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DESIGN AND FEATURES ANALYSIS OF GENERALIZED ELECTRONIC CONTENT-COMMERCE SYSTEMS ARCHITECTURE

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Abstract. This article is dedicated to the development of standardized methods and software for information resources processing in electronic content commerce systems (ECCS). In this paper an actual scientific problem of methods and tools development and research of information resources processing in ECCS was solved with the use of designed classification, mathematical tools, software and generalized ECCS architecture.

Keywords: Information management, electronic commerce

PROJEKTOWANIE ORAZ ANALIZA FUNKCJI UOGÓLNIONEJ ARCHITEKTURY SYSTEMÓW HANDLU TREŚCIĄ ELEKTRONICZNĄ

Streszczenie. Artykuł jest poświęcony rozwojowi znormalizowanych metod i oprogramowania do przetwarzania zasobów informacyjnych w systemach handlu treścią elektroniczną (ECCS). W artykule pokazano rozwiązania aktualnego problemu naukowego projektowania i badań przetwarzania zasobów informacyjnych w ECCS z wykorzystaniem metod i dedykowanych narzędzi matematycznych, oprogramowania i uogólnionej architektury ECCS.

Słowa kluczowe: zarządzanie informacją, handel elektroniczny

Introduction

This article describes the commerce content lifecycle phases and management features and services. The detailed analysis of content management systems and prospects of electronic content commerce systems implementation are made. A detailed classification of electronic commerce systems and electronic content commerce systems are developed. Business processes, content flows, tools, content management systems models are analyzed. Content management methods/tools and their advantages/disadvantages are described.

Modern Internet progress causes increasing needs in productive/strategic information and new forms realization for information service [1–38]. An information product or commercial content is documented information that is prepared in accordance due to users needs [2]. Information service is a lot of actions for commercial content users providing. The Internet market is a totality of economic, law, organizational and program relations for information products and services sale/purchase between developers/providers and users [2, 6, 7, 8, 9].

1. The recent researches and publications analysis

The content term has few interpretations according to the application direction [1, 2]. For the computer science area it's informatively meaningful filling (for example: graphics, multimedia) of the information resource [2]; set of all values, operated by information system [2]; generalized notion of data without

pre-defined structure [2, 9]. Information resource is a set of structured/non structured content arrays in information system, for example: libraries, archives/repositories, funds, portals, directories/vocabularies, data banks/bases/warehouses, electronic commerce systems etc. [1, 2]. Commerce content is determined as information resources filling in electronic content commerce system (ECCS); ECCS business process object (for example: article, software, book etc.); structured set of logically completed information, which is an object of relations between user and ECCS; data set without pre-defined structure, that exist only in electronic form; commercial appointment information, indivisible in time; main factor of ECCS activity area formation, functioning and appointment [1, 2, 33–38].

Content distribution market provides technological progress of operational content preparing. It is available through information resources and depends on perception, image, and preservation of his values. Moderators provide content formalization, analysis, structuring and formatting for problems tracking and their resolving in the information system. Content structuring process is unit determination, methods and rules of their combination amongst themselves from smaller to bigger content elements formation [2]. Formed content arrives to data base/warehouse, where it's thematic/ features are defined, for example: electronic publications with bigger demand coefficient from information resource visitors/users (Fig. 1). Structured content is concentrated in ERP/CRM and not only. Non structured content is concentrated in e-mail's, freeform working papers and collective work provision tools and is stored in ECMS and not only [2].

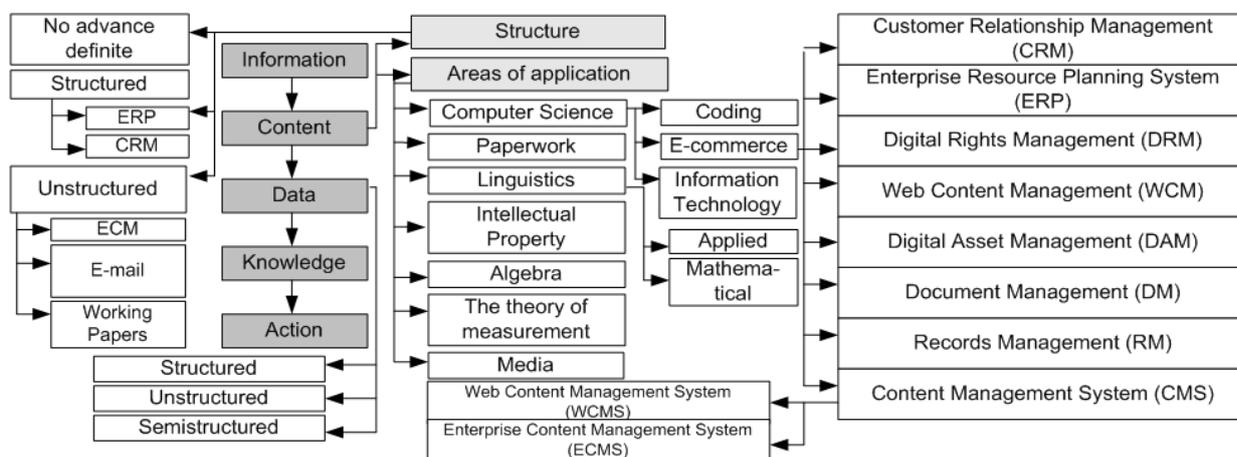


Fig. 1. Structure and directions of content using classification

Content lifecycle is complicated process. Content passes through different stages/phases of publication. It has properties, as teamwork, collaboration, digital assets and versions, inventory management that are supported by various technologies [2]. Existing e-commerce tools are giving system administrator/ moderator various content management possibilities (formatting, formalizing, structuring, adding, editing, deleting), but does not solve automating information resource processing problem. So for content lifecycle realization tools that are producing content formation, management and support processes are required. Content is characterized by renewability/modification time and has a set of specific properties (Fig. 2). Content volume is measured in information quantity units (bit/byte). Content quantity/quality characterizes user's interest degree to information resource, where it is located [2]. Web content is textual, visual, sound content or part of information resource user's experience. Business process management is an important phase of commercial content lifecycle. Commercial content parameter determining as topicality/accuracy (latest information about defined question) requires clear business process management on the basis of workflow.

Economic content is an element of e-business object of economic activity (Fig. 3). Content market based on Internet with information technologies of knowledge management is a tool. It helps e-business functioning with commercial content spreading and its profitability growth for e-commerce subjects [1, 2, 9, 17-20]. Commercial content is object of purchase sale between e-commerce members [2], for example:

- information block that is divided into blocks (exchange rates, weather block),
- other sections/resources, announcements materials (with links),
- referential information (holiday dates, event announcements, and train timetable),
- entertaining information (anecdote of the day),
- advertisement,
- buttons and information partners links,
- statistic buttons.

