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<https://doi.org/10.32014/2019.2519-1629.41>**N. A. Abilkayir**

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E-mail: abilkayir.nazerke@gmail.com**APPLICATION OF CONTENT MANAGEMENT SYSTEM
BY EXAMPLE OF MUNICIPAL CLINIC**

Abstract. The paper investigates the issues of ready management systems application at creating and managing a site on the Internet. The paper highlights the advantages and features of the Content Management System (CMS) application for site development. In addition, the CMS functioning and its technological structure are described in details, the standard structure of the site is shown, the existing ready solutions are described, the available models of data presentation and its classification are shown. The main problems that could appear during filling the content, site editing are highlighted, and possible ways of its elimination are shown. As an example, the municipal clinic #17 site created using the CMS was analyzed.

Key words: content management systems, information technologies, site building, municipal polyclinic.

Introduction. The adoption of contemporary information technologies in medicine is not a typical thing, but this brings the health care system to the next level as the immediate access to the information and its exchange decreases significantly the time expended to solve a problem, and the time is often a crucial factor for saving the people lives.

The creation of an own site can become a key factor for further development of a medical organization. At the same time the development of sites for municipal clinics is a quite difficult task.

Currently, there are different systems to manage the content. Among others, there is the Content Management System (CMS) that is considered as the breakthrough technology to create the projects of any complexity. The distinctive features of the CMS are high reliability and quality of the performance. In addition, the CMS popularity is gained by its open-source feature. And, at the same time, the system capabilities are the same as of paid contents.

The CMS allows creating the sites without knowledge of html, css and other web-programming features. The CMS also allows quick adding, removing, editing and formatting the content that is important for significant facilitation of the site management process.

The opportunity to add text files and multimedia materials allows enhancing the attractiveness of the site for new users. Another advantage of the CMS application is automated generation of the administrator panel that is connected with all fields of the site operations showing the system convenience and usability.

The application of the CMS for a web-site creating for medical organizations allows improving the level of services quality, makes the medical aid more accessible, allows satisfying the population with the rendered medical service, provides maximum transparency and patient awareness with the results of diagnostics, treatment, health assessment, methods of preventive care and monitoring of its health state. This work describes the application of the CMS for the site creation for the municipal polyclinic #17.

1.1. Technological base of the CMS. For the detailed analysis of individual capabilities of the CMS to create and support the medical organization sites and to understand the difference it is necessary to provide a definition for the CMS and its functions.

The Content Management System is software allowing any user to publish and change by himself the information published in the site without addressing to the site developers. To use the system it is not necessary to have any special knowledge and technologies. However, the training of the personnel is obligatory in the part of learning the system operation, not more [1].

The CMS is usually consists of back-office (infrastructure system) and front-office (user interface). Back-office provides the functionality and information store, and includes the applications servers and port solution. Namely the back-office implements all functional operations and site management, and the front-office is responsible for user features. Front-office has the web-interface allowing editing documents using standard office packages such as text editor, electron table, presentation, mail system etc. [2, 3].

The already in-built design templates of the CMS allow users creating the design of pages and change them minimizing the dependence on developers. The CMS administrator, using a computer mouse, can place different information blocks within the set page, determine its size, color and other features of the site. Another significant advantage of the CMS is Drag&Drop function to manage the site content. To set a new position for a document in the structure or to make a note in the list, it is just necessary to “catch” this position with the mouse and “drag” to a new place the same as it is done with files in Microsoft Windows explorer.

1.2. The structure of the site based on the CMS. The CMS system has two databanks: relational DBMS and file system. The first databank is designed for data published in the site, the second – for presentation elements (templates, images etc.). In addition to the external presentation of the site, there are two specialized workstations [4].

The first workstation is designed for the site developers. Here the developers can set the structure of site and content, change design and site view, set the templates for the information presentation. Usually, these operations are semi-automated. The site setting is conducted using the CMS means, and another part of information is placed manually.

