The Optimization of Performances for Web Applications by Using Mysql Data Basis

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Abstract
In this study, we have tried to state that in the modern society, traditional commerce must be interwoven with the electronic commerce in order for any trader to withstand the market. Thus, we began by presenting the role and importance of electronic commerce fulfilled by online stores. We emphasized in a theoretical manner, offering practical solutions, on the optimization process of web applications. On one hand, we addressed the problems related to web optimization which increases the number of visitors emanating from the search engines, and on the other hand the data base optimization process, used in the web applications.

Keywords: optimization, online store, data basis, search engines, web designing, electronic marketing

JEL Classifications: M15

Introduction

The technological revolution of the past centuries changed the modality of communication between persons on the entire planet. In this context, Internet became a common communication modality, borders disappeared in the conditions in which, at the present moment, there is the possibility to have conferences with persons situated in different continents.
Electronic commerce benefits of a strategic position in the development of contemporary world economy, emphasizing the dynamic role of small and medium sized enterprises. No stocks, opened 24 hours from 24, no sale persons, accessible from anywhere and almost for anyone, an electronic store is in many aspects superior to a common one.
The paper starts from the presentation of the role and importance of electronic commerce that is realized through the agency of online stores, but emphasises problems connected to the optimization of web applications that are used in this purpose. By describing the steps to realize the content and impact of an online store, it is tried the underlining of new tendencies in electronic commerce. The accent is emphasised on aspects connected to the optimization of the proposed application, at web site level as well as the level of the used data basis.
The purpose of this paper is:

- to show the importance of the Web optimization process which means, creating some web pages corresponding from the content and functionality point of view to some criteria of the search engines (according to some different licenses and settlements) with the purpose to supply the visitors all information necessary and to promote the page in a correspondent manner.
- to supply solutions for web optimization according to the proposed technology (obviously, we all want to be granted first place in presenting some results).
- to offer optimization solutions of the data basis, as we cannot speak about the development of a web application for electronic stores, without using a performing system of data basis management.

The importance that optimization has for an electronic store, resides also in bringing the visitor on that site, after a number of key words that are considered important for the purpose of that page. The web pages possessors elect a number of key words on which they would count in bringing visitors. Results are different from one search engine to another; each having a separate indexing policy, but which, from point of view of optimization differences are reduced. This is the reason for which we consider that the **optimization of Web applications for electronic stores** means:

- Creating some web pages to be correspondent from the content and functionality point of view of some criteria of the engine search (according to different licences and settlements), with the purpose to supply visitors the desired information and to promote the page in a correspondent manner, through this optimization;
- Using some optimization techniques at the level of management system of data basis.

The impact of electronic commerce on informational society

In the last decade, Internet progressed in a formidable tool having a major impact on all life aspects. In this context, electronic commerce became an integrant part from the actual life of many persons due to commodity, efficiency and development of certain order solutions and online payment.

Electronic commerce refers to the development of activities that are specific to business environment (transactions) in an integrated automatic system for the exchange of information, by using electronic means (computer net).

In a larger sense, electronic commerce can be considered an integrative concept, incorporating a diverse scale of support services for business. Between these are included: electronic mail, inter-organizations systems, electronic catalogues, support systems for commerce with goods and services, support systems to take possession of orders, logistics and transactions, systems of statistic report and information for management. The electronic commerce has as objective the development of activities specific for the business environment, using the computers net, in an automatic system. Under technological aspect, the electronic commerce has a large scale of components like: EDI (electronic data interchange), messaging X.400, electronic mail (e-mail), internet, web pages net, intranetul (internal net of a company, enterprise etc), extranetul (net ensuring the electronic exchange of information of a company with its collaborators: suppliers, customers, banks, etc) (Buraga, 2003).

It became a habit that companies became known through the agency of internet, by publishing, with the aid of Web pages, information regarding services offered and on products traded. In comparison with the other classical commerce forms, electronic commerce offers a series of advantages.