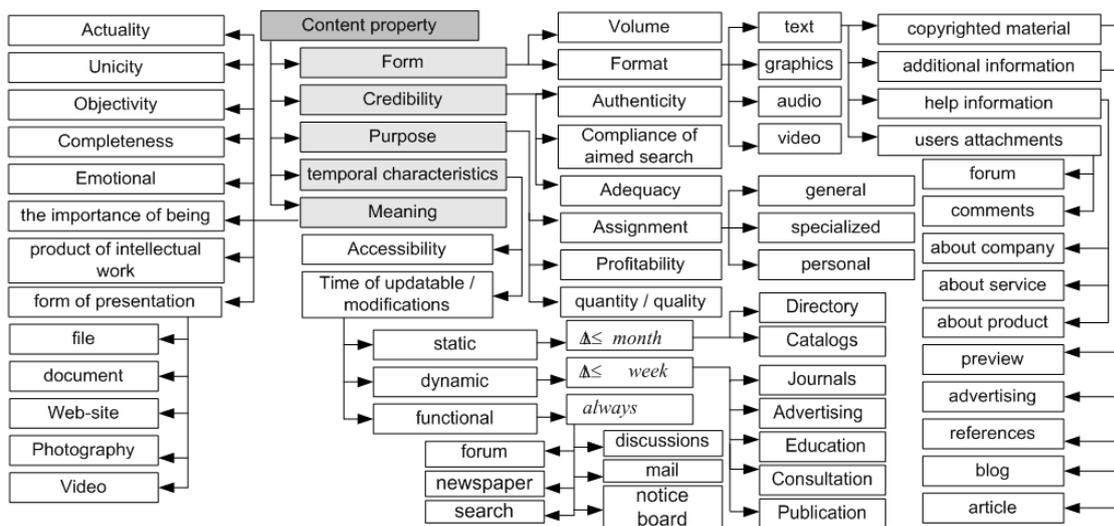


Fig. 2. Main content properties

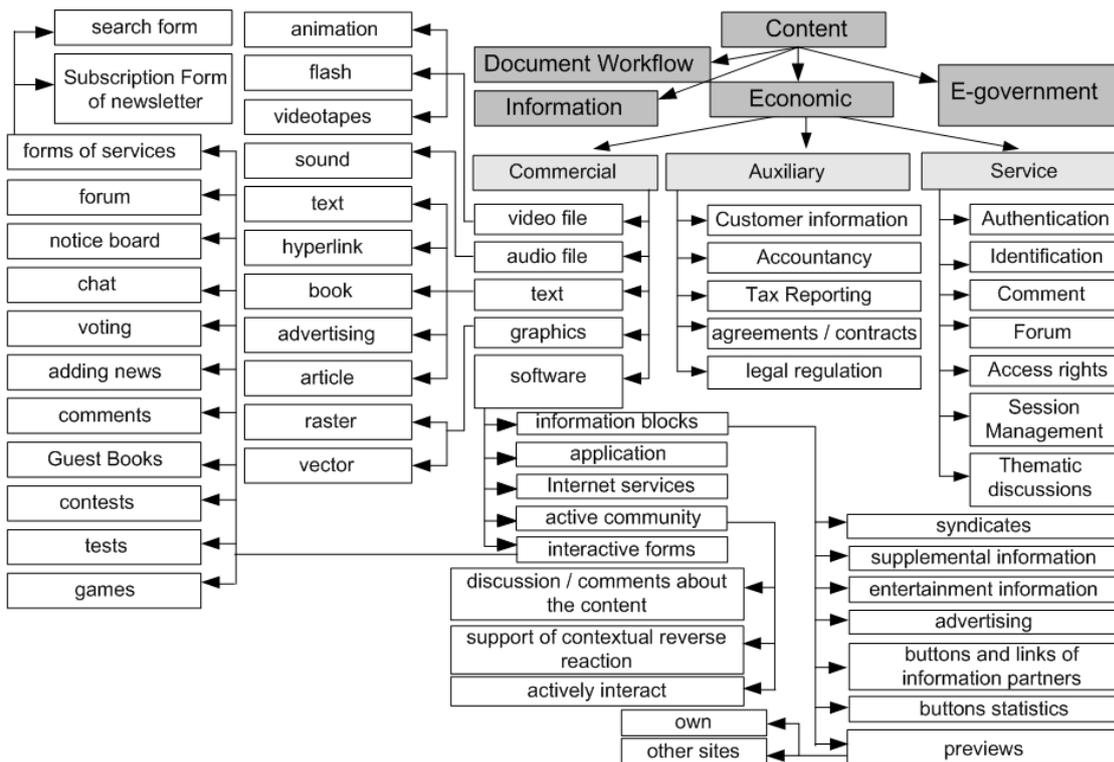


Fig. 3. Economical content classification

Table 1. CMIS standard characteristics [17–20]

Name	Characteristic	Explanation
Standard goals	Single service	It allows application to determine operations set that are performed in the current context, on behalf of a specific user on a specific object.
	Data integration	This work is to provide new applications with existing repositories of archival data and accumulated content in their.
	Authenti-cation	It remains for repositories, protocols and appli-cation
	Language independence	Independent content management of different repositories through Web-services.
	Web 2.0 support	Web-services and Web 2.0 interfaces providing (IT that simplifies application development for Internet perception user changing).
	Openness	Creation and support of independent platform from content language.
	Content formation	Composite applications and content collages development support from several sources, that looks like single unit
	Actions permissions	Repository determinates the allowed actions based on the internal model of authorization.
Standard conceptions	Repository abstraction	It is independent from the main mechanisms for data storage. The standard defines interfaces for the abstraction storage formation.
	Object typing	Basic types of objects in the repository are documents, folders, relationships and politics.
	Types detalisation	Repository determines additional <i>object types</i> for any of the base types.
	Object properties	<i>An object type determines properties</i> schemes that are allowed/required for object.
	Independence from Protocol	The data model and services are independent of the protocol (are supported protocols based on SOAP / REST), that are used for service running.
	Services	Content management services availability.
	Documents versions support	<i>Document</i> objects can be <i>versions</i> (objects of folder, relations and politics are not versions). All methods for <i>documents</i> sending/receiving indicate whether they belong to a particular <i>version</i> of the document or always have the latest <i>version</i> .
	Multiregistration	Repository has the ability to support several document feeding in zero/one/few folders simultaneously. It does not give folders few times.
Object types	Documents	Individual objects in repository that include /exclude one content flow.
	Folders	Organizational containers in which store documents/folders.
	Relations	Free connections only between two objects (documents, objects) in repository.
	Politics	An administrative rules sets, which are applied to objects.
Content management services	Type identification	Identification of <i>object type</i> and other data in repository, including information about additional possibilities offered specific repository.
	Modification	<i>Objects</i> creation, editing and deleting.
	Distribution	Documents distribution in multiple folders.
	Navigation	Implementation of navigation in repository and search by folders hierarchy.
	Versification	Object (documents) versions creation and access providing to version history.
	Search criteria	Samples in any objects repository that satisfy the user-defined criteria for search order.

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EMC, IBM, Microsoft Alfresco, Open Text, Oracle and SAP corporations developed Content Management Interoperability Services (CMIS) specifications on Web-services interface for content management systems interaction (Table 1).

CMIS does not specify security system and its parameters configuration and does not solve integration problems [2, 9, 17–20]. Interoperable Content Application tools interact with content from different repositories via service interface and special module CMIS Implementation that is developing by each CMIS member [2, 17–20].

2. Objectives

Electronic commerce is an e-business separate case (Table 2), where commerce content is valuable asset [1, 2, 9]. For fast business growth effective e-commerce policy is taken into account: intellectual property protection; interactive confidence (content protection/privacy); free/open trading; active investments in its infrastructure [1, 2].

Table 2. Main determinations of e-commerce notion

No	Definition
1	All forms of goods trade and services by using electronic tools, including Internet. It allows to develop new markets, but raises the question of information security and intellectual property [1, 2] that solves the digital legal management.
2	A large set of interactive methods for providing services or selling goods to consumers.
3	Any form of business operations where the parties interact through IT, and not in physical contact or exchange. For example: electronic data interchange (EDI) systems are a processes set of content creating, processing, control, transmission, reception, storage, use and disposal that are performed by the integrity verifying and fact confirmation of its receipt if necessary [1, 2].
4	The use of electronic communications and electronic data processing technologies for the relationship establishment and modification, for value creation between institutions and organizations and individuals.
5	Doing business in online mode in the following areas: direct sales of goods and services; banking and billing; safe placement of content; corporate procurement.

