of a visit, whereas the end is the site exit or the termination of session. If the online shop is not closed for a long time, the customer session is terminated and a 30 minute interval is accepted for session division[12]. The e commerce site traffic has considerable importance, the more the visitors, the greater the likelihood for them to become buyers. Admittedly, the traffic should be targeted in order to bring greater profits.
Unique visitors	It indicates the viewers of a particular site. To register their number, the technology of "cookies" is usually used; when activating a particular site in the visitor's browser a cookie file is recorded via which at a next session the visitor is identified and thus the repeat visits are not counted. Admittedly, the number of the unique visitors can not be calculated with absolute precision, because the client may use a web browser with a setting unable to save cookie information. Even though this metric is a sufficiently reliable indicator to show how many of all visitors are the different ones.
Repeat visits	It measures the percentage of visitors, who have already viewed the online shop. Once again, the technology of "cookies" is relied upon for counting. This indicator shows that the website appeals to visitors, it has aroused their interest and has been useful.
Duration of site visit	It shows the approximate duration of visits in minutes. The duration of visit on each page is usually calculated as a difference between the moment of accessing the page and the moment of opening a new one. The site duration is the sum total of duration of all pages. It should be noted here that, because it is difficult to measure duration at the last visited page in a particular site, it is reported that the duration on this page is 0 minutes. The indicator for duration of site visit identifies to what extent the site manages to attract the attention of viewers and offers them useful content. However, if the duration of visit in an online shop is very high we might consider it is due to the difficult orientation of the viewer, bad navigation, incomprehensible content or a complex system for placing an order.

[12] Catledge, L. and J. Pitkow. Characterizing Browsing Strategies in the World-Wide Web, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.103.4010&rep=rep1&type=pdf, (12.07.2014).

Site exit rate	The indicator shows the percentage of visitors who view only one page and then they leave the site. An online site for e commerce is successful if the exit rate is possibly at its lowest, and this is achieved when the traffic to the page is well targeted. Rendering an account of the site exit rate is essential, because one online shop may have a great number of visitors but, then, it may turn out that the larger part of them do not become its clients and have immediately left it.
Number of pages viewed from a visitor	It is calculated as a relation between the total number of viewed pages and the number of visitors of the website. Generally it is better if the number of pages viewed is bigger which is usually a sign of attractive and useful online shopping. The only exception is the case when the site needs redesigning; because in order to find the required information, it turns out, that a person has to view a lot of pages.
The most popular pages	The most often visited web site pages for-commerce are found. This indicator helps to draw conclusions about the visitors' interests, optimize supply and make offers which live up to the clients' expectations and preferences.
Exit pages	It shows the page from which the visitors most often leave the online shop. All websites are studied apart from the ones where a purchase is finished because then it is logical to exit the site. When the exit pages are analysed the reasons for the exit of the web site can be found; for example, whether this happens after getting to know the characteristics of some goods, after charging the transport fees or after reviewing the proposed ways for online payment of goods.
Countries of registered visits	It gives information about the geographical location the site visits are made from. It is very important for online shops to know which country their main visitors and customers are from in order to be able to offer a wider range of goods relevant to the national characteristics, traditions, and culture of their potential buyers.

The measurement of the proposed general indicators for evaluating an e-commerce website on the basis of its visit rate data can help to define the advantages and disadvantages of the web system for e commerce. Conclusions on the ground of the listed common indicators can be drawn about:

- **the dynamics of visit rate of the online shop** – which days, months, the online shop is most visited. This study can help to look for ways to boost sales during the remaining periods;
- **the interest in the web site**, measured on the basis of the number of visited pages as well as the time for their review. The presence of real interest from

viewers means well organized online trade activity and availability of reliable and working web site for e commerce;

- **goods and services which attract the greatest number of visitors**, as it is possible to increase their supply and meanwhile consider ways for making other goods look more attractive and appealing, too;
- **possible reasons for losing interest in the website** and finding out what exactly does not satisfy the visitors;
- **e-commerce websites having errors** and the opportunities for improving the system for making online purchases, so as this would not cause visitors to leave the site or becomes reason for unsuccessful deals;
- **the tradition and habits of main visitors**, which can help for making promotional and holiday offers, relevant to the national peculiarities of the prevailing clients.

Table 2

Specific indicators for evaluating online shops on the basis of data for their usage

Indicator	Method of measurement, significance
Average rate of a visit	The rate of a visit is measured on the basis of total profits and the total number of visits. It is a significant indicator for defining the traffic quality because there may be a lot of visits in an online shop but few of them may be able to generate profits. The rate of a visit most often measures the effectiveness of the advertising companies. This indicator can also be used for analyzing the system for fulfilling orders, to evaluate if it is sufficiently intuitive, easy to use and contributes to turn the visitors into clients.
Rate of visit according to types of clients	The clusterization method serves to look for an independent group of clients in the whole range of data. The rate of visit is measured on the basis of profits from this client group and the visits made from the independent group. The study of visit rate according to the type of clients contributes to applying differentiated approaches in servicing them. The clients, belonging to an identified segment, respond in a similar way to the applied marketing impacts on them.
Rate of visit according to countries	The indicator is worked out on the basis of data saved about profits by country of origin and the visits made from the respective countries. The results allow the traders to make offers, consistent with the peculiarities of customers in the respective geographical regions.

