Quantitative Evaluation Method for Mass Media Manipulative Influence on Public Opinion

Sergiy Gnatyuk[1[0000-0003-4992-0564]], Jamilya Akhmetova[2[0000-0003-3054-5987]], Viktoriia Sydorenko[3[0000-0002-5910-0837]], Yuliia Polishchuk[4[0000-0002-0686-2328]], Valentyn Petryk[5[0000-0003-2301-0722]]

[1,3,4]Kyiv, Ukraine, National Aviation University,
[1]Aktau, Kazakhstan, Yessenov University,
[2]Aktobe, Kazakhstan, Zhubanov University,
[5]Kyiv, Ukraine, ISZZI Igor Sikorsky Kyiv Polytechnic Institute
[1]s.gnatyuk@nau.edu.ua, [3]v.sydorenko@ukr.net,
[4]polishchuk.yu.ya@gmail.com,[5]iszzi_open@ukr.net

Abstract. The manipulative influence issue is not a new topic for discussion. However only with the advent of the mass media concept it became popular and requires the intervention not only of scientists but also of the international community. The investigation mass media phenomena are equipping a mankind with a broader and deeper understanding of society and culture due to the fact that the texts produced by the mass media are the most socially significant messages and have a priority in the society over all other types of texts. Moreover, in in recent years, the concepts of mass consciousness influence and mass behavior influence had become increasingly popular. Frequently, mass media is the subject or instrument of such manipulation. The manipulation process (as the influencing process on a person or a social group) is the more effective (by the power of impact), when the deeper level of consciousness the manipulator employs. Additionally, the deeper the level of manipulation when the slower the «processing» of consciousness, but the stronger the transformation in all other levels, and the result of exposure is more prolonged. In the article was developed the quantitative evaluation method of mass media manipulative influence on public opinion. The method by means of evaluating financial expenditures, defining goals, objectives and strategies for manipulating, selecting mass media and classified methods of manipulation, based on the generated databases of causes, goals of the criteria, focus groups and mass media, allows to calculate the quantitative parameters that characterize the magnitude of manipulative mass media influences on public opinion.

Keywords: information-psychological security, manipulative influence, mass media, quantitative evaluation method for manipulative influence.

1 Introduction

Currently, the mass media has become the main tool for information dissemination that affect individual consciousness and subconscious and, as a consequence, the public consciousness. Public consciousness should be considered as a social phenomenon whose main function is to influence the audience through semantic and evaluative information transmitted by mass media channels. Moreover, public consciousness is a mechanism for actualizing information through various means of communication. Therefore, mass media influence does not always have a negative effect, since in the globalized world it is difficult to imagine human life without newspapers, social networks and other mass media. However, on the other hand, some individuals, for gaining their own advantages, use mass media as an instrument of influence on society.

2 Analysis of known approaches for evaluation the manipulative influence

The research in mass media manipulative influence field was engaged by large number of scientists, both Ukrainian and foreign, among them: Ivanov, V., Nesteryak,Yu., McQuail, D., Schiller, G., Noelle-Neumann, E. etc.

In Peleschyshyn, A. and Guminskyi, R. scientific researches, the description of informational environment of the virtual community in social networks was described; a model of internal informational environment and the discussion model of the virtual community were developed and detailed; on the basis of a formal model of the informational environment of the virtual community, taking into account the quality of information content, the indicator of information threats is determined [1-3]. The presented models allow to organize the detection and counteraction of the information threat in social networks and provide the information-psychological safety of a person in a social network. However, a significant disadvantage of that models is the impossibility of their evaluation.

A human activity model and human joint activities model in the information space was proposed by Shiyan, A. On the basis of proposed models, a human protection method from negative informational and psychological influence on the basis of the peculiarities of its activity was presented [4-6]. However, directly, the formal protection model from manipulative influence was not highlighted, as a consequence, is not possible to evaluate mathematically the effect.

In Gubanov, D. studies [7-8], an overview of the influence models in social networks was presented, the main classes of models in social networks were considered and the correspondence between classes of models and parameters of the modeling object was established. An analysis of these models allows to study the relationships between objects in a social group and the dependence of information influence on individuals and public opinion.

