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Current Communication Technologies in the Promotion of Scientific Knowledge

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Abstract

Exchange of scientific information is a basic component within the process of promoting humanitarian, life-science and technical knowledge. Distortions and disruptions in providing tactical and strategic mass- and corporative communication have a negative impact on transferring and receiving specialized information, both within the corresponding information system, and beyond its limits. Development of a structure of specialized communications of the scientific communities depends on a significant factor: the dialogue is conducted between the subjects of a certain field of scientific knowledge or within a certain research institution. To a certain extent, subjects of scientific communication play their part in providing scientific communication flows, which facilitates the development of scientific ideas about the reality within a scientific corporation, as well as outside it. Communications among the members of the scientific communities can be organized at the global, international or national level, or locally, within a certain research organization. Present article focused on the current communication technologies that were used for promoting scientific knowledge. It addressed the principles, characteristics and functions of communicative activity in the field of science and higher education, which defined the state and development perspective of the social progress.

Keywords: *science, knowledge, communication, scientific information, mass media.*

1. Introduction

Scientific communications are hi-tech specialized informational and communicative exchanges directed at humanitarian, life-science and technical space. They develop intellectual characteristics of various social fields. During these exchanges by sender and/or recipient of the messages, one of the sides acts as a representative of the scientific community. Analysis of the communicative activity of specific research organization can be conducted according to the type and amount of information transmitted by the organization.

Ranking of the scientific information allows sorting it according to the following criteria:

– By the content (economic, legal, technical, etc.);

– By the purpose (single-aimed – a message states and requires the solution of a single scientific problem; multiaimed – the need to solve several related problems);

– By the level of usability – primary (non-systematic data, a lot of excessive irrelevant facts), intermediate (the facts that underwent preliminary processing and that allow solving the issue of further directions and ways of use), final (characterized by accepting a rationalized, precise and correct decision);

– By the possibility of consolidation and storage: registered – has its own information carrier and is stored for a prolonged period of time; unregistered – does not have its own information carrier, or the carrier is unreliable or temporary, and such information can disappear quickly or experience distortions;

– By value, significance and benefit (highly valuable, significant and beneficial information that is necessary for work; advisable information is hypothetically necessary for the study or is used during the search of scientific fact; useless information consists of the facts that lost their relevance or are outdated);

– By completeness (partial, complex, systematic);

– By the nature (multipurpose – for solving any problems; functional – for solving a range of related problems; specific – helps solving the current problem);

– By level of reliability – true (fully represents relative or absolute truth), probabilistic (expected, hypothetical), debated (does not have single solution and requires new scientific discussions and deeper, more extended and reasoned proven scientific facts and studies).

When describing the specifics of channels and means of translating the information in a certain research institution, it is necessary to focus on the specifics of its management, i.e., certain ways of solving current and long-term problems, questions of information exchange, mediation of intercorporation conflicts, as well as the channels of receiving feedback. Out of all types of communications, the key role in studying the behavior of people, who work in a research organization, belongs to interpersonal communications. Their structure depends on the following factors: feedback, competency of the sender and recipient of information, legitimacy of sender's rights, degree of recipient's responsibilities, level of information recipient's trust towards its sender, time of recipient's waiting for the information, interpersonal and professional compatibility of the recipient and the sender, communication climate in the group, social and cultural environment.

Interpersonal scientific interaction is highly significant, especially in the societies aimed at traditional intra-cultural values, as well as

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the national and territorial ones. The dialogue in the scientific community substantially defines the successfulness or failure of tactical scientific communication, which can be verbal and nonverbal, written and oral, formal and informal, with higher or lower level of bureaucracy. Typical information system of scientific organization can include the following information-oriented subsystems: administrative-distributive, industrial, financial, economic, commercial, innovative, strategic and social ones.

2. Methods

It is impossible to study communicative technologies in the promotion of scientific knowledge without an established scientific methodological basis. Present study is based on such general research methods, as:

– Method of generalization as a process of defining general tendencies through the specifics;

– Methods of systematic and cognitive analysis as a process of establishing relevant and unified formally-logical and cognitive connections among the elements of the studied object. The phenomenon of the current scientific knowledge is addressed in relation to the current content-related and technological characteristics of post-industrial information society;

– Method of monitoring the activity of research institutions and mass media as an opportunity for further exploration of public representation of scientific topics in order to define the relevant issues in a certain research field, as well as to reveal the reserves and new opportunities for the solution of the studied problems.

