Online Community Information Model for Use in Marketing Activities

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Abstract. Some aspects of the use of virtual communities in the marketing activity of the enterprise have been considered. Based on a formal description of characteristics, data on online communities and discussions and their analysis results, an information model of a community for online marketing has been built, which serves as the basis for a database structure for accounting of information flows in online communities. The problem of determination of indicators of relevance and importance of online communities for marketing, use of these indicators in solving community selection tasks for participation of representatives of the enterprise has been considered. The use of the database provisioning in the process of creating, verifying and distributing marketing messages in virtual communities has been proposed.

Keywords: Online Marketing, Online Community, Information Model.

1 Introduction

The use of virtual communities in the marketing activities of the enterprise requires all participants in the communication process to make strategic and immediate decisions regarding specific actions and marketing events. The availability of the component of decision support demonstrates the technological maturity and completeness of the project of the enterprise's comprehensive IT penetration.

Among the typical tasks, the key ones with regard to the activities in online communities are the choice of the strategy for using communities in marketing; selection of online communities for certain activities; analysis of the effectiveness of marketing information flows in the virtual environment.

An important aspect of successful online marketing in an information-intensive environment of the online communities is the use of the state-of-the-art IT solutions, custom-made mathematical tools and software in all parts of the process. In particular, there is a need to process large pools of data in real-time, in the data mining and automation of some processes and tasks.

Some aspects of the company's activities in the social media of the Internet are the subject of research on information retrieval and analysis of web space content [1, 3, 9,

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11, 12, 20], development of methods for building and managing web communities [7, 13, 14], positioning of websites in the global environment, management of information activities of the company in the networks of sites [21, 23, 25, 27], organization of marketing in online communities [8, 10, 15, 17, 24, 26, 28]. The have investigated the use of international standards of quality management system in higher educational institutions. It has been found that the effective work of a university, in order to provide educational services, depends on the implementation of quality standards ISO 9001 [6].

The concept of relevant and important for marketing online communities and discussions has been introduced in [5], while the basic strategies for using online communities in marketing, the necessary resources and risks during their implementation have been defined in [4].

2 Information Model for the Virtual Community for Online Marketing Needs

2.1 Formal communities' data model for online marketing

Competent activity of a marketing expert in virtual communities should take into account the peculiarities of the communication process in online environments, in particular the availability of certain traditions and rules of interaction between community members. Formalizing the communication process, analyzing and computer-based accounting of the characteristics of online communities and marketing information flows provide support for the activities of the marketing expert during the generation of marketing messages and participation in discussions.

The structure of the online community VC_i from the array

$$VC = \{VC_i\}_{i=1}^{N^{VC}}, \tag{1}$$

of online communities that are used in marketing is described as follows:

$$\begin{aligned} VC_i = \langle & NameVC_i, DiscrVC_i, TechVC_i, RuleVC_i, RuleLangVC_i, \\ & StatVC_i, RThVC_i, AdvVC_i, AnRELVC_i, AnIMPVC_i, TpVC_i \rangle, \end{aligned} \tag{2}$$

where $NameVC_i$ – is the name of the *i*-th online community; $DiscrVC_i$ – description of the *i*-th community; $TechVC_i$ – technical specifications of the *i*-th online community; $RuleVC_i$ – the rules of the *i*-th community; $RuleLangVC_i$ – communication languages in the *i*-th community; $StatVC_i$ – statistical data of the *i*-th community; $RThVC_i$ – relevance of the topic of the *i*-th community with marketing topic; $AdvVC_i$ – recommendations for working with the *i*-th online community; $AnRElVC_i$ – results of the analysis of the relevance of the *i*-th community; $AnIMPVC_i$ – results of the

analysis of the importance of the *i*-th community for its use in marketing; $TpVC_i$ – discussions of the *i*-th online community.

The technical specifications needed in the process of using the online community to solve marketing problems are described as follows:

$$TechVC_i = \langle URLVC_i, CMSVC_i, MLVC_i \rangle \tag{3}$$

where $URLVC_i$ – the website address of the *i*-th community; $CMSVC_i$ – community site management system; $MLVC_i$ – markup language (BB Code, HTML, etc.).

