Computer-linguistic Selection of Potential Entrances' Motivation Intentions from Posts of Education Web-Community

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Abstract. The aim of the article is to analyze the activity of the higher education institution, depending of the entry campaign period and the communicative activity of educational services consumers in specialized web-forums for entrants and in social networks; development of algorithm of computer-linguistic selection of motivational intentions from thematic reports. The paper uses the method of the "Text Mining" to posts of specialized web communities users and participants in thematic groups in social networks that based on the comparison of the post parts with elements of the set of keywords for a certain time period of the entry campaign. Based on the results of the analysis of text messages, typical scenarios of reactions from higher education institutions to identified motivational intentions of potential entrants are identified. The results of the research are applied and can be used to effectively plan educational services and to keep feedback from prospective entrants through communicative activities.

Keywords: Higher Education Institution, Entry Campaign, Communicative Activity, Motivational Intentions, Typical Action Scenario, Need.

1 Introduction

Planning for the provision of educational services by higher education institutions (HEI) is an important step in maintaining its competitiveness in the market of educational services. Potential consumers of educational services are the key elements for the effective functioning of a higher education institution. In other words, the existing contingent of students of each HEI, namely its quantitative characteristics and scientific potential, forms or adjusts the main aspect of planning for the provision of educational services and activities of HEI. Communicative process is the one of the most important sources of influence on the decision-making process for potential entrant on the choice of HEI and specialty. Linguistic analysis of the potential entrants' postings in the web-communities gives a clearer idea of their interests and adjusts the HEI's activities towards their motivational intentions at each stage of the entry campaign. That is why, the precise algorithm of action on the activities of the higher education

institutions at each stage of the entry campaign to take into account the interests of consumers of educational services is the purpose of this article.

2   Related Works

Research analysis [1, 2] allows us to assert that the communicative process in online communities is one of the effective methods of informational influence on its participants. In particular, educational web-communities play an important role in the decision-making process for potential entrants in the selection of the HEI and specialty [3, 4]. The results of the communicative activities of the participants of the education web-communities, that described in work [5], are an important factor to the effective planning of the provision of education services of the HEI [6, 7] and the receipt of the highest quality contingent of students by the results of the entry campaign [8]. In particular, the role of communicative activity in web-communities [9, 10] and its impact on the age category of future entrants [11, 12] shows, that communicative activities should be taken into account in the planning process for the provision of educational services for HEIs. Since communicative activities in the educational web-communities begin with the availability of a specific need of a potential entrant (for example, to obtain information, share experiences, etc.), taking into account the interests of these consumers of educational services effectively affects the process of planning educational services and the ability to predict their behavior [13]. Peculiarities of communicative activity analysis of web communities' participants on the basis of computer linguistics methods are the subject of research [14, 15]. Methods for identifying experiences in communicative activities of participants and structuring educational information are described in works [16, 17].

3   Analysis of the communicative activities of participants in the web-communities depending the periods of the entry campaign

The communicative activities of the participants in the educational specialized web-forums for entrants differ in their activity with depending to the periods of the entry campaign. The communicative activity of the participants in the web-communities is wavy and depends on the period of the entry campaign (see Fig. 1). It describes the activities of active participants in communication.

As shown in Fig. 1, communicative activity becomes more active depending of the period of the entry campaign and the degree of responsibility of the future student in deciding to entry. Its reduces quantitative characteristics after enrollment to the HEI.

The activity of the HEI in each period of entry campaign depends on the stages of activity of potential entrants, which are defined by the rules of entry to the HEI.
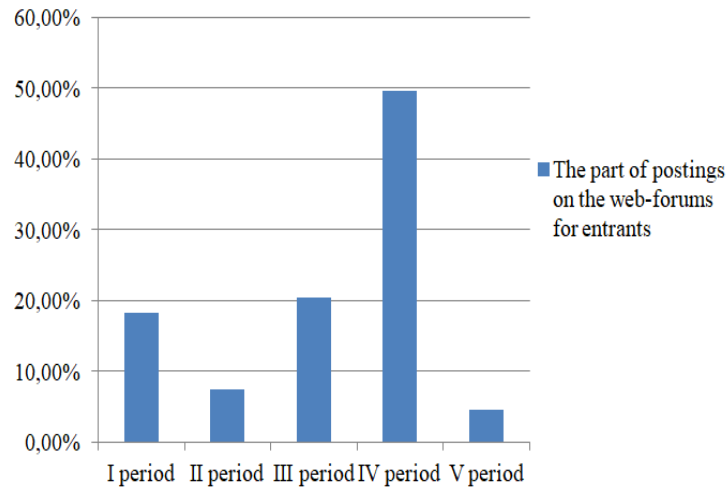
Fig. 1. The part of postings on the web-forums for entrants for the entry campaigns of 2013-2018.