Using the abovementioned methods in present study seems to be preferable, because this would allow obtaining reliable results and setting the perspectives of further developments in this field of scientific knowledge.

The presented work continues the studies of information and communicative technologies in the process of promoting scientific knowledge, the results of which have been previously presented. They include the works of international researchers [1][6] and Russian scientists [7]–[21].

3. Results

3.1. Internal communications in the promotion of scientific knowledge

Internal communications in the promotion of scientific knowledge are the means and ways of administrative, organizational and creative activity, which are used by the institution direction for distributing scientific ideas and scientific point of view within the organization structure (scientific, educational or research institution). The primary aim of such activity is the need to develop systematic tactics and strategy of internal communication, presence of the necessary personnel potential (creation or consolidation of information department and public relations service), development of information-communicative and technical capacities of the organization, establishment of a long-term plan of informational and communicative work.

The main issue regarding the effectiveness of such activity is scientifically-oriented administrative organization of the employees' work, particularly the creation of an effective structure of managing informational and communicative work, with its manager working for the organization's CEO or his/her assistant. Practical experience shows that the work with internal and external communities is weakly presented in the organizations where the director does not pay sufficient attention to such work, or considers it to be of secondary importance.

There are three levels of developing a communicative strategy of an organization – strategic, tactical and operative ones. Strategic level implies the presence of organization's communicative strategy, which is based on a well-developed culture of communication with the organization and which represents a large-scale and long-term program. Tactical level is related to planning specific coordinated actions aimed at high-quality information exchange and development of favorable environment with the organization. Operative level implies integration, control and supply of communications within an institution at all hierarchical levels. Activity related to establishment and development of effective internal communications manifests in strict separation of the functions of the abovementioned levels, along with the ability to plan and provide content for their functioning and sufficient control of the performed tasks.

In case of research and educational institutions, the level of successfulness in promoting scientific knowledge manifests itself not in the quantity of references to the university and its direction in mass media, but rather in the extent of respect and trust that the organization's employees feel towards the routine decisions and actions of the executives, aimed at providing work conditions. This way, a system of normative representations of such activity develops. Moreover, a system of necessities, caused by the demand of perfecting and modernizing certain areas of administrative and technological work, might be considered as a significant factor in providing the functioning of relevant communicative technologies aimed at the promotion of current scientific knowledge.

For example, organization's executives create favorable conditions for the personnel to post scientific publications in an internal information-communicative system (Internet, Intranet, which requires user's authorization), conducts the tracking of authors' scientific works, assigns identification numbers to them, develops short-term and long-term (prospective) plans of research work and a system of rewarding publishing activity of the research organization's employees. Another crucial factor for the distribution of information about the studies includes the scientific journals that are published within the appropriate fields of activity on the foundation of the research institution. Publications of the young researchers are especially encouraged. For example, the works of young researchers in the field of journalism at Saint-Petersburg State University are published in an online issue "Century of information" [22], [23].

3.2. External communications in the promotion of scientific knowledge

N.V. Litvak and S.M. Medvedeva state that the absence of high-quality communication between science and broad public can lead to conflicts and mutual accusations, which have a negative effect on the fate of the science, as well as the society's life [11]. External communications in the promotion of scientific knowledge are the means and ways of administrative, organizational and creative activity of, which are used by the institution's executives for distributing scientific ideas and scientific point of view outside of the organization, i.e., scientific knowledge is promoted with the aim of its popularization and large-scale distribution in the external environment. Such scientific information works for external public and creates favorable reputation and image of the scientific, educational or research institution.

In order to conduct well-balanced external communication, it is necessary to use mass media for maintain a useful and rational dialogue between scientific institutions and the society. Recently, many Russian universities have created public affairs offices, which facilitate the interaction between journalists and scientists. Direct contact between journalists and scientists requires "two-layer" communicative environment: the first layer is the public relation office in the research institutions, while the second contains scientific information agencies that collect and systematize information from the public affairs offices and from organizations that do not conduct research themselves, but are

related to integration, evaluation and regulation of scientific achievements. Therefore, it enhances the possibility to solve the problem of the communication gap between the scientific field and media field and to create favorable conditions for science popularization.