E-commerce system (ECS) is information system with functions set for automatic support of processes in electronic commerce (Fig. 4) [1, 2, 9].

Electronic commerce systems are classified by type of e-commerce member's relationship and main kind of business process flow (Table 3, Fig. 5) [2]. ECS can be classified by type of activity: global electronic marketing; Media interactivity, that changes the paradigm of advertising business and market research; active progress of e-commerce direction; operative services provided at a distance (counseling, law/accounting support, etc.); distance work (distributed offices organization for collaboration from different world parts).

Communication overhead is insignificant. The result is the global markets opening for small and medium businesses, competitiveness and proposals set improving; development of new approaches of ECS modeling and designing; new product implementation as commercial content [1, 2]. ECS implementation is difficult through such problems as costs, value, safety, interoperability [1, 2, 9].

The Internet provides an additional alternative way of e-business conducting. But the ECS should be integrated with existing systems for avoiding of functional possibilities duplication and their applicability, current work and reliability support. ECS is able to automatically content exchanging. Because business reaches cost reductions, improved operation and dynamics increasing of surplus value chains creation.

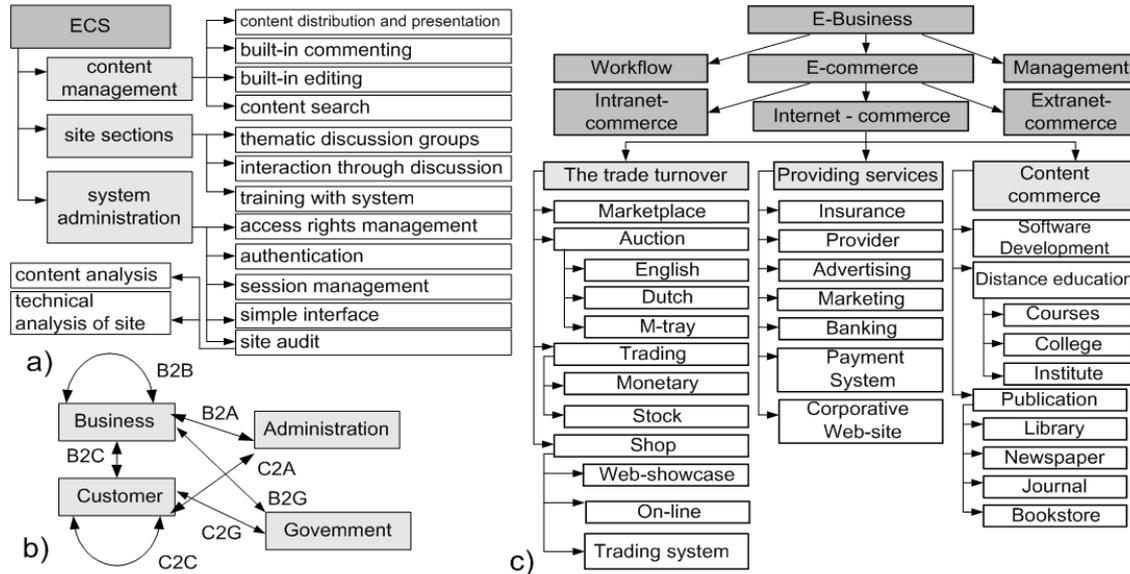


Fig. 4. E-commerce systems a) functions, b) relationships and c) typology

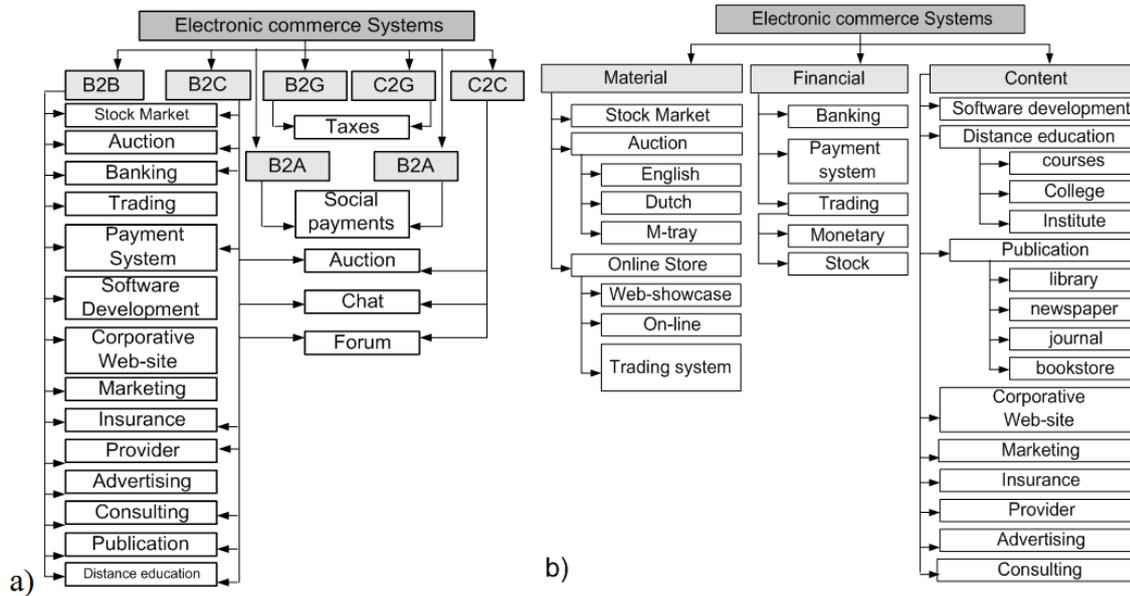


Fig. 5. Electronic content business a) categories and b) processes

3. The main results of the research

Electronic content commerce system (ECCS) is information system of automated support of information e-commerce resources processing and commercial content promoting on global markets (Fig. 6a).

SEC development prospects are caused by economical social and electronic technological, organizational and legal factors. Among them there are significant factors as Internet multi-function, the economic activity liberalization and the economy globalization, the organizational/technical availability and the financial/economic efficiency of e-commerce for market players.

ECCS are divided into universal, specialized, independent and/or highly specialized systems; components of the traditional publisher; corporative, proprietary and/or rented systems

This range depends on the content of information technology type, status, creation method. Content is an important factor of e-business riving (Fig. 6b) with following features as a significant increase in demand for content; fundamentally new technology introduction based on rapid development of e-commerce; rapid expansion of software for ECCS creating. The main areas of marketing services are products/services markets research and business partners search (Fig. 7a).

Content consumers satisfy the information needs of the following ways as information resources or data bases/warehouses visiting; content receiving periodically by e-mail; connecting to specialized information systems/networks. Among the main problems of consulting content providing (Fig. 7b) are isolated non-payments of debtors, cost increasing, tax payments minimization, selling products on the market.

The main perspective research directions are improving/researching methods of e-business strategic planning and improvement; management systems implementation of quality, personnel and content flows; e-commerce technologies implementation. The content flows number is significantly greater than of products displacement ways in industrial plants (Fig. 8).

A considerable part of the content flows consists of easily formalized and automated procedures (Fig. 9) [1]. ECCS is a core of content exchange process. Information resource processing in ECCS is a powerful and effective tool of e-business.

The main e-commerce tool is the electronic content commerce system. Its Web-site is the link between users and system (Table 4).