The formalized model for detecting PR-influence through publications in the Internet was developed by Ryabyy, M., Khatyan, O. and Bagatsky, S. [9]. According to [9], PR-influence is the mass media manipulative influence. However, this model allows to identify the impact, but do not assess it. Therefore, the developed model can be used as an initial stage for the development of a further evaluation model.

Proceeding from the above, a detailed analysis of manipulative influences models was conducted [10].

The analysis was based on such basic criteria (Table 1): IE – taking into account the information environment influence; MMI – taking into account methods of manipulative influence; EE – taking into account the links between information environment elements; FD – the formal description of models and methods; CIE – taking into account the content of information environment; TCh – taking into account the content transfer channel; CA – taking into account the content adequacy.

As a result of multicriteria analysis, it is established that studied models and methods have certain limitations as to practical application for solving various kind of tasks of information and psychological security. It is found that the evaluation method of mass media manipulative influence is only then effective and adequate in case it meets all the specified criteria. The paper purpose is to develop an evaluation method of mass media manipulative influence, which will allow to calculate the quantitative parameters of their influence on public opinion.

Table 1. Analysis of manipulative influence models.

№	Title	Parameters						
		IE	MMI	EE	FD	CIE	TCh	CA
1.	Peleschyshyn-Guminskyi's Model	+	-	+	+	+	+	+
2.	Shiyan's Model	+	-	-	+	-	-	-
3.	Gubanov's Models							
Type 1. Optimization and simulation models								
3.1. Models with thresholds		-	-	+	-	-	-	-
3.2. Models of independent cascades		-	-	+	-	-	-	-
3.3. Impregnation and infestation models		-	-	+	-	-	-	-
3.4. Ising models		-	-	+	-	-	-	-
3.5. Models based on cellular automata		+	-	+	-	+	-	-
3.6. Models based on Markov chains		-	-	+	-	-	-	-
Type 2. Theoretical and game model		+	-	+	+	-	-	-
Type 3. Models of innovations diffusion		+	-	+	-	+	-	-
Type 4. Models of network correlation		-	-	-	+	+	-	-
Type 5. Models of imitative behavior		-	-	+	-	+	-	-
Type 6. P^* - social influence models		+	-	+	+	+	+	+
Type 7. Models of «diffusion of innovations» associated with the social opinion formation		+	-	+	-	+	+	+
4.	Oltarzhevskiy's Methods [11]	+	–	–	–	+	+	–
5.	Ryabiy's, Khatyan's, Bagatsky's Method	+	–	+	–	+	+	+
6.	The Ministry of Russian Federation for the Affairs of Civil Defence, Emergency Situations and Disaster Relief Methodology [12]	+	–	+	+/–	+	–	–

3 Theoretical background developed method

The proposed evaluation method of mass media manipulative influence on public opinion is realized in 8 stages (Fig. 1): 1) Evaluation the financial costs; 2) Ranking of reasons by the degree of their danger; 3) Determination the objectives of the manipulation campaign (hereinafter - KMp); 4) Determination of the KMp tasks; 5) Determination of strategies for the KMp implementation; 6) Selection the mass media for manipulation; 7) Selection the manipulation method; 8) Estimation of manipulative influence. Input data for the method are: the set of reasons for conducting KMp; the set of dislocation places; the set of goals for KMp; the set of focus groups; set of criteria for estimating parameters; the set of strategies for KMp; the set of mass media; the set of manipulation methods and the set of «weight by criteria». Output data: list of selected causes, goals, criteria, tasks, strategies, methods, mass media; values of magnitude and effectiveness of manipulative influence. The realization of this method allows to evaluate the magnitude of mass media manipulative influence on public opinion [13].