The range of communication channels is large and diverse. Their most general classification includes informational, analytical, communicative and organizational channels. A company interacts with internal target groups with the communication tools. Moreover, one technique can serve for several tasks (for example, corporate mass media mostly carry the informational function, but if they publish a survey, they can conduct the analytical function, while the publication of the executive's speech would serve the organizational function).

One of the most common ways of information transfer is a speech from the company's executives. Another necessary element of promoting scientific knowledge is the participation of the research organization's representatives in meetings, symposia, conferences, round tables, video- and Internet-conferences. Obtaining fresh and objective information allows preventing the distribution of pseudoscientific facts. The most suitable mean for individual information exchange is a business talk or an interview. Structure of scientific events includes official, scientific and educational events, which include:

– Ceremonies (openings, closings, award ceremonies, celebrations);

– Receptions (festivities, jubilees, related to arrival of important people or award ceremonies);

– Travel (related to business, science or introductory);

– Relaxing events, which support the establishment of informal connections and friendly interaction among the members of scientific community (outing, meeting, jubilee or birthday of the organization, professional holiday, party, etc.);

– Official and scientific events (conference, seminar, round table, discussion, symposium, summit, business meeting, report conference, etc.).

Success is indicated by the quality and quantity or participants, their interest, organizers' competency, positive changes in the emotional environment, correspondence of general expenses of the event with the total number of participants, and receipt of positive feedback about the event.

Effective promotion of scientific information can be facilitated by the leaders of scientific knowledge, which include famous experts, researchers, scientists, executives of organizations that represent a certain university or institution and speak on their behalf in the media. Moreover, it is necessary to distinguish the media by the extent of their involvement in the social processes. A leader of scientific knowledge can and should be included in constant communication; he should participate and present in printed issues, television and radio programs of analytical profile, which typically contain deep and large-scale perspective on the content and results of scientific studies.

In order to choose the most appropriate channels of communication, it is necessary to be able to navigate the complex media system in terms of its ideological and humanitarian identity. In some cases, it is also possible to participate in the projects related to so-called "tactical media": "during the development of tactical media, with the help of educational centers and laboratories it was possible to create networks of media activists that allowed accelerating the distribution of the tested techniques. Methods that were tested and used in Laboratories, such as The Yes Lab, were used for brainstorming, development of leadership qualities and exchange of media technologies" [24].

3.3. Forms of scientific knowledge promotion and necessity of scientific dialogue

The issue of professional popularization of science can be studied on several levels. There are five levels of information presentation depending on the orientation towards the audience. The first level contains communication within the scientific community with especially narrow fields being clarified to the representatives of adjacent fields. The second level includes the development of communications among the specialists of close disciplines. The third level contains the exchange of knowledge within a cycle of scientific disciplines (life sciences, technical or humanitarian disciplines). The forth level is for the representatives of a different cycle of disciplines, e.g., a linguist explains the material to chemists. The fifth level is for people unrelated to scientific knowledge, i.e., for broad public.

The main goals that are solved by the popularization of science are the following:

1. Educational goal. It implies transferring the scientific knowledge from the source to the audience in order to increase its intellectual level and erudition, and to raise awareness and comprehension of the reality within science and technological progress.
2. Belief-system goal. It implies stating life-sciences knowledge and laws of nature, and presenting achievements in the development of theoretical problems that provide new scientific perspectives.
3. Financial goal. It includes attracting investments and sponsors and fostering a positive attitude of tax payers towards science.
4. Image goal. It works for creating and maintaining the image of science and scientists.
5. Human resources goal. It is responsible for attracting new personnel, which, in turn, is necessary for developing the scientific field and generating new ideas and theories.
6. Entertaining goal. It transforms complicated scientific text in a form that is most clear to the audience in order to engage the people in a dialogue with the representatives of the scientific field.

There are certain principles of popularization that are necessary for performing the abovementioned functions. They include:

1. Clarity of presentation. Directing the audience according to its level of preparation, age and education specifics. Any abstract discussions should be supported by graphs, diagrams, formulas and other illustrative informational materials.
2. Statement of the scale of the problem. Description of facts should be stated through their comparison with the phenomena known to the media audience in order to facilitate the perception of the material
3. Involvement. The speech should reflect author's aesthetic experiences and creative perspective. Moreover, it can include author's remarks, i.e., reflect author's opinion on the question.
4. Maintaining the dialogue. It manifests through the effect of direct communication between the author and the audience of readers.
5. Credibility of the stated opinions. It is possible to use epigraphs and citations from the works of famous scientists, because they serve as a way of attracting the interest of mass audience.