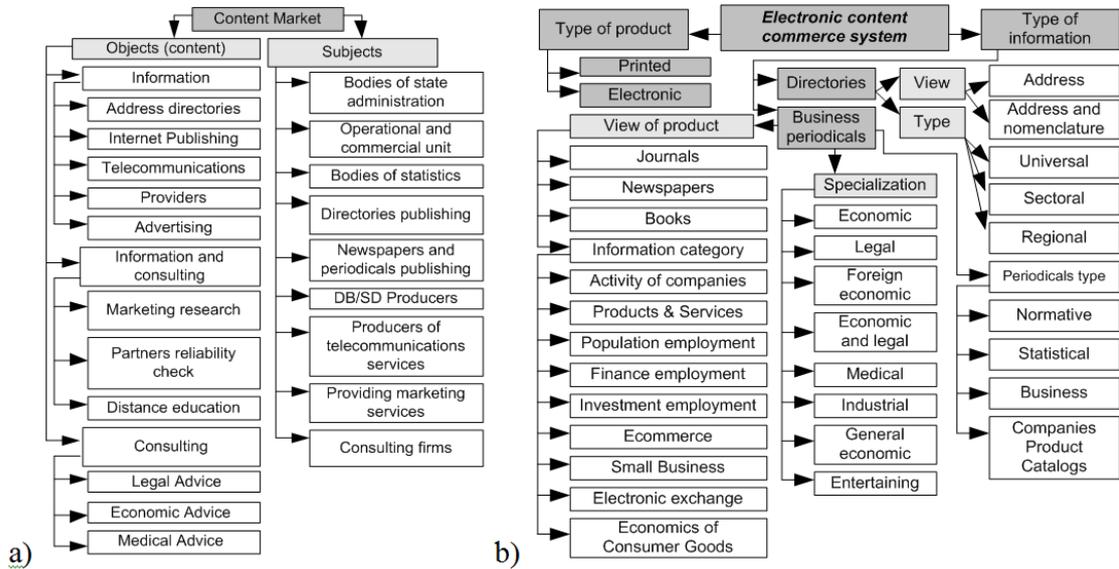


Fig. 6. E-commerce content classification by type of: a) commercial activity and b) commercial content

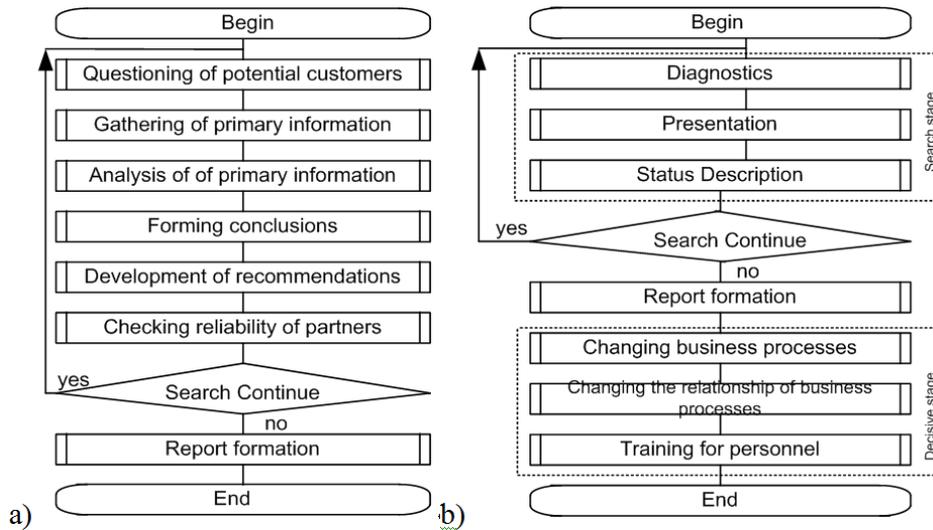


Fig. 7. Stages of granting a) marketing and b) consulting services

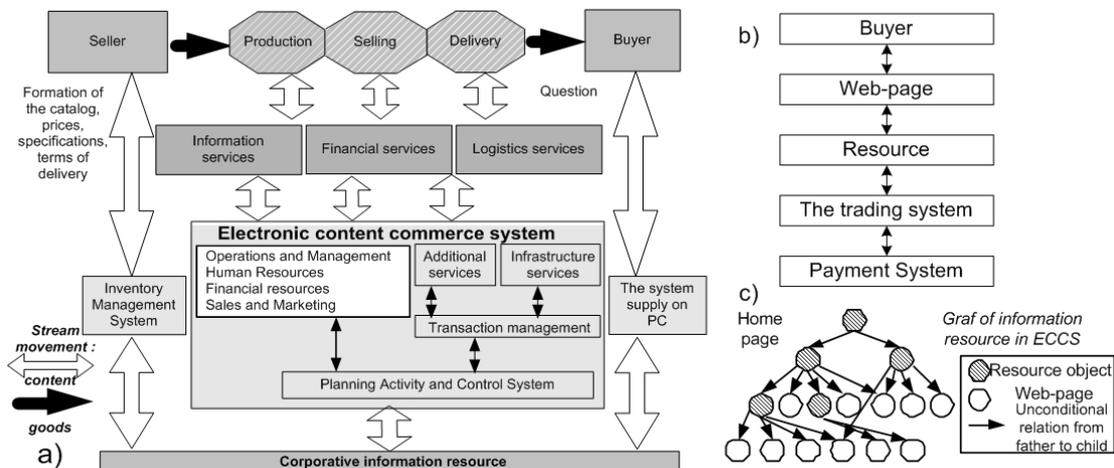


Fig. 8. Content flow scheme in e-commerce systems

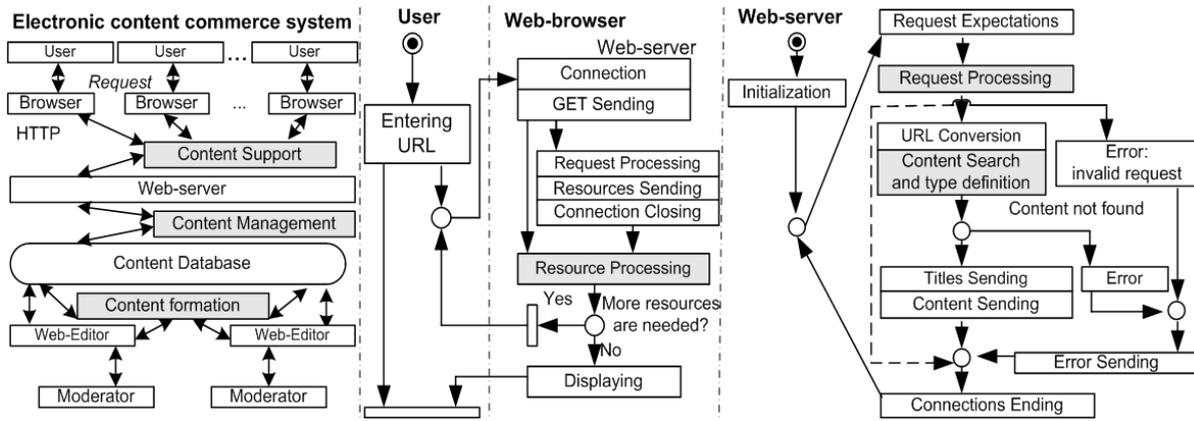


Fig. 9. Electronic commerce system functioning scheme, developed by [1]