- I period: Activity of the HEI in relation to the I period of the entry campaign can be divided into two halves. In the first half of this period, the focus should be on analyzing the results of the previous entry campaign and developing, on the basis of them, the action plan for the next entry campaign. In the second half of this period, communicative activities are increasing and require control and appropriate reaction from the HEI. If communicative activities do not begin, then the representatives of the HEI should analyze the reasons for this situation and try to interest potential entrants, using communicative activities on other open web resources.

- II period: In this period, it is also advisable to actively participate in communicative activity or provoke this activity in the second half of this period, when the potential entrant actively "catch" the necessary data in the information space and select exam subjects. Since, in the first half, this information is not yet relevant enough and may get lost in the information space without getting to the addressee. It is advisable to provide this information as soon as the motivational intentions of potential entrants are identified in the second period of the entry campaign.

- III period: It is important to provide information on the third period of the entry campaign in the first half of this period, as in the second half, users are less active and focused on the compilation of subjects and obtaining the highest quality, in terms of their capabilities, the results of the examinations.

- But in the second half of this period, they can already critically evaluate their opportunities and make choices about further education. That is why, quickly and timely reaction can be crucial for some potential entrants in the process of choosing a specialty and HEI.

- IV period: The communicative activity of this period should be marked by active interaction with users in relation to the waves of enrollment to the HEI. Infor-

mation of this period can help to attract the necessary number of applicants to cover the licensed volume of HEI's specialties.

- V period: This period is not decisive for the entry campaign as a whole, but a timely reaction to the postings of social conditions for students and the organization of educational activities, will create more favorable conditions for students.

Communicative activity in web-forums does not take into account the activity of passive participants, who themselves are seeking the necessary information on the official web-resources of the selected HEI (see Fig. 2).
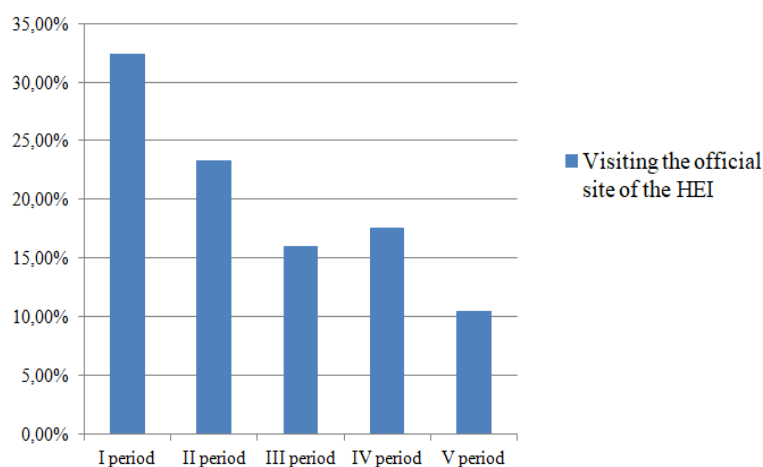
Fig. 2. Visiting the official site of the HEI for the entry campaigns of 2013/2018.

The attendance of the official web-site of the HEI by potential entrants for the entry campaign of 2013-2018 is on average stable and varies from 7% to 10% of the total number of visits for the selected years of entry campaigns. These metrics are expected, because users are visiting this web resource not only for information about the entry campaigns.

However, comparing the attendance data of official web-resources and communicative activities (see Fig. 3) makes it possible to determine that the attendance rates of official web-resources are higher than communicative activity indicators in periods I, II, V, characterized by less active communicative activity. This allows you to orientate the activities of the HEI at these stages of the entry campaign to increase content on the benefits of education in the HEI and the choice of its specialties. In the III and IV periods, the activity of the HEI should be aimed at timely response and support of activity on web-forums, since communicative activities in this period are the largest.
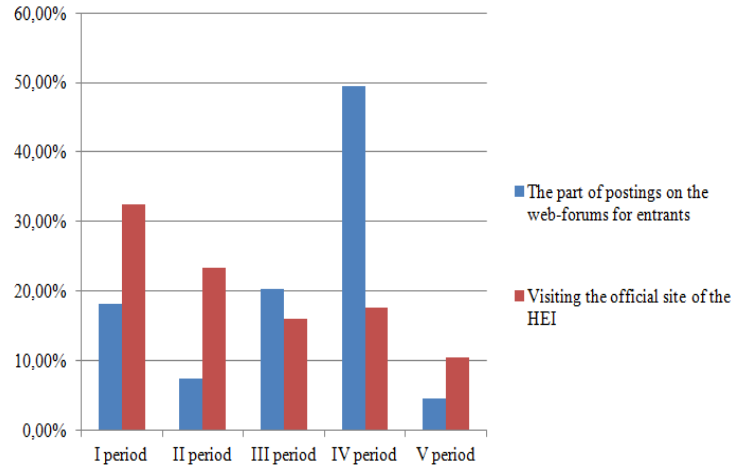
Fig. 3. The activity of the forum participants for the HEI entrants and the attendance rates of the official web-site of this HEI relative to the periods of the entry campaign