From the purchaser’s point of view, the essential gain is equivalent with time factor. The same product or service can be brought cheaper as, in a very short period of time can be visited, virtually, several stores. The purchaser also has the freedom to choose: due to the great number of stores that the customer can visit, this will have the opportunity to elect a product depending on a greater number of options (price, delivery date, colour, etc).

For the companies using this type of commerce there must be taken into consideration the following advantages:

- Substantial increase of the communication speed;
- Significant improvement of efficiency, achieved through easy processing of information introduced by the purchaser, due to the

standardization of virtual documents and/or reduction of the production and purchasing cycle;
- Reduction of some costs as for example of mail or messaging type, as a result of shortening the delivery time;
- Strengthening the relationship with customers and suppliers;
- Fast and easy way of supplying information on the company or its products;
- Alternative sale channels.

The electronic commerce known also like e-commerce, can be realized due to different applications developed on the internet, being able to identify 8 significant types of electronic commerce: electronic store (e-shop); electronic supply (e-procurement); electronic universal store (e-mall); marketplace of a third party (3rd party marketplace); virtual communities; supplier of services having value for channels of electronic commerce; collaboration platforms; electronic brokerage.
The greatest development is of the electronic/on-line stores allowing the administration and management of marketing and sale of specific products or services to a company, offering at the same time the opportunity to take orders, by e-mail or other interactive forms, facilitating the realization of on-line payment.
Starting from facilities offered by electronic commerce, the present paper proposes to present a technological solution of realizing an electronic store that emphasize on problems connected to the optimization of web application and of used data basis.

Objectives and the stages of realization of a web application for electronic commerce

The electronic commerce allows the participation of physical and juridical persons, as well as of state or its institutions. Depending on the relations between these participants, there appeared several categories of electronic commerce.
Regarding the technological solution proposed, there are several aspects (Buraga, 2003) which must be taken into account in the development of web applications:
- Design – the design of the site must be original, consistent, relevant, professional;
- visibility (refers to the apparition of the website on the Internet, to a greater extent as part of the search engines;
- the informational value of the site, from the content point of view (refers to the modality in which the content is presented on the site such as a visitant to find the information researched in a fast manner and in a form which must convince him to stay on the site, to buy or contact us;
- the easiness to use the site (the website must be friendly user, having a simple and intuitive interface and navigation).

To realize web application assigned to electronic commerce, must be transited the following stages:
- **Apprehending the purpose** of the business to be developed on Internet by establishing the objectives of own business on short, medium and long term, the role of the web site as part of the global business strategy and of the online and offline competition context, in which business is positioned.
- **The identification and analyze of the market** – costs evaluation to realize the project: market and audience; competition as part of the regarded market segment; the modality in which competitors approach the road to success, online as well as offline; tendencies of market and audience evolution; technologies to be used in the implementation work; strong points and weak point of the future offer; time, effort

and budget offered to the design stages, promotion and maintenance of the site.

- **Design of web application**:
    - The content of web site, in accord with all standards of a professional presentation. In the development of an application, the content can be realized by the beneficiary of the application and managed through the agency of a content management system (CMS);
    - The structure of web site, so that navigation be easy, clear and ample;
    - The design of the site, such that the graphical elements should not miss but not be too abundant, everything in harmony;
- **Ratification of web application:** syntactic and morphological correctness of texts (grammar ratification); semantic structure of the entire content; composition of the code (HTML, CSS, JavaScript, PHP, MySQL, Flash); general line of presentation of offering; the author right on the obtained application, brand name (mark) and the used logo.
- **Promoting web application** – the activity of promotion of a web application takes into account the following aspects (Buraga, 2003):
    - main coordinates of the promotion campaign (marketing);
    - assignment of the budget and its proportional assignation;
    - the degree of interest of aimed audience, in comparison with own offer, in comparison with the concurrent offers;
    - volume of daily/ weekly/ monthly online researches of the Internet users, according to the words and key expressions that are characteristic to the aimed market segment;
    - the volume of researches having tangential and complementary subject;
    - actual tendencies of evolution of the market and audience;
    - strong and weak points of the present offer;
    - existent content;
    - new key words and expressions, in case their sense is relevant for the present offer or for the general theme of the site;
    - new and attractive content to integrate in an harmonious manner new words and key expressions in the semantic structure of the site;
    - offer (as diversity and modality of presentation) if this thing is necessary and possible;
    - an intense popularization campaign, based on gathering external connections;
    - subscription of the site in: free web directories, manually, free search engines, manually and payment web directories;
    - ensuring the maintenance of the activity of promoting the application:
        - subscribing in a repeated and periodic manner of the site in engines and directories;
        - constant review of the potential of different key words and expressions that are afferent to the market and its tendencies;
        - the content of the site to support in an optimal manner the integration in the syntactic and semantic structure of the new key words and expressions;
        - intense campaigns of gathering links (increasing links popularity);