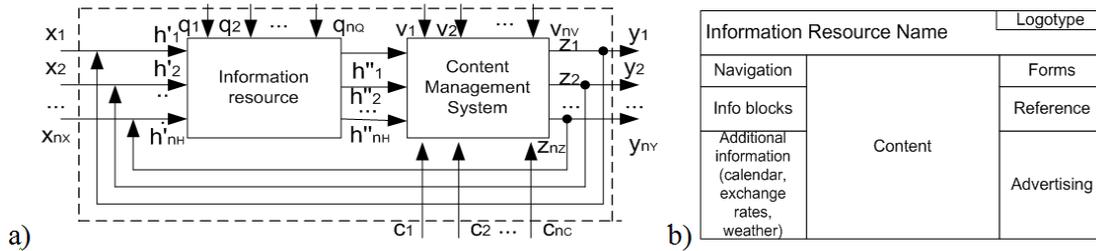


Fig. 10. Structure of a) content management system and b) information resource layout, developed by [10]

Table 4. Electronic content commerce tools classification

Name	Definition
Corporative Web-site	Information page/resource with information about company, project, content, activity type, proposals for cooperation. Information resource with content about company, project, commercial content, activity type, proposals for cooperation etc., which has hierarchical structure and optimal scheme of functioning.
Internet – publishing house	Variety of Internet store, where product is thematic content topical during certain time classified and submitted to information resources.
Provider	Access to the Internet and information services.
Internet advertisement	Commercial promotion of consumer product qualities in order to increase demand.
Distance education	Profile courses or distance education (where content – knowledge variety) with further specialty or document about learning specialty receiving.
Content portal	Complicated system of company business processes and content flows management is established on the basis of corporative information resource and integrated with ECCS.
Internet marketing	Production/sales activities management system of companies/firms, based on complex market analysis, demand, prices, advertisement studying/forecasting, funding and planning coordination, new content sorts creating etc.
Software development	Software designing, development and support on-line via Internet.

Table 5. Content management system components

Name	Marking	Range	Plural
Input system effects	$x_i \in X$	$i = \overline{1, n_X}$	$X = \{x_1, x_2, \dots, x_{n_X}\}$
Users effects on system	$q_d \in Q$	$d = \overline{1, n_Q}$	$Q = \{q_1, q_2, \dots, q_{n_Q}\}$
Content flow effects on system	$c_r \in C$	$r = \overline{1, n_C}$	$C = \{c_1, c_2, \dots, c_{n_C}\}$
External environment effects on system	$v_l \in V$	$l = \overline{1, n_V}$	$V = \{v_1, v_2, \dots, v_{n_V}\}$
Internal system parameters	$h_k \in H$	$k = \overline{1, n_H}$	$H = \{h_1, h_2, \dots, h_{n_H}\}$
System information resource components	$z_w \in Z$	$z = \overline{1, n_Z}$	$Z = \{z_1, z_2, \dots, z_{n_Z}\}$
Content management transaction time	$t_p \in T$	$p = \overline{1, n_T}$	$T = \{t_1, t_2, \dots, t_{n_T}\}$
Output system characteristics	$y_j \in Y$	$j = \overline{1, n_Y}$	$Y = \{y_1, y_2, \dots, y_{n_Y}\}$

Table 6. Commercial content plural amount

Content subset	Published	Not published
Relevant	a	g
Irrelevant	b	d

Content management system, CMS is information system for information resources organization on the Internet, Intranet or Extranet [1, 2]. CMS process functioning output information is data about purpose and conditions of the system that determines main goal of modeling and allows formulating requirements to formal model of S system and content management models. Content management system formal model is set of values $S = \langle X, Q, C, V, H, Function, T, Z, Y \rangle$, which describe system functioning process and create subsets, (Table 5 and Fig. 10) [2, 9, 10].

Values x_i, c_r, v_l, h_k, y_j are disjoint subsets elements and contain deterministic and stochastic components [2, 10]. Incoming effects x_i , effects of the commercial content flow c_r , the external environment effects E and internal system parameters are

independent variables and output characteristics of the system are dependant. CMS S work process described $y_j(t_p + \Delta t) = Function(x_i, q_d, c_r, v_l, h_k, t_p, z_w)$, where x_i is visitors/users requests to the content management system. According to Google Analytics [5] $y_j = \{a_1, a_2, \dots, a_m\}$, where a_1 is number of visits over time Δt ; a_2 is average time on information resource (min, s); a_3 is fault indicator (%); a_4 is reached aim; dynamics (%); a_5 is total number of page views; a_6 is page views per visit; a_7 is new visitors (%); a_8 is absolute unique visitors; a_9 is traffic sources % (search engines, direct traffic

or other information resources) etc. [2]. Values effects c_r, v_l, h_k , on z_w and y_j as a CMS work result are unknown and unexplored [1, 2, 10].

Formal CMS model does not reveal relations between input information, content, output information and content processing processes in system. Content commerce dynamics flow studying and information resources processing model building in CMS are important and actual [2]. For effective commerce content management process realization divide content plurality c_r to relevant/irrelevant and published/unpublished subsets (Table 6), where content plurals quantity is equal to $a+b+d+g$ [1, 2, 6, 9].

In Table 7 are formulas which calculate effectiveness indicators of commercial content search [1, 2, 6, 9]. One hundred percent quality search is impossible because of software tool power limit. Attempts are improved one of the parameters (accuracy/completeness) causes deterioration of another [6].

Dynamic flows of commercial thematic content are leads to limited models, opening way to further researches [1–11]. Content management models are assigned for content flow aging/topicality processes determination. They do not solve formation, content support problems. Commercial content lifecycle models authors suggest and describe several stages with set of properties that are supported by various technologies and processes (Table 8). In certain content lifecycle models project/content/ resource management concepts, information architecture, content strategies, semantic printing is foreseen. Different authors suggest various content lifecycle phases [1–9]. Main phases (content creation, development, view, spreading and activation) are present almost in all offered models [2]. Content management processes, actions, status and role lifecycles vary in models depending on organizational strategies, needs, requirements and possibilities of models [2, 9, 16–32].

Considered content lifecycle models do not solve its formation and support problems and solve not all management problem: presentation set content to user according to his request, stories and information portfolio; automatic digest and information profile formation; thematic story detection and content meaning duplication; building relationship tables and content rating calculation; gathering data from various sources and their formatting; keywords and content notions detections; rubricating and content selective spreading. Existing e-commerce systems don't support all commercial content lifecycle and don't solve main information resources processing problems – content formation and support (Table 9). Lack of general and detailed classification of e-commerce content systems is led to the problem of defining and shaping general methods of design/development functioning architecture/algorithms of these systems. This justifies the research purpose, relevance, appropriateness and directions. Known technology of content management is Internet marketing with Internet-integration, information management, public relation, service work with customers and sales in different areas [1, 2].

Internet marketing uses all aspects and the basic elements of traditional marketing, combined with new research methods and data analysis using modern technology (Fig. 11) [2].

Staying in constant contact with users is effective because of automatically tracking statistics. For its analysis return on investment, rate of return and conversion rate coefficients are used. Conversion or information resource visiting efficiency is relation of information resource visitors quantity, that complete targeted actions on it (hidden/direct advertisers instructions, sellers, commercial content authors, i.e. purchase, registration, subscription, information resource certain page visiting, ad-link transition), to total information resource visitors amount [2]. Successful conversion is differently interpretation by authors (customer buy operation, who got interested in product by clicking on the ad), advertisers or content providers (actions that are

expected from visitors, for example: information resource visitors registration, mail subscription, software downloading). Internet marketing involves the use of strategies and trends of traditional direct response marketing and specialized areas of research that are applied to e-business Internet space. Internet marketing is not only content trading, but information space, software, business models etc. [1, 2].