Thus, the informatization of potential entrants related to each period of the entry campaign should be concrete, but not clog up the information space, and be provided to the group for the relevant motivational intentions identified in the communicative activity. This enables timely and qualitative responses to the needs of potential entrants.

4   Construction of an algorithm for selection users' motivational intentions in posts in depending of the entry campaign period

Detection of actual presentations in the communicative activity of the users of educational web communities is based on the model of the communicative structure of the information content of the web forum (Figure 4). The computer-linguistic selection of motivational intentions of potential entrants is done by the procedure of matching parts of the post $PostPart_{ijk}$ with elements of the set of keywords for a certain time period of the entry campaign $Keyword(TimePeriod)_p$ using the text analysis of texts (TextMining) of educational web-communities thematic discussions.
The selection of motivational intentions from the posts of thematic discussions takes place in the following steps:

1. $Post_{kl}$ – the k-th post of l-th discussion;
2. $Period(Post_{kl})$ is the function, that determines the affiliation of the k-th text message of the l-th discussion to a certain period of the entry campaign to the $TimePeriod_p, p = \overline{1,5}$;
3. $MotivVoc$ – dictionary of motivational intentions of potential entrants.

4. $\omega_{pi} = \emptyset$ is the set (weight) of the weight factors of i-th motivational intent of the j-th keywords that relate to the p-th period of the entry campaign;
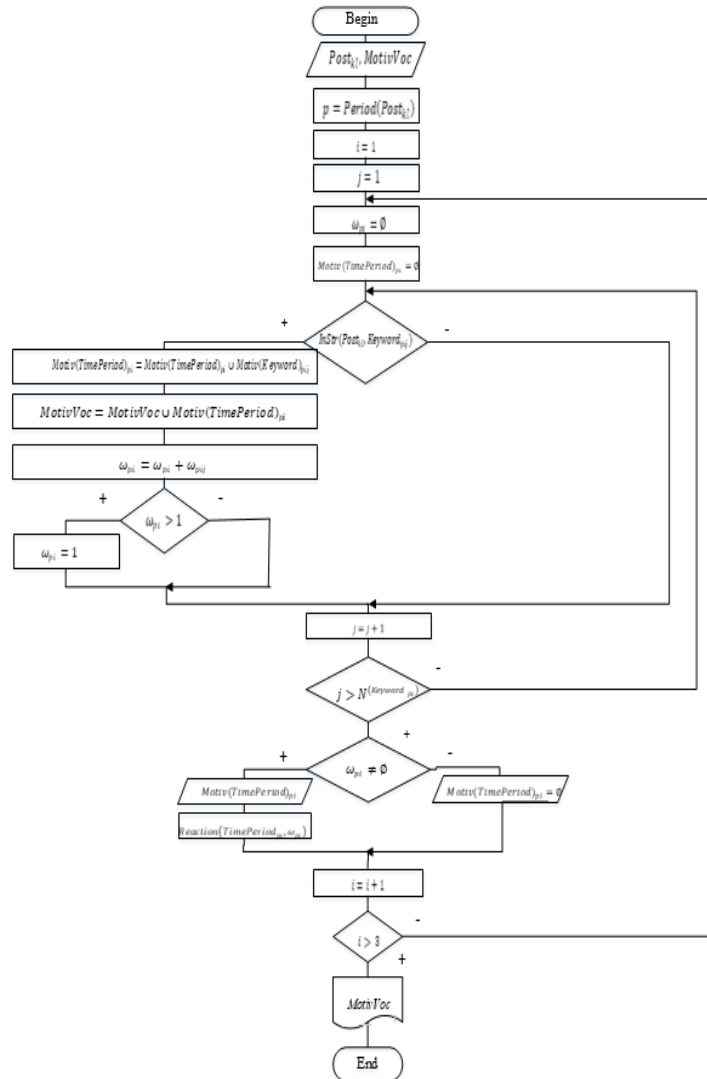
Fig. 4. Algorithm for selecting motivational intentions from posts of educational discussions in depending to a certain period of the entry campaign

5. Since the needs of potential entrants, namely: the need to receive information, the need to harm and the need to share experience, determine their motivational intentions, then for each period of the entry campaign, $Motiv(TimePeriod)_{pi}$ - the set of the motivational intentions of potential entrants relative to the p-th period.