The rules for online communities are usually presented in a free unstructured text format, which makes it impossible to directly enter them into a specialized database. Therefore, it is necessary to analyze the rules manually by certain definite features. The list of features for formalization and subsequent computer accounting usually depends on the task. The main characteristics that are subject to accounting are the following:

- languages of communication;
- permission to publish advertising materials;
- restrictions on the use of graphic images (size, type list, possibility of connecting external files);
- restrictions on the use of attached files;
- restrictions on user names (case, the Roman/Cyrillic characters, aliases, site addresses);
- restrictions on user's photos (admissibility and user image size);
- restrictions on user's signature (number of characters, number of rows, admissibility of graphic images, admissibility of references);
- restrictions on links (admissibility of links, admissibility of referral links).

Community rules regarding the languages of communication of their participants $RuleLangVC_i$ are important in the process of communication, preparation of promotional and informational materials. The linguistic characteristics of the target audience are taken into account when creating an array of marketing terms that are used for searching for relevant online communities.

To describe the rule for using the language of communication $Lang_j$ in the community VC_i, we introduce the function of defining a priority $PLangVC_i(Lang_j)$, the value of which is: $PLangVC_i(Lang_j) = 0$ - if the language is not used in the online community; otherwise, the function value (integer) indicates the priority of its use when communicating as compared with other languages. Then the language use rule in the online community is described as follows:

$$RuleLangVC_i = \{PLangVC_i(Lang_j)\}_{j=1}^{N^{Lang}} \tag{4}$$

where $Lang_j \in Lang = \{Lang_j\}_{j=1}^{N^{Lang}}$ – j-th language of communication from the array of communication languages that a company uses in marketing in online communities.

One way to adapt marketing actions to the requirements and traditions of online communities is to use recommendations when creating messages. These recommendations are obtained as a result of the analysis of rules and community traditions. The structure of recommendations $AdvVC_i$ regarding the work in the community is recorded as follows:

$$AdvVC_i = \langle AdvUserVC_i, AdvPostVC_i \rangle \tag{5}$$

where $AdvUserVC_i$ – recommendations for the optimal version of the user name of the i-th online community (nick, real name and surname, website address, company or product name); $AdvPostVC_i$ – recommendations for the creation of posts in the i-th community, which should contain the following information:

- expediency of using in-depth formatting and a large number of links in one message;
- expediency of using advertising graphic objects;
- optimal size of the message;
- additional linguistic characteristics (youth slang, industry slang);
- admissibility of extended citation of sites.

To link the topics of the online community VC_i and identified marketing topics $Th = \{Th_i\}_{i=1}^{N^{Th}}$, we introduce the adherence function $FRThVC_i(Th_j)$: $FRThVC_i(Th_j) = 1$ - if the topic of discussion relates to the marketing term Th_j from the array Th, otherwise $FRThVC_i(Th_j) = 0$.

Then, we will describe the relevance of the topic of the online community as follows:

$$RThVC_i = \{FRThVC_i(Th_j)\}_{j=1}^{N^{Th}} \tag{6}$$

where $Th_j \in Th$ – j-th marketing term.

For decision-making on the use of the online community in marketing and in the planning of the communication process, it is important to record and analyze community statistical data. The required statistics for the online community VC_i will be recorded as:

$$StatVC_i = \left\{ \begin{matrix} \langle T_{ij}, CMVC_i(T_{ij}), CTpVC_i(T_{ij}), CPVC_i(T_{ij}), CRVC_i(T_{ij}), \\ CVVC_i(T_{ij}), FrNTpVC_i(T_{ij}), FrNPVC_i(T_{ij}), CQVC_i(T_{ij}) \rangle \end{matrix} \right\}_{j=1}^{N^{StatVC_i}} \tag{7}$$

where T_{ij} – *i*-th date of collection of statistical data for the *j*-th online community; $CMVC_i(T_{ij})$ – count of members; $CTpVC_i(T_{ij})$ – count of topics; $CPVC_i(T_{ij})$ – count of posts; $CRVC_i(T_{ij})$ – count of readings; $CVVC_i(T_{ij})$ – daily attendance of the community (from Count of Visitors); $FrNTpVC_i(T_{ij})$ – frequency of new discussions started in the community (Frequency of New Topics); $FrNPVC_i(T_{ij})$ – frequency of new comments (posts) in community discussions (Frequency of New Posts); $CQVC_i(T_{ij})$ – the number of external links to the community site from other sites (Count of Quotation).
The results of the analysis of the online community relevance to marketing topics are as follows:

$$AnRELVC_i = \left\{ \left\langle AnRELDate_j, RELVC_{ij} \right\rangle \right\}_{j=1}^{N^{AnRELDate}} \tag{8}$$

where $AnRELDate_j$ – *j*-th date of the relevance analysis; $RELVC_{ij}$ - relevance of the *i*-th online community as on the *j*-th date of analysis.