Table 7. Content search effectiveness indicators

Coefficient	Characterizes a content part	Around content array	Formula
Completeness	Published relevant	Relevant	$p = a/(a + g)$.
Accuracy	Published relevant	published	$n = a/(a + b)$.
Noise	Published irrelevant	Published	$e = b/(a + b) = 1 - n$
Sediment	Published irrelevant	Irrelevant	$q = b/(d + b)$.
specificity	Unseen irrelevant	Irrelevant	$k = d/(d + b)$.

Table 8. Content lifecycle models classification, developed by [1, 2, 16–32]

No	Author	Information resources processing		
		Formation	Management	Support
1	McKeever S.	+/-	-	+/-
2	Bob Boiko	+/-	+/-	+/-
3	McGovern G.	+/-	-	+/-
4	JoAnn Hackos	+/-	-	+/-
5	Ann Rockley	+/-	+/-	+/-
6	Russell Nakano	+/-	-	+/-
7	The State Victoria	+/-	-	+/-
8	AIIM	+/-	+/-	+/-
9	CMP organization	+/-	+/-	-
10	Bob Doyle	+/-	+/-	+/-
11	Woods Randy	+/-	+	+
12	Halverson	+	+/-	+/-

Table 9. Features comparison of electronic commerce systems and electronic content commerce systems

System characteristic name	E-commerce	Electronic content commerce
Product immateriality	-	+
Stable product quantity	-	+
Product variety growth	+/-	+
Storehouse absences	-	+
Keeping product in databases	-	+
Efficiency of product promotion by keywords	+/-	+
Efficiency of product search by keywords	+/-	+
Automatic detection and liquidation of product duplication	-	+
Automatic product aging determination by content	-	+
Automatic product topicality determination	+/-	+
Automatic audience analysis	+/-	+
Automatic digest formation	-	+
Automatic distribution of products between members	+/-	+
Automatic distribution of digests between workers	-	+
Automatic product formation	-	+
Automatic product formatting	-	+
User's experience effect on sales amount increase	+/-	+

Google, Yahoo and MSN raised Internet-advertisement market on new level and segmented Internet-advertisement market, suggesting local advertising services to e-business. Through automation of audience research ROI increases and costs are reduced. The main advantages of online marketing: interactivity, the ability to make the most accurate targeting, the ability post

click analysis to maximize performance information resource conversion and ROI / ROR online advertising [1, 2]. The purpose of the online marketing technology using is the maximum effect getting of the potential audience of information resource with the possibility of instant obtaining of statistics about sales, visits, demand, etc. (Table 10) [1, 2].

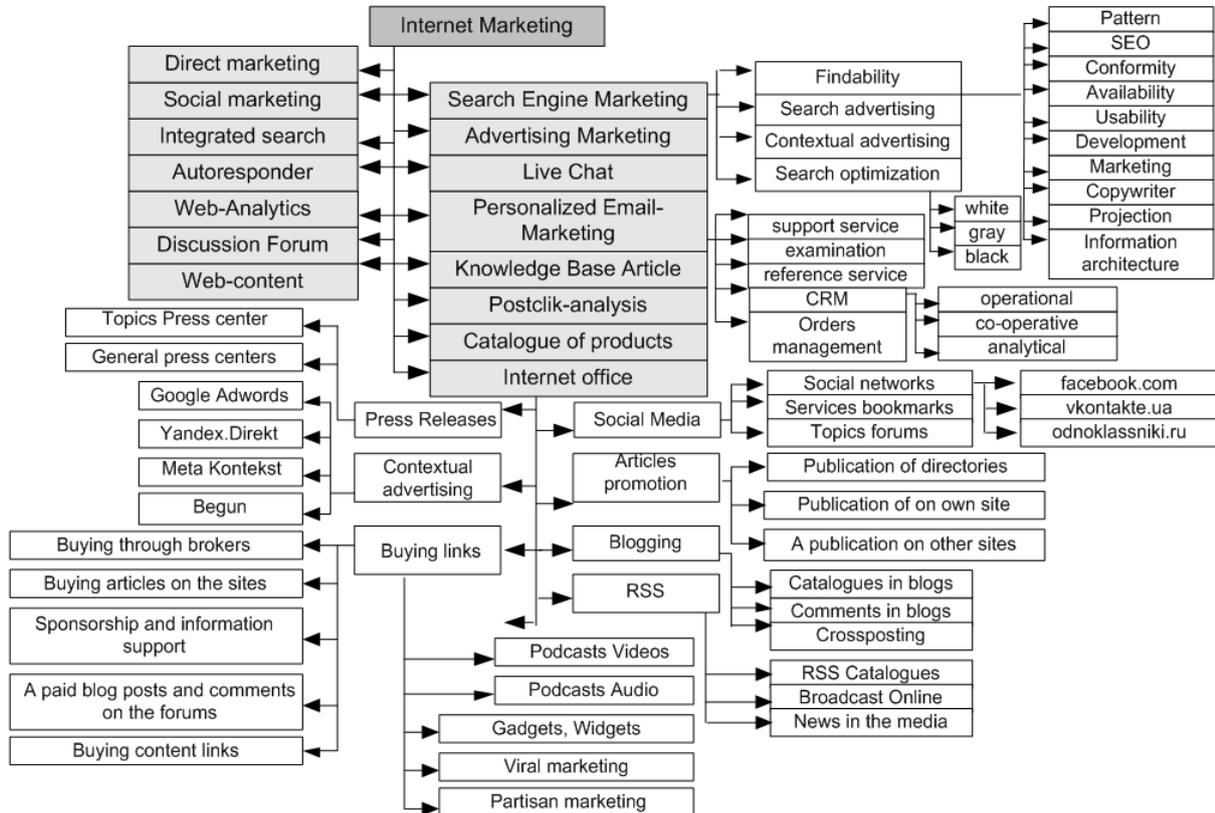


Fig. 11. Internet marketing directions

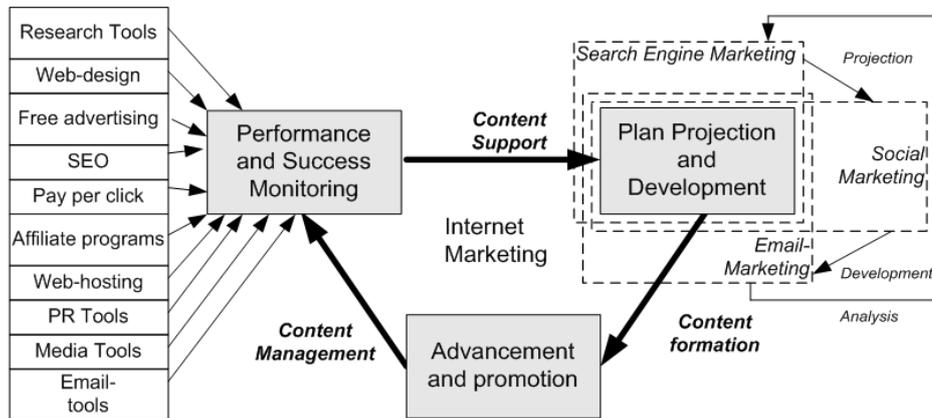


Fig. 12. Internet marketing for electronic content commerce systems

Table 10. Main Internet marketing benefits

Name	Definition
Interaction	System organization principle, when aim is reached by content exchange between system elements and environment.
Search engine marketing, SEM	The process of increasing traffic from search engines, the lists of search results and advertisements.
Targeted advertising	Advertising mechanism that allows to select target audience that meets criteria to show it advertisement.
Post-click analysis	Method of Post-click marketing that maximizes efficiency and information resource conversion and ROI of online advertising.