Clients loyalty	It is defined through close observation of the correlation between new and existing customers. Raising the number of loyal clients entails direct boost of profits from trade operations. To evaluate clients and agents loyalty the methods for classification and clusterisation of website visits data can be used. Thus, the clients who are most valuable for an online shop can be identified, too.
Reviewed goods, which are a good source of profits	From the most requested and visited pages describing the supplied goods and on the basis of purchases made, information is worked out about products which are not only a customer interest but also bring the greatest profits. Identifying these commodities can improve the range of goods.
Successions of connected events and goods, bought together	The method of associating and finding events which happen in conjunction and goods which are bought together is used. On the basis of analysis of added goods into the consumer basket, commodities can be found, which externally do not look connected but are often bought together. The information from server sessions can be a resource for identifying regularities in customer behavior. The succession analysis can assist for planning the stock supplies, too.
Exceptions and risk control	Through extracting knowledge from the collected data we can identify the so called exceptional cases which significantly differ from the norms. The indicator is most often applied when fighting credit card frauds and when attempts for unauthorized access to the systems of e commerce are identified.
Effectiveness of the advertising campaigns	To evaluate the Internet advertising campaigns we most often scrutinize the number and frequency of the advertisement views. As an effectiveness indicator we can calculate the correlation between the number of advertisement hits and the number of visitors on the page where the advertisement is displayed. Advertisements are important for online shops and to be effective they should reach the largest possible number of clients.

The specific indicators contribute to transform the available data into client and business awareness. The results help the managers to make adequate business decisions. The pointed out specific indicators promote the following conclusions about:

- **what the main sources of profits for the online shop are.** On the basis of identification of clients groups with similar demographic, psychological and behavioral characteristics and the available profits from them, conclusions can be drawn about the group the most valuable clients belong to;

- **clients' satisfaction** with the goods and services offered and the e- commerce system as a whole. The purpose is to understand to what extent the needs or expectations have been met and, if required, to improve the quality of service;
- **sources of greatest profits**, these goods and services, which have the greatest number of hits, are preferred and at the same time bought at most;
- **availability of connected goods**, identifying goods, which even though may not have direct relation among them, are often bought together and on this ground generate recommendations for new purchases;
- **success of advertising campaigns**, which are part of the marketing and communication strategy of the company;
- **presence of risk**, connected with online payments and access to the system and its data.

The indicators presented in the two tables, in our view, are essential to e-commerce. They are grounded on data taken from the server logs, which register the visits in an online shop. Although the nature of used data, as well as the methods for its processing, do not give entirely accurate results, we think that they can be used by the business analysts as an additional source of knowledge. The results of their measurement serve as a good ground for obtaining additional and useful business knowledge. Depending on the particular online commercial activity, the analysts may use all or part of the proposed indicators and integrate them into the general company business intelligent system. **We reckon, that the systematic use of all indicators as an addition to the ones that are evaluated on the grounds of data collected from online shop operations, would give the best results**.

In many cases, the choice of analysis indicators depends on the analytical software tools the company has at its disposal. For the analysis based on the usability of e commerce websites, several software tools are usually used in parallel. Most frequently they are: the embedded tools in the systems for deducing statistical information; the web analytics free tools, the most popular of which is Google Analytics and the tools for extracting useful knowledge from web resources (Web Mining), such as RapidMiner, R and others.

Conclusion

As a summary to the above mentioned, we think that by means of processing data collected as a result of e-commerce site usage, one can gain valuable and useful information about customer visits in an online shop, about customer interests, their behavior, as well as the operation of the e-commerce system. The proposed system of key indicators can be used as an addition to all indicators, which are calculated on grounds of data collected in databases of online shops. This is grounded on the application of data mining techniques from the Internet resources and it is essentially significant for improving the processes of customer relations management and other marketing activities, which have an impact on the profits from the commercial activity to a great extent.

EVALUATION OF E-COMMERCE WEBSITES ON THE BASIS OF USABILITY DATA

Assoc. Prof. Dr Snezhana Salova

Abstract

By processing the data on the use of e-commerce websites there can be derived useful information concerning consumer visits in an online store, information on the interests of the buyers and their behaviour, as well as on the functioning of the system for the placement of orders. In the article there is revealed the nature of the process of analyzing websites for e-commerce on the basis of data on their use and is proposed a system of indicators for the assessment of these websites. The proposed key assessment indicators are of significance for the development of the processes in customer relationship management and other marketing activities.

Keywords: *assessment indicators, e-commerce websites, usage.*