6. In the text post $Post_{kl}$ we look for j-th keywords that point to the i-th motivational intent $(i = \overline{1,3})$ for the p-th period of the entry campaign: $InStr(Post_{kl}, Keyword_{pij})$;

7. If such a match is found, then we formulate a set of these motivational intentions, that including motivation for the j-th keyword $Motiv(TimePeriod)_{pi} = Motiv(TimePeriod)_{pi} \cup Motiv(Keyword)_{pij}$;

8. 8. The found motivational intention $Motiv(TimePeriod)_{pi}$ is added to a specific section of the dictionary $MotivVoc$;

9. Add up the weighting of the found keywords $\omega_{pi} = \omega_{pi} + \omega_{pij}$;

10. If the sum of the weighting coefficients of the i-th motivation intention is greater than 1, this means that the post contains a sufficient number of keywords to conclude that the motivational intentions of the p-th period are detected. That is why, $\omega_p = 1$;

11. We check j + 1- th keyword $(j \leq N^{(Keyword_{pi})})$, and return to p.5.

12. If $\omega_{pi} \neq 0$, then the motivational intentions of the i-th needs of the p-th period are revealed. Therefore, the HEI must react to this post $Reaction(TimePeriod_{pi}, \omega_{pi})$ using one of the typical action scenarios.

13. Otherwise, the motivational intentions of the i-th needs of the p-th period are not revealed.

14. A dictionary of motivational intentions $MotivVoc$ obtained as a result of the implementation of the algorithm must be evaluated by an expert to effectively react to the HEI on relevance posts in the educational web-communities.

Thus, the proposed algorithm for the computer-linguistic selection of the motivational intentions of potential entrants from posts of educational web communities' discussion makes it possible to clearly identify the motivational intentions of potential entrants from relevant, relatively specific periods, text messages and to form a plurality of motivational intentions for the particular needs of participants in communication, and structuring selected motivational intentions with the help of vocabulary creation.

5 Typical Scenarios of the HEI Reactions to the Identified Motivational Intentions of Potential Entrants in the Communicative Activities of the Web Community Participants

Each discovered relevant, relatively specific period of the entry campaign, a text message poses to the HEI a task of timely and qualitative response to it. This reaction can play a decisive role in the decision-making process of a future entrant.

As is well-known [13], motivational intentions of participants in the communicative activity of educational web-communities consist of motivational intentions of potential entrants and motivational intentions of the HEI.

The reaction to a particular type of motivational intent of communication participants, provoked by their needs, is a subset of concrete actions on the part of the HEI.

5.1 Typical scenarios of reactions to the identified motivational intentions of potential entrants

The motivational intentions of potential entrants include:

- Need for information;
- Need to hurt or give false information;
- Need to share experiences.

The main actions or combinations of these motivations can be:

- Consultation - providing the necessary information to potential entrants from the HEI
- User blocking - preventing the distribution of false information and incorrect user behavior;
- Correction of information - clarification or verification of the authenticity and relevance of information provided to potential entrants by another user.

Typical scenarios of action on the part of the HEI on the motivational intentions of potential entrants are shown in Table 1.

Consequently, if a potential entrant finds the motivation to obtain information, then the HEI must promptly provide the necessary information and / or correct existing information that the user can own.

If a potential entrant wishes to "harm" consciously providing inaccurate information to other users in the web-communities, the reaction to this behavior is to block that user and provide reliable information to the discussion participants.

Table 1. Typical scenarios for action on the motivation of potential entrants.

Motivation / Action	Receiving information	Providing false information	Need to share experience
Consultation	▓	▓	▓
User blocking		▓	
Correction of information	▓		▓

If an entrant has a need to share experience, the HEI representative should verify the correctness of the information provided, adjust it if necessary and / or provide reliable information to the participants in the thematic discussion.

Consequently, the typical scenarios for the response of the HEI to the motivational intentions of potential entrants are basic. The response to the thematic postings of potential entrants allows us to exclude information gaps that relate to the educational activities of the HEI as a whole and to timely identify incorrect content in the web community and its author.