Table 11. Main search marketing technologies

Technology	Search marketing technology appointment
Search advertising	Dissemination of information in search engines by placing ads with keywords [1, 2].
Search engine optimization, SEO	The set of actions to change the state of information resource (promotion) and elements of external environment in order to obtain high positions in search results for queries [1, 2].
Context advertising	Placing advertisement on thematic information resources [1, 2].

Search Engine Marketing (Table 11) has the following features [1, 2]: work on the specific requests (keywords); relation with search (search engines, information resource search); increasing content findability on information resource; context analysis (content subject, information resource subject, etc.). Usability is overall comfort rate of object using; software user interfaces development concept, oriented for maximum psychological/visual user friendliness; efficiency coefficient of menu design and information resource navigation system performance; ease of use, friendly interface and usability of the software.

Search engine marketing is not reaching advertising purposes due to factors such as [2]: advertised product is not always directly reported; selling service/product is not always a purpose; difficult to increase brand awareness; impossible to bring a new product/service to market. Result of the search engine marketing use is [1, 2]: users attraction to the information resource, where for each individual case is different audience, therefore attracting wide (increasing the overall rate of information resource attendance) or interested audience; spread the content about the information resource in search engines.

The criterion for successful chosen search engine marketing strategy is the information resource visitors amount and the obtained by estimated audience quality accordance. A simple criterion of information resource popularity checking is the dynamics of the external links number on information resources and name mentions increasing of the product/service or trade mark in the Internet. The limiting case of search and contextual advertising is advertisements placing in thematic search results on information resource. The Internet development is contributed to the emergence of new technologies for social marketing optimization and video search marketing. Search engine marketing separation as a separate independent strategy is associated with continued growth of [1, 2]:

- the Internet market volume;
- the market for contextual and search advertising;
- the search engine optimization using [1, 2];

- the need of optimal navigation and browsing in content area that contains textual, visual, animated and/or audio content and/or users experience of the system;
- complex process support of content lifecycle that it is passing during management through various stages of publication.

The ECCS designing and creation process by Internet marketing is an iterative. It proceeds from plan analysis, design and development to prototype creation and experimental tests. That is starting with the specifications and layout formation, template creation, content formation and its position according to the information resource structure (Fig. 12). Developers are focused solutions to business goals and end users needs.

At the initial stages before functional requirements determining and the process development beginning they are connected users by questionnaires, design alternatives and prototypes of varying degrees of readiness. That is collecting valuable information that is causing a direct involvement feeling in the user at the design process and is gaining their trust.

A well-known analysis method of textual information is content analysis. It is standard research method in the social sciences (Fig. 13), the object of which is to analyze the content of text arrays and communication correspondence (comments, forums, emails, articles, etc.). The concept of content analysis has no unambiguous definition [2, 9, 11], so systems that are based on different approaches are incompatible. The use of content analysis of the text in the electronic commerce content systems has several advantages for simplifying business and solving a number of problems faced by participants in business processes, namely: user content filtering on information resource; the ability to automatically create a "portrait" of permanent user by analyzing his comments; the ability to automatically create a "portrait" of the target audience by analyzing the "portraits" of regular users; reduce the number of information resource moderators in ECCS; reducing the time for posting content to information resources through its automatic processing, not moderators; elimination of the language barrier through automatic creation of dictionaries and regular user automatic translation.

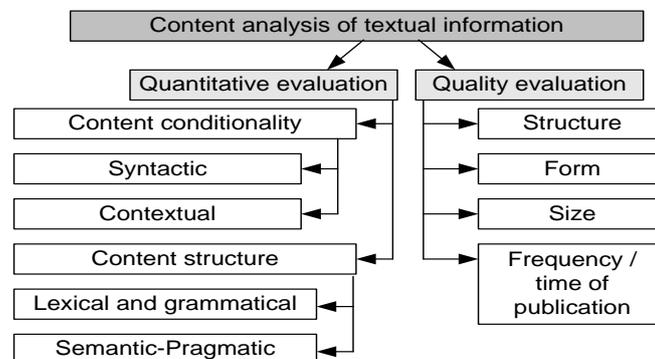


Fig. 13. Textual content analysis mechanism

Most definitions of content analysis are constructive, i.e. procedural. Due to different initial approaches they generate different algorithms, which sometimes contradict each other. Existing various approaches to content analysis understanding are criticized [11]. The biggest doubt is ignoring the role of context, but the practical value of the method avoids many contradictions.

Combining tools and methods and natural selection by repeated evaluation of the results make it possible to select or confirm knowledge and actual power/usefulness of the tools. Thus, content analysis – a quantitative and qualitative analysis of numerous texts for further meaningful interpretation of the quantitative and qualitative patterns. Content analysis used in the study of sources invariant in structure/content and existing as no systematic randomly organized text [2, 9, 11]. The content analysis method is the abstract model formation for content template with different textual set.

There are two methods of content analysis: quantitative and qualitative. In the study of the mechanisms of generating text in [9] found that the choice of models describing the content depends on the construction of probabilistic-linguistic testing and selection of some of its units. Simulation of the text and its components is the first step to describe the features of its linguistic units. Analysis of the language via probabilistic text modeling based on methods of quantitative linguistics, probability theory, mathematical statistics, information theory and combinatory. In linguistic studies, such as content search [9], there are tasks, associated with the a relevant number emergence prediction of classes' word forms/phrases in a given length segment. Modeling text, compositions, phrases, and grammar classes determines sample size that is required to provide with a certain probability of appearance at least once relevant linguistic unit [9]. Quantitative assessment of meaningful information in the text, words and phrases are based on the value of syntactic information

and contextual conditioning [9]. Hypotheses about the most probabilistic extension text built on the basis of two types of combinatorial restrictions: combinatory figures (letters and syllables) and combinatory signs (morphemes, words, phrases) [9]. At the fifth text symbol step combinatory of letters and syllables are suppressed by restrictions that related to the compatibility of morphemes and words. When deploying text on word combinatorics restrictions are pilling with combination of phrases and sentences, limitations associated with combinatorics paragraphs, sections of the content. When guessing letters far enough from the beginning of the content is located, basing not on static letters and syllables combinatorics, but on meaningful (lexical and grammatical) text building. If the text removed from the initial portion of content serves as a quantitative assessment of the distribution and statistics of letters, the syntactic information from remote sites from the beginning of content serves as a reflection of the content (semantic-pragmatic) information. These considerations make it possible to offer content analysis method for quantitative evaluation of the content and information content segments.

Content tone determination based on text analysis is harder than spam detection. Finding spam considers two hypotheses (spam, not spam), determining tone requires emotional tone check (positive, negative, neutral) and their combinations. In Bayesian method for spam detection base assessments are used as two buildings content, one of which is made up of spam, and the other – no [7, 8]. For each content count frequency of each word and weighted score is from 0 to 1, i.e. the conditional probability that the content of this word is spam [7, 8]. Weights value close to 1/2, not taken into account while integrated calculating, so words with such weights are ignored and deleted. On detecting new events from the stream of content, which series to the input ECCS from scanning tools or content router and caused by thematic query, new events are revealed, described in content [7, 8]. Plot strings of similar content are formed for them. Content, which represents new event, is interdependent content cluster base (Table 12) [7, 8].

Main ECCS management tools is content management system [1, 2]. CMS has to match certain set of requirements (Fig. 14). Usually such systems are used for saving and publishing huge content amount (documents, pictures, music, video etc.). Similar CMS allow managing textual and graphic filling, giving to user convenient information saving and publishing tools. CMS do not support all content flow lifecycle and do not solve main information resource processing problem – content support and formation [1, 2]. Main CMS disadvantage is connection absence between incoming information, content and output information. CMS are often used to builds ECS and ECCS (Fig. 15) [1, 2].