The second workstation allows the site owners and a company staff to place the information in the site themselves. The customer managers operate through the specialized workstation.

Today, the most organizations, independently on its size, structure and type of activity, have their own web-site. The local Ethernet is used by a tiny part of companies. At the same time, the contemporary web-sites of the Companies are based on static pages and as a result the process of the information placement is not visible for users. But this type of operation requires managers to have knowledge and competencies in the field of programming and HTML as the risk of errors is high [5].

The CMS system also allows an employee to renew information quickly without addressing the site developers. The information is renewed itself, so there are no expenses for a developer or the site maintenance. Thus, the cost of support decreases.

The CMS provides a lot of services – search, forum, poll etc., i.e. for the creation of a site based on the CMS the tested ready modules can be used. In comparison with a static site, the CMS splits data and its presentation allowing changing the external view of the site with lower expenses.

When the site is created using the CMS the further information is renewed by non-technical specialists. This became possible owing to the definite web-interface allowing placing information, use definite visual instruments for editing, import information from Office documents. Web-interface is a specialized workstation accessible via the Internet Explorer [6].

One of the key moments is the opportunity of visual editing of the text. The system has WYSIWYG (What You See Is What You Get) – an editor allowing for placing a text and formatting a document without special technical knowledge [7]. Along with a text, it is also possible to place different images – graphs, diagrams etc.; the system has an opportunity to transfer data from the Office applications to the site.

The Microsoft Internet Explorer has a managing element allowing for visual editing. Developers access this managing element and then the results of its work are used. As the system uses the in-built capabilities of the Microsoft Internet Explorer (MSIE), to publish the information it is necessary to use the Internet Explorer. But this is only for developers and owners of the site who replenish and edit the content. As for the site users they can use any Internet browser [8].

During the site content replenishment, the managers encounter with a problem of text placing together with images, i.e. inside the text, not in its beginning or end. The WYSIWYG editor described above does not have this capability. It allows placing a link to the image at any place and requires indicating the server address (URL) where the image is placed. In result, the image automatically appears in the server at the discretion of editor.

To solve this problem it is necessary to modify this software so an image could be placed into the common library. Another way is image link to a definite document, and further during the editing process choose necessary image to include.

The difference of the methods is in quantitative application of images. The first method allows repeated application of the same images, but if its quantity is large it becomes difficult to find necessary one, and deleting unnecessary data is complicated. The second method does not allow using the same image in several documents; otherwise it is necessary to upload an image several times for each document. But the advantage of the second method is more facilitated process of selection and automated deleting of images together with the document.

Thus, the Content Managing Systems allow managers having no technical knowledge and competence to publish information in the site and implement the simple operations on text editing. Text highlighting with italics on the site page is made the same as in Microsoft Word and this capability exists in all systems.

1.3. Existing CMS solutions. At the present time the CMS is one of the most competitive applications in its field. There are several tens of thousands of such applications in the world that can be divided into the following classes:

- closed-source systems;
- open-source systems.

The closed-source applications are mainly used by large enterprises and organizations. The most famous applications among them are Microsoft Content Management Server, Documentum, Plumtree Portal, IBM WebSphere Portal [9].

Due to high price of the project adoption on the base of these solutions, the field of its application is quite narrow and is limited to creation of the Internet solutions for large organizations.

The open source systems have such features as accessibility, source code availability, localization opportunity. At the same time there are the following problems of its exploitation:

1. Lack of technical support – all problems appearing during the process of such systems application are solved by a developer himself.
2. Narrow application field – most often the product was a side result of own tasks solving.

For example, the developers created a site-community for communication. And further, the solution on which the site operates is proposed as the CMS.

It is clear that such solution can solve well the tasks on creating the similar sites, but can be absolutely unpractical to solve other tasks (online commerce, b2b, etc.).

The most famous examples of such systems are OpenCMS, PhpNuke, PostNuke, Portal Starter Kit etc.