- the analyze of the promoting activity: the efficiency of online activity development, in a general and particular manner on interest domains (recovery of the investment, the necessity and possibility to realize new small or great investments, monthly positioning in the classification of the search engines and web directories, the volume, quantity and origin of visitors traffic, the rate of visitors – customers conversion, new development opportunities of the business). Depending on the results of the obtained analyses and rapports, it would be proceeded or not to continuing from a certain step from those previously mentioned (afferent to the design and promotion) of the entire process.

In essence, a strategy of online promotion of the web sites is represented by electronic marketing.

According to a more stringent definition, electronic marketing is a promotion plan by exclusive online means of the own site, aiming mainly to attract several new customers and making as constant as possible the existing ones, at minimal costs, with gaining from maximum sales. An essential stage of each marketing plan on Internet is the sites optimization (web pages) especially for search engines and thematic directories of sites of the Internet.

The electronic marketing combines creative and technical aspects of the Internet, including design, projecting, advertising and commerce.

Electronic marketing offers a series of advantages:

1. The development of brand-target relationship which ensures the establishment of a genuine dialogue with all categories of target audience, realising increased adequacy, increase and development of a faith relationship with the potential customer and implicit by the increase if the conversion degree from the potential customers in customers and ulterior in satisfied customers.
2. Fastness – web communication lasts less than mail communication.
3. Opportunity cost for the response through electronic modalities is smaller. So, by using e-marketing it is exceeded a huge impediment connected to the difficulty of obtaining response, being easier to give a reply to an e-mail, click on a banner, introduce some personal information in a formulary on the site or send a SMS.
4. Maximum availability: communication between company/brand and consumers is available non-stop, to anyone with internet access.
5. Control of the actions efficiency – e-marketing allows a better control on the efficiency of the actions: how many persons saw the promo message, how many persons required more information, how many persons proved to be interested in similar products, how many gave their personal data, how many brought, how many repeated shopping, how many had problems with the product, so on.
6. Marginal costs efficiency – the costs for sending messages through e-mail have a marginal cost that tends towards zero, and fix costs for sending some messages on e-mail to a consumer are extremely low.
7. Efficient marketing research - e-Marketing supplies supplementary information on consumer, consumption customs and his declared and effective behavior. There are numerous technical artifices through which can be gathered extremely precious information on target: cookies, spyware, logs from data basis, so on.
8. Easy payment – using method like safety payment by card or services of e-payment type.
9. Multimedia experience – besides text and design, web can offer also a video and audio content, which also takes advantages of much reduced costs in comparison with direct marketing.