The existing channels and means of science popularization can be divided in several blocks.

Non-fiction literature. In the broad sense, a non-fiction book is an issue that contains information about theoretical or experimental studies and serves for popularization and propaganda of the bases and achievements of science and technology, culture and results of applied activity among the broad readership in a clear form.

Non-fiction projects. This concept includes conferences, public lectures, specialized cafes, websites and mobile applications. The main specifics of such format follow the new capacities of Internet-communication: 1) global nature of information distribution;

2) possibility of multilingual presentation; 3) multimedia; 4) interactivity; 5) hypertexts; 6) high selectivity; 7) high flexibility; 8) high efficiency; 9) selective effect on the audience [13]. The main feature of non-fiction projects is their interactivity: the

audience interacts with the scientific field through its representatives, who translate the knowledge in form of interactive maps, videos, animation and other entertaining formats.

Public lectures. The advantage of this channel consists in the possibility for the audience to ask any questions to the speaker in the live timing. Lectures are often one of the few grounds for creating communications between a scientist and an audience. Moreover, a lecture can be accompanied by multimedia presentations and interaction with the audience in form of small quizzes in order to improve the effectiveness of the event.

Informal conferences: science-lunches and science battles. Science-lunches have appeared in Russia only recently and are being actively integrated in the scientific communications environment. The first science-brunch at Saint-Petersburg State University was conducted in 2015. This format includes a short (up to 30 minutes) report of a researcher about aims, current results and perspectives of his research, followed by free discussion with journalists present, as well as individual interviews. Another new and increasingly popular form of specialized events is Science Slam, which represents a project of science popularization and is aimed at creating a favorable image of young researchers. The term "science slam" intentionally refers to "poetic slam", during which poets compete with each other for public's approval. This type of projects includes such events, as Pecha Kucha (an event where a speaker presents 20 slides, with each slide lasting 20 seconds) and Standup (presentation on a scientific topic that includes comic elements).

Mobile applications. Currently, they are one of the most effective ways to promote scientific knowledge to a broad audience. Applications allow performing several functions of science popularization at once, including education and entertainment.

3.4. Significance of mass media in the promotion of scientific knowledge

The structure of modern mass media includes a significant number of issues, television, radio channels and new media – online issues, Internet resources, as well as communities on the social networks, private websites, blogs and livejournals that distribute scientific knowledge or conduct discussions about it and post opinions about scientific information on their pages. Presence of a newsmaker is a stimulating factor for attracting mass media. According to the analytical data of a communications agency "SPN Communications", the shifts in the number of publications and materials about science were observed in 2013 during the discussion of Russian Academy of Sciences reform.

Non-fiction issues affect the audience by the methods of suggestion, argumentation and chronologically ordered presentation [21]. Along with that, another problem is the limited number of popular scientific mass media that can present the scientific news in simple language and captivating manner. This problem is especially complicated due to several reasons. On the one hand, there are not enough qualified scientific journalists in Russia, who are able to "translate" scientific texts into a language familiar to a broad audience: the abovementioned study by "SPN Communications" revealed that the number of such specialists in Russia did not exceed 400. The majority of scientific publications in Russian mass media concern scientific and educational organization and the newsmakers that they generate, such as personnel reshuffling, activity of organization's management and budget changes. Messages about real and relevant studies constitute a very small percentage of the overall information published in social-political and business issues. As a result, actually relevant scientific achievements and researchers' activity do not get the attention of journalists and the real science is surrounded by vacuum.