1.4. CMS classification. Over the years the Content managing systems improved significantly. The CMS can be classified by the fields of its application [10]:

Portals. Portals are used for information resources; its main goal is to facilitate maximally the publication of papers and news. They can consist of individual modules. Among the most famous representatives of this class are AngelineCMS, Bes-cms, CoolPHP, CPG-Nuke, ве6ZE, Xaraya, xNuke, XOOPS and other.

Engines without SQL. This branch in the CMS elaboration is developed poorly as application of files instead of database tables for storage causes a lot of problems which solving is very difficult. Its advantage is accessibility for content modification and opportunity to be placed at free of charge hosting. This idea was used by the following companies: Cute News, DeeLight CMS, Progressive, SAPID.

Blog. A “blog” originates from English “weblog”. Russian term – “network diary” – this is a site containing author’s private notes. And the notes are links to the sites interesting to the author, and comments to them. The blog can consist not only of links, but online diary of a user. There following CMS can be related to this category: b2evolution, bBlog, BLOG:CMS, MyPHPblog, Nucleus, pLog, pMachine Free, Serendipity, Textpattern, WordPress, XHP.

Forum – is the instrument for communication on the site. The forum messages are similar to e-mail messages – each has an author, topic and content. However, to send a message within a forum, no additional utility is required – it is just necessary to fill a proper form in the site.

A distinctive feature of the forum is that its messages are combined in threads. When one user answers the message of another one, his answer will be “tied” to the original message. The famous forums are FUDforum, openBB, Phorum, phpBB, PunBB, W-Agora, XMB, Zorum, ExBB, IPB, vBulletin.

Stores. A store is any site at which any goods can be ordered. “Goods” is absolutely everything including the access time to the Internet, minutes of cell connection. The virtual stores created using the CMS: MyMarket, osc2nuke, osCommerce, Zen Cart.

Groupware is the software allowing arranging the operation of a company, relations with clients and customers in the Internet network. Usually, this is completely or partially closed part of the site allowing tracking the implementation time of the set tasks, distribution of roles and time standards. It is also possible to raise the issues for discussion for making decisions by higher management. The following CMS are known: dotProject, eGroupWare, MoreGroupware, phpCollab, PHProjekt.

Training (e-Learning) is a distant form of education through the Internet. The distant learning has been used for a long time in educational systems of a lot of world countries. Its main strategic goal is fast renew of knowledge and effective application of the information. There are a lot of such systems: ATutor, Claroline, LogiCampus, Moodle, Segue, Site@School.

Knowledge Base provides an opportunity to collect the experience of numerous developers. Each database has its own distinctive structure; therefore currently there are no definite common solutions. The most famous knowledge base is RFC [Request For Comment] – request for comment that describes a work with a protocol etc.

Billing. Billing is the software that allows providers and resellers to work with clients’ bills. This kind of the CMS represents an integral part of a large system on recording the services consumed by users. The task of the CMS is to render the information on the provided services, add new services, change current parameters, accept payment etc. Often such systems are developed by own means. The billing-panel RuWEB has a lot of service plans allowing paying only for those hosting parameters (traffic, hard disk space, MySQL, PHP, Perl...) that are used to its full extent.

Administrator hosting panel. This class has such products as Direct Admin and Control Panel.

1.5. Models of CMS data presentation. The frame-based data model uses such definitions as class and object. Classes determine the data structure and represent a set of attributes (text string, round number, image etc.).

The class representatives (objects) have definite structure and can include other objects forming undefined hierarchical structure. The objects can copy the properties, content and behavior of the objects they contain. The objects examples are documents, images, folders and users accounts. The content class does not keep real data – such information is stored in objects (class templates). After determination of one class it is possible to create a lot of its representatives (content objects).

The CMS-systems usually keep data in the relational database. In this case the frame-based data model is reflected on the relational database model. The links between the objects are created, for example, using such tables as `id`, `from_object`, `from_object_version`, `to_object` [11].