Evaluation of the importance of the online community is as follows:

$$AnIMPVC_i = \left\{ \left\langle AnIMPDate_j, IMPVC_{ij} \right\rangle \right\}_{j=1}^{N^{AnIMPDate}} \tag{9}$$

where $AnIMPDate_j$ – *j*-th date of the importance analysis; $IMPVC_{ij}$ – importance of the *i*-th online community as on the *j*-th date of analysis.
The importance of the online community in formula (9) depends on the type of the marketing task set for the company's specialists. The list of types of marketing tasks is presented in the form:

$$TaskType = \left\{ TaskType_k \right\}_{k=1}^{N^{TaskType}} \tag{10}$$

Then the importance of the community, defined during the j-th analysis, will look like:

$$IMPVC_{ij} = \left\{ \left\langle TaskType_k, IMP\left(TaskType_k, VC_i, AnIMPDate_j\right) \right\rangle \right\}_{k=1}^{N^{TaskType}} \tag{11}$$

where $TaskType_k$ – the task of the k-th type from the array (10); $IMP(TaskType_k, VC_i, AnDate_j)$- the function of determining the importance of the *i*-th online community for performance of the k-th type task; the date of the analysis $AnIMPDate_j$ determines the relevance of the statistical and analytical data of the online community needed to calculate marketing importance.
In addition to accounting of online communities in general, separate discussions, the topic of which relates to the object of marketing promotion, should also be subject to mathematical formalization, computer accounting and analysis. Given the complex

nature of the tasks of marketing, both technical information and the semantics of discussions conducted around the object of marketing promotion, should also be subject to accounting.

2.2 Using The Content of a Database of Online Communities to Carry Out Marketing Tasks

The given information model forms the basis of the database of online communities relevant to the marketing subject of the company. Data arrays are created based on expert analysis of each community that is being added to the online marketing database. Sample community discussions, its general numerical values (usually these are available on the community statistics page) and the texts of its rules are used for expert review

Data relating to the semantic characteristics of the online community are used when creating and verifying marketing posts and choosing task performers. In particular, the size of the post; the presence and number of references in the post; the presence of referral links can be checked in the automated mode.

Data related to the technical characteristics of online communities is used, in particular, to determine the priority of actions and forecast work volumes, planning of work schedules, software adaptation and hypertext markup of information and advertising materials.

However, for solving some tasks, in particular, planning of the participation of the company representatives in discussions, numerical expressions are required for these characteristics.

The methodology for determining these indicators depends on the available information on the characteristics of online communities and discussions. In any case, the specifics of the tasks of prioritizing the actions of a marketing expert implies a quicker relative assessment of importance and relevance than the conditionally precise one. This, to some extent, makes up for the incomplete information about the community.

There is no general rule for determining the importance and relevance of communities, because these rules reflect the essence and peculiarities of marketing strategies in online communities.

We will assume that the topical characteristics of the search results for a particular community determine the topical preferences the new visitors of the site (because they get there by the topic queries) and active members of the community (since they have created virtually all content of the online community).

Consequently, we may use the results of the search engines to determine the degree of relevance of the online community, limiting ourselves to publicly available information that does not require significant computing resources.

In this case, we will define the marketing relevance of the online community of the marketing object as a part:

$$Rel(VC*) = \frac{\|SERP(VC*, Th)\|}{\|SERP(VC*)\|} \tag{12}$$

where $\|SERP(VC*)\|$ – the total number of pages in the online community in the search results $SERP(VC*)$ (from English Search Engines Result Page); $\|SERP(VC*,Th)\|$ - the number of pages of the online community found by the terms of marketing topics Th .

The array of marketing terms determines the width of further search that is reflected in the number of communities found and their thematic orientation. Therefore, the keyword selection procedure depends on which strategy of using the online communities in marketing has been chosen.