Approaches regarding the optimization of web applications for search engines

Optimization of web site – Search Engine Optimization (SEO) is the process of structuring web site to be better indexed by search engines, to be better found at searching different words or groups of words.
Search Engine Optimization of the web sites is neccesary because the search engines like Google, Yahoo, MSN or other bring as an average of 90% from the traffic of the optimised web site. The advantage of optimization for search engines of a web site is that must be realised only once. This process is not instant, it is realized for a long period of time, the first results being seen from the first month, these being in continuous development.
Optimization process for optimal indexing in search engines and web directories is defined by designing and development of the sites in agreement with a succession of key elements aimed by search engines and web directories as the correspondent classification and indexing of the sites, in own databases (Acu, 2003). These key elements, evaluated in conformity with the search engines algorithms, offer to site pages a certain relevance and importance, in rapport with the information field, depending on which the site would be presented in a certain position in the classifications resulted after the researches of the users.
Since the search engines and web directories represent the main online instrument that is used by the majority of Internet users for the identification of web sites and the commercial offers and the costs to attract new visitors – potential customers – are insignificant this way, it can be emphasised in an exact modality the winning potential that an optimization strategy that is efficient on long term offers to each online developed business.
Optimization for search engines can be divided in two categories (Acu, 2003): on-page optimization (usually it is realized as part of the web design process based on some analyses of the concurrence, of the key words, of traffic, of the content and the modality in which the website is seen and programmed) and off-page optimization (is realized after launching the site and includes the realization of a system of back-links to increase the page rank and to position key words in external links).
The most significant optimization on-page techniques are:

- Text between the labels <title> and </title>
- Text between the attribute 'content' of the label <meta name='description' >
- Text between the attribute 'content' of the label <meta name=keywords >
- Name of the field
- Frequency of key word, in page as well as global
- Synonyms of key word
- ALT attributes for images
- Title of the links
- Total number of hyperlinks from and to a page
- The quality of the sites from which links start to a page

A technology of on-page optimization, recently appeared, is the one "friendly url's", referring to formation in an intelligent manner of the links of a site from the dynamic form to a static structure. So, a site containing immediately after the field extension a structure like: ?title=SEO&action=View to be renamed in /visualising/SEO. This solution is allowed due to the extension of the server Apache, named ReWrite and can be activated from the system file.htaccess
The off –page optimization method supposes the registration of the site in many web directories and obtaining external links to ensure a better position in presenting the pages of the search engines.

Optimization of data basis in web applications for electronic commerce

Optimization of the data basis structure

The significant improvements of a web application for the performances with data basis can be brought also at the data level, more precise on the deposit and especially management side, namely information searches and updating (Ullman, 2008).
For the development of web application, the design of a databases represents a laborious activity that requires crossing the following stages: formulating the problem, analyze of the informational requirements and define exit data and entrance data, defining charts, their structure and the relations between charts, optimization of databases structure.
Since the design phases, must be taken into consideration the possible optimizations as part of the process of relational shaping, as well as bringing databases in a normal form (FN3, FN4 or FNBC).
Through the procedure of optimization of data basis it is aimed (Fotache, 2005):

- the reduction of the information redundancy: up to a minimal level and controlled, aiming the elimination of the inutile duplication of some fields in several charts or the elimination of the fields obtained by calculus based on atomic fields.
- minimization of the space that is necessary for data deposit;
- minimization of the risk of apparition of inconsistent information as part of BD;
- diminishing the need of periodical reorganization of the pattern;
- improvement of the base structure, representing different connections between attributes of the data base
- eliminating the updating abnormalities that appear at the activation of the events of introducing, modification and erasing in the databases.

Applying the process of normalization starts from the means of rendering information that are (or will be) presented to the users, like web pages, displays of the applications , rapports and so on (Oppel, 2006). Collectively, these are named user views. Designing the system of data processing starts from the results that the user will see, crossing afterwards the road back to the means used to obtain wanted results (the design variant that starts from the informational issuance to entrances). During databases design, the process of normalization is applied to each view, and the result is a set of normal relations which can be afterwards directly implemented as charts of the relational data basis.
The first normal form has as purpose the elimination of repeated data, namely the attributes having multiple values (multiple values attributes), having more values for the same data raw.
The second normal form fulfils the following criteria: the relationship is first of all normal, all non-key attributes are dependent from the functional point of view by the unique identifier (primary key), taken as a totality.
The third normal form fulfils the following two criteria: the relationship is in the second normal form and there are no transitive dependencies (in other words, all non-key attributes depend only on the unique identifier).