Usually, the systems based on the object-oriented data model are more functional, flexible, but, at the same time, more complex.

The frame-based data model in CMS divides the content into individual modules by the type of content. The data structure depends on the module and all work with content is focused inside the module. The modules do not depend on other systems and are responsible for the work with documents of this type. The documents are described using definite set of parameters – the types of documents are strictly fixed. The functionality can be enlarged by adding a new module, replacement or editing of the existing code. Usually, the documents of different modules and the documents of the same module are not interconnected. The content of standard set of content (modules) types consists of links, articles, files, news, sections and forums. The obvious limitation of data module did not affect the system popularity owing to the simplicity of its application.

These are such systems as PHPNuke, Joomla! and Xoops. The common shortage of the module CMS-systems is a strict fixation of content structure within the module. At the same time to enlarge its functionality it is possible to use external modules. The distinctive advantage of the frame-based systems is obtaining of almost ready to use portal over a short period of time [12].

1.6. Parameters and elements of the web-site of municipal clinic #17. The clinic web-site of MUS on REM “Municipal clinic #17” of the Healthcare Department of Almaty is located on <http://gp17.kz>.

MUS “Municipal clinic #17” is legal successor of the municipal hospital #2 (hereafter MH #2). Municipal clinic #17 is the polyclinic of mixed type, rendering services for 76500 persons, among them: adults – 55106, children – 21394, kids under 5 years – 8380, women of fertile age – 20238 [13].

The polyclinic uses innovation technologies to render services for population. “Electronic Queuing Systems” are installed at the reception and all departments of the polyclinic where the queues are possible: fluorography, mammography, X-ray, treatment rooms. The time-table of doctors’ reception is actualized in the electronic board “Time-table of reception”, the changes are automatically copied into the time-table of the clinic web-site.

There are also other online informational services, such as “Prescription of medicines”, “Sick notes”, “Fluorography card register”, “Immunoprophylaxis” that systematize and facilitate significantly the work of medical staff.

Digitization of the healthcare system of Kazakhstan is one of the priority tasks of the project “Modernization of the healthcare system” under the implementation of the President’s Address “Third modernization of Kazakhstan: global competitiveness”. The topicality of digitization issues is connected with increasing demand of citizens for qualitative medical services [14]. According to the schedule approved on 04.04.2018 by the Mayor Deputy of Almaty, since May the municipal clinic #17 started to transfer to “Damumed” Program. Since June 1, 2018 the polyclinic operates under this Program to full extent. Every citizen registered to municipal clinic #17 has the electron passport of health. Currently, the electron cards are filled with patients’ data [13].

The application allows people booking an appointment with a doctor from home, receive the results of analysis, and call the ambulance. All actions of a patient in a clinic are shown in the personal profile of a user and in passport of health, and are accessible at every step of aid rendering.

The home page of the municipal clinic #17 is presented in several blocks: the upper part shows the site name represented by a graphic base and text with organization name.

The web-site has the blocks of right menu and main menu. The download of the homepage takes just a few seconds. There is no Flash screen in the site that is the advantage for the informational site. Colors, types and graphics are in uniform style. The main text is black on grey background. The colors of pages design are in balance.

On the left, closer to the middle part of the home page is the news of the clinic. On the right, under the menu of the home page is healthcare news. In the page bottom, under the blocks of menu and news of the clinic there is a clinic contacts block and different videos.

The web-site also has Damumed representing the integrated medical information system. For more convenient use of the site, there is a private profile option allowing receiving electron service for the registered user and members of his family. According to the National standards requirements the site has visually version.

All pages of the site were developed in uniform style. The considered web-site meets the contemporary requirements of target audience. To find necessary information no more than 3 hyperlinks pass are required. The home page is not overloaded with abundant information. Graphic design is minimal and does not hinder the information apprehension. The quality of graphics is good. The colors are pleasant for eyes. The text is easy readable, and does not merge into the background. The site supports scaling and can operate with any resolution starting from 800x600 pixels and higher. The lower angle of any page always has useful links, roadmap and contact information of the organization.