5.2 Typical Scenarios of Reactions to Motivational Intentions of a Higher Education Institution

Motivational intentions of HEI include:

- Need to organize information space;
- Need to determine the relevance of the thematic post.

The peculiarity of the motivational intentions of the HEI is their interrelation. Namely, the organization of the information space has a tent to provide certain information about the stages of the entry campaign, but this information is relevant for a certain period of the entry campaign. This is a feature of the formation of informational content of educational web communities and the life expectancy of information.

Typical scenarios for action on the motivational intentions of the HEI are shown in Table 2.

Consequently, if there is a motivational intention to inform potential entrants in relation to the entry campaign as a whole, it is appropriate to provide the HEI with information on the activities of the HEI in the open web resources on the general conditions of admission to the HEI, the specialty in the areas of training, the list of certificates of testing and a list of related specialties and their list of exams, which are relevant in the I period of the entry campaign.

If there is a motivational intention to provide information on exams and exams certificates of a higher education institution, then this information should be provided in the II period of the entry campaign, as well as to supplement it with the list of related specialties of this HEI. If there is a motivational intent to provide information on the list of specialties, then the HEI should provide general information on the existing specialties and a list of adjacent, to popular specialties, relevant in the III period of the entry campaign.

If there is a motivational intention to provide information on enrollment of entrants, then it is expedient to provide it in the IV period of the entry campaign.

This information will also include information about rating lists and a list of specialties that are not sufficient for a licensed amount in relation to a particular enrollment wave.

If there is a motivational intention to provide information on benefits, then it is relevant to the IV and V periods of the entry campaign at the enrollment stage and decides of social and living conditions for students.

Information about the leisure time of students of HEI and the organization of their social and living conditions is relevant in the period of the entry campaign.

The relevance of the motivational intentions of the HEI depends on a certain period of entry campaign. Namely, in the I period it is advisable to provide general information on the activities of the HEI.

Table 2. Typical action scenarios for motivational intent of a higher education institution.

Motivation / Action	Organization of information space						Relevance of information				
	«Introduction»	«Examinations»	«Directions of preparation»	«Enrollment»	«Privileges»	«Leisure»	I period	II period	III period	IV period	V period
General information about HEI	■						■				
Information about the specialty and the list of items for testing		■						■			
Information about related specialties			■						■		
Information about enrollment				■						■	
Information about social and living conditions for students and leisure						■					■

The information for the II period should include, in the vast majority, information on the list of specialties for entry and the list of certificates of extermination. In the III period it is worth providing information on the related specialties relatively popular. Informatization of the IV period should be guided by the information on enrollment of entrants in connection with the waves of entry. The information provided in the V period should be aimed at improving the social and living conditions of students' stay and diversification of their leisure time.

Consequently, the motivational intentions of a higher education institution in the course of entry campaign are interconnected, and therefore the formation of a response to them from the higher education institution should take into account not only the subject matter of the information provided, but also its relevance for a certain period of the entry campaign.

6   Conclusion

The HEI's activities in relation to the periods of the entry campaign should be wavy, but not obsessive. The HEI's algorithm of activity should take into account the analysis of the previous entry campaign and the analysis of each preliminary stage of the current entry campaign. In particular, the activity of the HEI in the I period of the entry campaign should be aimed at increasing the content of the educational services of the HEI by means of informatization in the Web 2.0 environment. Increasing the

target audience and expanding the range of potential entrants' interests is the purpose of the HEI's activity in the II period of the entry campaign. The activities of the HEI in the III period are aimed at expanding the opportunities for the entrants to receive the chosen specialty. Since the activity of HEI in the IV period is aimed at forming a contingent of future students, rapid reaction to the post and the provision of qualitative information can be decisive in the decision-making process of the future student. The activity of the HEI in period V is important for the planning of activities in the next entry campaign. It provides an opportunity to critically assess the activities of the HEI and its ability to plan educational services. The procedure of computer-linguistic selection of motivational intentions from text messages of potential entrants enables to influence the process of forming a decision by a potential entrant and to predict its behavior in relation to the choice of HEI and the future specialty. As a result of the research, the procedure for selection of motivational intentions of potential entrants on the basis of computer-linguistic analysis of their posts in the educational web-communities has been formed. Since the identification of motivational intentions indicates that there is a need for a participant in communicative activities, this poses the task of the HEI in a timely and qualitative way to respond to them. That is why, typical scenarios of reactions from the HEI to these motivational intentions are proposed. Typical scenarios are the basis for the formation of actions for HEI. The result of this procedure is an important tool for effective planning of providing educational services by higher education institutions and prediction of the behavior of potential educational services users.

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