Table 12. The process of new developments identifying

Author	Stages of new process detection
G. Salton	<ol style="list-style-type: none"> 1. First reviewed content is associated with first cluster. Each class shown as terms vector (keywords), which are included in clusters content. Normalized or approximated by certain criterion terms vector is centroid. 2. Each next content is compared with available clusters centroids via measure of proximity. 3. If content is close enough to certain cluster, than it is credited to this cluster, where after appropriate centroid is recalculated. 4. If content is not close to available clusters, then new cluster is formed, and new content is credited to it. 5. Content time range is an observation window. Cluster, all content of which goes outside observation window, is not considered. New event corresponds to each new cluster, shown is this cluster content.
R. Papka	<ol style="list-style-type: none"> 1. Requests by themes formation (Text Mining is used to detect and choose notions from content). 2. New incoming content is compared with available requests. 3. If content doesn't match requests, he is associated with new event. 4. New request is added into system, which matches such content (optional).

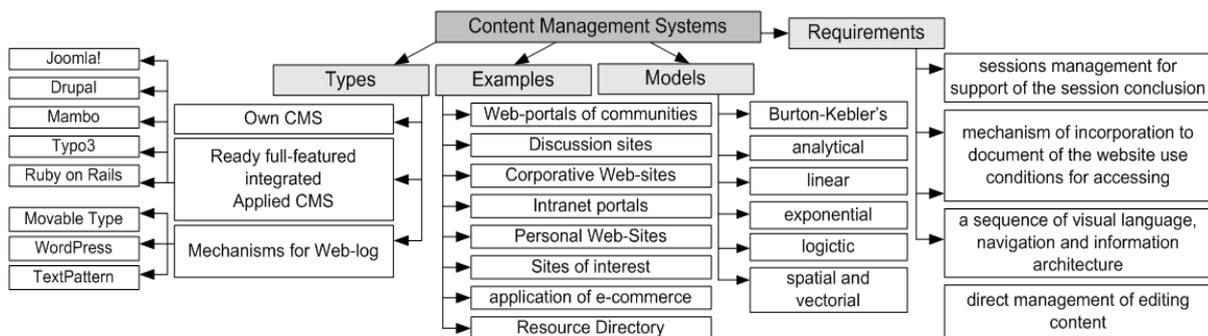


Fig. 14. Content management systems features

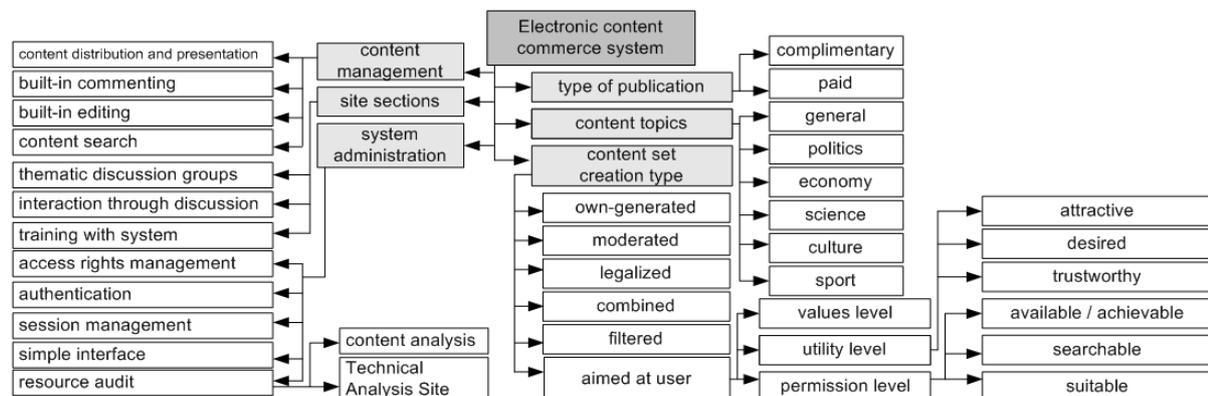


Fig. 15. Main components of ECCS

Web Content management system, WCMS is a tool (Table 13) for modeling information resource branched structures in ECCS and managing their content [1, 2] without having special technical programming skills or html-layout. WCMS is developed for content generation in applications with such problems as dynamic gathering, content caching, safety etc. [1, 2]. CMS provides control on access information resource and alteration and designed to simplify as much as possible information resource management process while keeping setting and control flexibility. Main information resource components in CMS showed in Table 14. Content

value determines his appeal for user. Content integration makes information resource attractive and application integration – useful. CMS using do not require software installation. Browser is used for editing and administrating. Intuitive system interface and work simplicity facilitates information resource management and lowers further spending on his support. CMS includes such possibilities: fast update and content search in information resource; data collection about clients and potential clients; surveys formation and editing; information resource visiting analysis.

Table 13. Main content management systems characteristic for ECCS, developed by [1, 2]

CMS name	Software requirements			Installation simplicity	Learning curve	Session management	Users management	Extensibility	Scalability	Themes using	xHTML/CSS
	Web-server	Database	Language								
Ruby on Rails	Apache, FastCGI	MySQL, PostgreSQL, SQLite, Oracle, SQL Serer, DB2, Firebird	Ruby	+/-	+/-	+/-	+/-	+	+	+/-	+
Drupal	Apache IIS	MySQL, PostgreSQL	PHP	+/-	+/-	+	+	+	+	+	+
Mambo	Apache IIS	Apache IIS	PHP	+	+/-	+/-	+	+/-	+	+/-	+
Typo3	Apache IIS	Apache IIS	PHP	-	-	+	+	+	+	+/-	
Movable Type	Apache IIS, Jetty, Tomcat	Apache IIS, Jetty, Tomcat	Perl	+	+/-	-	+/-	+/-	+	+/-	-
Word Press	Apache, mod_rewrite	Apache	PHP	+	-	-	+/-	+/-	-	+/-	+
Text Pattern	Apache	Apache	PHP	+	-	-	+/-	-	-	+/-	+
Joomla!	Apache	MySQL	PHP	+	+	+	+	+	+	+	+

Table 14. Main content management components, developed by [1, 2]

Name	Content management system characteristics
Menu items	Addition, editing, information resource of any level menu items management.
Articles	Addition, editing, planning and articles publication (information resource pages).
News	Addition, editing and news publication.
Photo gallery	Possibility of galleries with under galleries work, automatic photo zooms.
Notice board	Adverts with photo, description and contact details addition.
Settings	All settings of information resource and his management system storage.
Users	Rights management of registered users.
Catalogue of companies	Addition, editing, publishing in under groups of any inset.
Survey	Addition/editing of surveys, results as graphs.

4. Conclusions

An analysis of commercial content formation methods is made. And popular content lifecycle models and standardized content management services are researched. This gives possibility to determine requirements for creating optimal commercial content lifecycle. Internet technologies for construction of service oriented electronic commerce system are researched, what gave possibility to classify electronic commerce systems and electronic content commerce systems. In detail information resources and production processes of electronic commerce systems are reviewed, what gives possibility to develop optimal content lifecycle and typical electronic content commerce system architecture. The content management technology in electronic commerce is analyzed, what gives possibility to develop formal models, unified methods and software information resources processing in electronic content commerce systems. The modern methods and tools of electronic content commerce systems designing, modeling and realization from system approach position are analyzed. Also the necessity and feasibility of unified methods and information resources processing software creation is justified.

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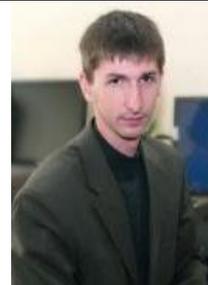


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