The value $\|SERP(VC*,Th)\|$ only in trivial cases can be calculated in one step. In practice, multiple searches by exact match for each marketing term is required, with the exclusion of other marketing terms.

According to the analysis, there are typical classes of communities in certain thematic areas, which are presented in Table1. It is understandable that the values of limits given in the table may vary substantially depending on the subject area.

Table 1. Classes of online communities by measure of marketing relevance.

Communities	Relevance	Comment
Restricted professional	0.1–1	Only about one or a group of products
Professional	0.02–0.1	About some product group, which includes the marketing object
Topical	0.001–0.02	About some subject area, to which the object of marketing belongs
General	0.0001–0.001	With uncertain or very broad subject matter
No topical	≈0	With topics not related to the subject of marketing

For exclusive products, the specified limits for a class of restricted professional communities are expanding, and for the rest - narrowing. This is caused by the fact that the very fact of mentioning the exclusive, used only in special cases, products, already gives grounds to attribute the community to a class of restricted professional. Such products include industrial and medical equipment, professional artistic tools, highly specialized software, corporate services, and the like.

For the products of a wider class, on the contrary, the limits of relevance for restricted professional and professional communities are narrowing, for the rest - they are expanding.

However, regardless of the specifics of products and the exact limits of class relevance, their overall list remains unchanged.

The selection of online communities for solving certain marketing tasks is appropriate to begin with identifying a set of online communities relevant to marketing object.

From the sample obtained, guided by the chosen selection strategy for a particular task, one must allocate the resulting array of important communities. If you start with identifying important communities, you can often get a great deal of important but irrelevant online communities.

Since the array of online communities relevant to the subject matter may be quite large and the resources for marketing in online communities are limited enough, then, of course, there is the question of the need to limit the array of relevant communities with which the marketing expert should continue working. This restriction can be achieved by defining the relevance threshold rule and applying it to the selection: an online community with a relevance indicator that is relevant to the relevance threshold rule relevant to a given marketing topic; otherwise, we will consider this community irrelevant (non-topical). The rule of the relevance threshold application is determined by the expert method and can be formulated in different ways, for example:

- the first 100 relevant communities are considered;
- communities with relevance indicator greater than some fixed value are relevant to the topic;
- selection of relevant communities is carried out in an iterative manner until the required number of important ones is obtained.

Regarding the discussions, it can generally be considered that relevant are discussions with messages that contain defined marketing terms. The greater part of the marketing topics relate to the message, the more the discussion becomes topical. The marketing expert takes the decision on the marketing relevance of the discussion after analyzing the posts in the discussion and the following groups of its characteristics:

- topicality of discussion - the relevance of the discussion to the marketing topics;
- proficiency of the discussion - the competence of the authors, the acceptability of the discussion style, its correspondence to network etiquette;
- timeliness of the discussion - the openness of the topic, the relevance of messages, the presence of views, answers.

Classification of discussions in online communities important for marketing gives us the opportunity to:

- organize the first-priority processing and analysis of typical discussions concerning the problems and queries of users (complaints, claims, etc.);
- carry out a comparative analysis of own and outside materials located in different communities and on different occasions;
- analyze typical discussions related to one topic when creating a new marketing message on this topic to avoid repetitions and inaccuracies in it.

Saving of interconnections between thematically similar relevant discussions in the database facilitates a comparative analysis of product reviews. Moreover, the establishment of relationships between company discussions and discussions about partners and competitors of the company helps in the analysis of competitiveness of the company by participants of online communities.

If a representative of the company initiated a discussion in the community or it contains his/her extended comments, then the response of other members of the community to the content and form of the marketing messages is important.
The analysis of negative reviews and critical messages allows identifying vulnerabilities in the marketing object, assess the communicative proficiency of marketing experts and outline the ways to improve marketing in online communities.

3 Conclusions

Determining the indicators of marketing relevance and marketing importance of online communities makes it possible to select the important for marketing online communities and use them more effectively. Due to the practically manual processing of the input information, determination of these indicators for discussions is generally subjective. For a transparent and high quality assessment process, the professionalism of the staff and the option of computer accounting of the discussions and the results of their analysis are of great importance. Because of the formalization of the marketing characteristics of communities, a model of online communities was built, which became the basis for developing a database structure for the accounting and analysis of marketing communications and information content of online communities.

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