The web-site content corresponds to its purpose. The web-site has all regulatory acts regarding the clinic activity, time-table, regulations and rules of the polyclinic. All information necessary for a user-patient is easily accessible and found. In addition, the polyclinic site shows news and other medical announcements. The information in the site has no syntax or grammar errors, text abundance is not observed. Information is brief, clear and logically correct.

Thus, the considered site is easy for use, understandable, and its content is structured in details.

Conclusion. The conducted research allows making the following conclusion:

1. Any CMS in its base view is just a frame that can be added with additional functions using plugin

modules. These are also mini-utilities that are integrated with the system and implement necessary functions.

2. The application of the CMS for the site creation solves the following tasks:

– reduces the time for the site development owing to ready solutions, to create a site it is only necessary to connect and make settings;

– further exploitation of the site (filling, editing, deleting) does not require a programmer, the site can be managed by the site owner;

– the site operates on a stable system that is constantly renewed and adapts to new realities.

3. The web-site of the municipal polyclinic #17 developed on the base of the CMS application shows the information on the clinic, allows looking through the list of services, provides detailed information on the rendered services, allows booking an appointment with a doctor, receive the results of analysis online, call ambulance etc. Owing to the information technologies the citizens have continuous access to the polyclinic services, the load on medical personnel decreased significantly, and some other issues hampering the operation of other clinics in the country were eliminated.

4. The web-site of the municipal polyclinic #17 allows improving the level of quality, accessibility of medical aid, satisfaction of population with rendered services, ensures maximum “transparency” and awareness of a patient with the results of diagnostics, treatment, health examination, methods of preventive treatment, and monitoring of his health state dynamics.

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САЙТ МАЗМҰНЫН БАСҚАРУ ЖҮЙЕСІН ҚАЛАЛЫҚ ЕМХАНА МЫСАЛЫНДА ҚОЛДАНУ

Аннотация. Мақалада интернет желісінде сайт құру және басқару кезінде дайын басқару жүйелерін пайдалану мәселелері қарастырылған. Мақалада сайтты әзірлеуге арналған Content Management System (CMS) қосымшасының артықшылықтары мен ерекшеліктері көрсетілген. Бұдан басқа, CMS функционалы, оның технологиялық негізі толық сипатталып, стандартты сайт құрылымы мен қолданыстағы дайын шешімдер, деректерді көрсетудің қолданыстағы үлгілері және олардың жіктелуі көрсетілген. Сондай-ақ сайтты толықтыру, түзету барысында туындауы мүмкін негізгі мәселелер және оларды жоюдың ықтимал жолдары аталған. Мысал ретінде CMS көмегімен құрылған №17 қалалық емхананың сайтына талдау жүргізілген.

Түйін сөздер: контентті басқару жүйесі, ақпараттық технологиялар, сайт құру, қалалық емхана.

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ПРИМЕНЕНИЕ СИСТЕМЫ УПРАВЛЕНИЯ СОДЕРЖИМЫМ САЙТА НА ПРИМЕРЕ ГОРОДСКОЙ ПОЛИКЛИНИКИ

Аннотация. В статье исследуются вопросы применения готовых систем управления при создании и управлении сайтом в сети интернет. В работе отмечены преимущества и особенности применения Content Management System (CMS) при разработке сайтов. Кроме того, подробно описан функционал CMS, его технологическая основа, приведена стандартная структура сайта, описаны существующие готовые решения, приведены существующие модели представления данных, показана их классификация. Также выделены основные проблемы, которые могут возникнуть в процессе наполнения, редактирования сайта, и возможные пути их устранения. В качестве примера, проведен анализ сайта городской поликлиники №17, которая создана с использованием CMS.

Ключевые слова: системы управления содержанием сайта, информационные технологии, сайтостроение, городская поликлиника.

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