In the Annex no. 1 of the paper, we will present the Entity Relationship Diagram (ERD) a normalised database which can be used in a web application of the on-line store type.

Optimization of MySQL database server

Optimization, no matter the place in which is applied, is a complex process which supposes knowing in details the situation. The same as in the case of the database MySQL server, optimization is complex and depends on several factors. A database server can be sufficiently optimized if we take into account several parameters (Dubois, 2008): RAM memory on hand, the number of processors and the average number of queries in an interval of a second.
The performance of a database server is affected most of all by caches and memory limitations (Schwartz, 2004). If we have an application rolling continuously 50 different queries, these will be solved faster if MySQL server makes a cache for the result. If the server does not have memory limitations well established, it is possible that this requires more memory than is available on the system and as result a part of the information will be on the swap partition as the operation system be able to manage high quantities of information, partition which is slower than RAM memory.

Interrogation optimizations

MySQL is very fast as database system, but even the fastest system can roll interrogations in a shorter period of time if these are optimised. In this purpose we index the charts to allow the database server to search rows in a fast manner; we conceive interrogations so that to take advantages at maximum of these indexes and we write interrogations to influence the planning mechanisms of the server so that interrogations arriving from several customers to better cooperate.
Solving these categories of problems determines the optimization of the database system performance so that this can process interrogations as faster as possible.
Interrogations optimizer is that software component from RDBMS system analysing a SQL instruction to find the best method to roll it. The majority of the modern optimizers are cost-based (Schwartz, 2004), which means that evaluates costs of all possible modalities of execution of an instruction and afterwards elects the one with the lowest cost. An important component of cost based optimizers is represented by statistics obtained from data basis, like the number of rows from each chart and the number of unique values that each indexed column has.
The utilitarian of optimization of the MySQL interrogations has numerous purposes, but its main purpose is the one to use indexes as many times as possible, as well as to use the most restrictive index, in order to eliminate as many rows as possible in a short period of time. To use the optimization utilitarian in most efficient conditions is indicated the application of the following rules (Dubois, 2008):

- using columns of the same type when are used indexed columns in comparisons;
- singularization of the indexed columns in comparisons: if are used columns in a function appeal or in an arithmetic expression, MySQL cannot use index, as must calculate the value of the expression for each row;
- it is not indicated the use of replacement characters at the beginning of LIKE pattern;
- using EXPLAIN instructions to verify the functionality of the optimization utilitarian. It must be verified if in the interrogations are used indexes for fast elimination of the rows. If not, it can be

used STRAIGHT_JOIN to force the realization of a connection using charts in a certain order.

MySQL has a unique characteristic through which offers several depositing engines (Schwartz, 2004), for each new chart can be selected only one type of engine (MyISAM, HEAP, MERGE, InnoDB etc.). The election of the depositing engine has a serious effect on the optimizer and on the performances of the SQL instructions that are applied to the chart.

Conclusions

- the electronic commerce became an integrant part from the present life of many persons, due to the commodity, efficiency and development of some unique order solutions, transactions and online payment.
- The greatest development from the category of Internet applications for electronic commerce is of the electronic/on-line stores allowing marketing administration and management and products sales or of the specific services of a company, offering in the same time the opportunity to takeover orders, by e-mail or other interactive forms, facilitating online payment.
- The optimization advantage for search engines of a web site is that it must be realised only once, this process is realized for a greater period of time, the first results being seen from the first month, these being in continuous increase.
- It is emphasized clearly the winning potential that an efficient, long term, optimization strategy offers to any business realized online, as the search engines and web directories represent the main online instrument used by the majority of the Internet users for the identification of web sites and the commercial offers and the costs for attracting new visitors – potential customers – are insignificant.
- The solutions of database optimization ensure the increased efficiency of the web applications that they use, as we cannot speak about the development of an application for electronic stores without using a performing system of database management.

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Annex no. 1 – Diagram Entity Relation of normalized data basis for an online store