It is necessary to mention the problems typical for humanitarian and social-economic scientific communities that are directly related to the corresponding professional structures. Considering the need for governmental regulation of the processes of the job market, normative acts, which define the rules of interaction between science in higher education and the corresponding professions, might provoke misunderstanding and critique from the target groups. Such situation established in Russia in search of ways to optimize professional standards in journalism: "Discussion of professional standards for mass communication revealed significant controversies in the media community regarding the discussed documents. Representatives of a number of issues were not ready for government's proposals about stricter regulation of the job market, setting the balance of its needs in different fields of economy and specification of professional requirements" [25]. Therefore, functioning of journalism as theoretical and applied social science, as well as the promotion of knowledge about it, cannot rely on excessive legal bureaucratization and redundant governmental regulation of this scientific and professional activity, especially in the conditions of global capitalism and global democracy, which facilitate dynamic and significant changes of the social process and mass conscience.

3.5. Functions of mass media in the promotion of scientific knowledge

Multitude and diversity of information resources and communication channels that promote technical, humanitarian and life-science information, and hence, the corresponding scientific knowledge, point to the fact that an intellectual system of scientific knowledge, which is capable of transforming a person and the surrounding nature, and affect social relations, is highly important in the modern society.

Because of that, it is necessary to characterize the main functions of mass communication in the process of promoting scientific knowledge:

- Presenting function: individuals and the society use catalogues of web communications to learn about traditional and new mass media that promote scientific knowledge;
- Informing function: the audience learns about new innovative achievements through the resources about science and technologies;
- Educational function: scientific illiteracy of the broad public is being decreased, and the light of truth is being shed on the difficult problems of scientific activity;
- Cultural function: individuals' general erudition expands, thus making a person widely educated in different fields of science;
- Aesthetical function: a person learns to value important and relevant scientific discoveries and understands their meaning for Russia and the whole world;
- Mentoring function: scientific information teaches a person to think logically and helps introducing scientific dialectical and scientific sociological thinking;
- Belief-system function: a person acquires multidimensional layers of research information through the scientific resources and develops general ideas about the reality according to the conditions and patterns of the development of natural and social environment.

Successful performance of the abovementioned functions by the information channels depends on sufficient human and technological resources, such as professional capacities of the journalists and appropriate personnel, industrial and technological resources of mass media. Their strengthening and development with simultaneous focus on scientific and educational segments of the society could lead to significant advance on the way to acquiring new knowledge and involving new representatives of different social groups and population categories in the science.

4. Discussion

Prospective long-term development of the science sector in Russia becomes one of the main priorities in the state politics and a factor of successiveness in further economic and technological development of the country. Due to this, the problem of promoting achievements in humanitarian, technical and life sciences can be considered one of the main aims for researchers and representatives of the communication field. The main problems of this activity include attracting new personnel in the field of science, obtaining governmental and commercial investments and increasing the level of general erudition of the population. The role of mass media in this process consists in making science clearer and more interesting for different groups of the population, establishing active and relevant communication between scientists and the public, and inviting political and economic elites to participate in the projects for developing and multiplying scientific resources.

Communicative technologies in the field of science provide support in establishing constructive and balanced interaction among researchers, allow precise and correct analysis of the level of their involvement in the research material and the level of competency in the appropriate scientific schools and directions. These processes can improve the effectiveness of the activity of scientific organizations in certain countries, which amplifies dualistic social mission of science: advancing scientific and technological progress and educating the population. Development of horizontal connections in science and higher education through information and communication technologies gains new meaning that is necessary for more intensive distribution of scientific knowledge, both inside the target scientific communities and within general increase of higher-education level with the aim of presenting current achievements of science in the process of mass education.

5. Conclusion

Technological explosion at the beginning of the XXIst century significantly increased volumes and speed of information transfer and caused significant changes in social, economic and political life of different countries. The incline towards innovative development of industrial, scientific and technological fields becomes evident. New paradigms in the field of communications, transport, military and industrial complex, being based on the achievements of the technological field and economics, rapidly grasp informational and communicative space and affect the conscience of individuals and society.

New scientific ideas, research and its results gain interest from specialists working in specific fields of scientific or technological activity, as well as from ordinary citizens. Thus, for example, such concept as “noopolitics” has been developed, which is actively being studied by Russian scientists [26]–[29].

The role of communicative technologies in the promotion of scientific knowledge increases, especially considering the increasing amount of general information flow, which is usually barely related, or unrelated, with the aim of popularizing scientific content.

In line with this, it is necessary to point out that the problem of promoting scientific knowledge through mass media, which has been addressed in the present article, requires further deep and focused comprehension. This general aim would be relevant for new prospective studies on the topic.

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