Evaluation the effectiveness of manipulative actions is the preparatory stage for conducting the campaign. This stage is only necessary for the customer – to evaluate the financial efficiency of KMp. At this stage, from the whole mass media database it is necessary to select those mass media which, in the opinion of the expert, are suitable for the implementation of manipulative influence. First of all, it is necessary to determine the economic effect of advertising in selected mass media:

$$E = \frac{T_D \times H_T}{100} - (U_P + U_D),$$

where E – the economic effect of advertising; T_D – additional trade turnover under the advertising influence; H_T – trade margin on goods (measured in % to the realization price); U_P – advertising costs; U_D – additional expenses on the growth of goods turnover. The next relation $\frac{Z_P}{Z_O} = \frac{Z_P - Z_O}{Z_O}$. gives an opportunity to evaluate the effectiveness of advertising in relation to the profits of the company, obtained from advertising (Z_P) to profit before advertising (Z_O).

Stage 1 – Evaluation the financial costs on KMp. Step 1 – Choosing the reasons for conducting KMp. At the first step of Stage 1 it is necessary to input a set of reason ($\boldsymbol{I}$):

$$\boldsymbol{I} = \{\bigcup_{i=1}^{P} \boldsymbol{I}_i\} = \{\boldsymbol{I}_1, \boldsymbol{I}_2, ..., \boldsymbol{I}_p\}, \boldsymbol{I}_i \subseteq \boldsymbol{I}, i = \overline{1, P}$$

and experts choose those reasons (using voting method), which, in their opinion, require a KMp . After that experts go to step 2.

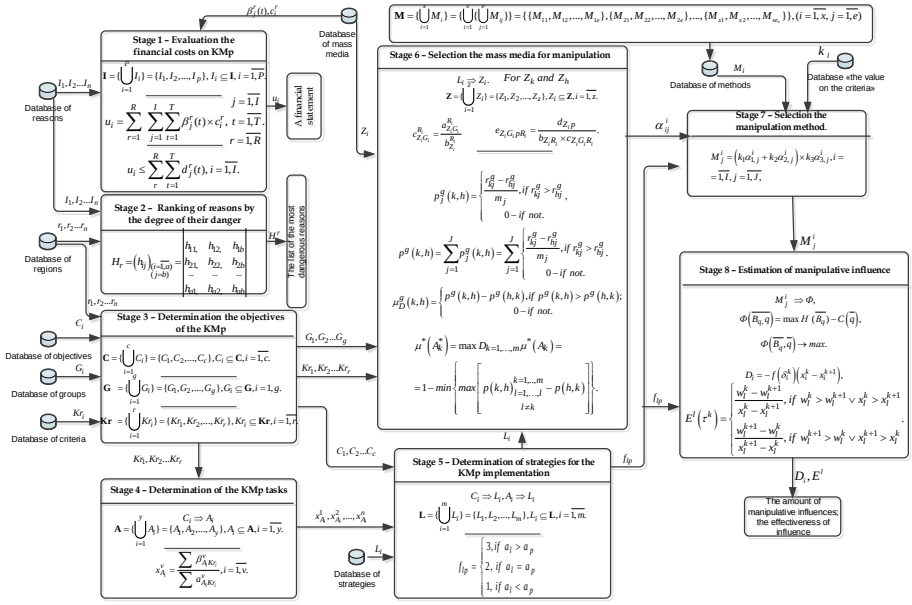

Fig. 1. Evaluation method of mass media manipulative influence on public opinion

Step 2 – Ranking of reasons by the degree of their danger. That is, for each possible i reason (for the period of preparation and implementation of the KMp) in r regions, it is necessary to evaluate the financial cost (u_i) for a manipulative attack on the next ratio:

$$u_i = \sum_{r=1}^{R} \sum_{j=1}^{J} \sum_{t=1}^{T} \beta_j^r(t) \times c_i^r,\ r = \overline{1,R};\ j = \overline{1,J};\ t = \overline{1,T},$$

where $\beta_j^r(t)$ – the amount of mass media of j type (social networks, newspaper, TV etc), for the period t in region r, c_i^r – the cost of one mass media of j type in region r.

Step 3 – Definition of financial constraints. At this step, it is necessary to determine financial constraints of conducting KMp for reason:

$$u_i \le \sum_{r}^{R} \sum_{t=1}^{T} d_j^r(t),\ i = \overline{1,I},$$

where $d_j^r(t)$ – the amount of possible financing of the KMp during t period in r region. As a result of Stage 1, will be received a financial statement about expenses on the KMp. Based on the report, it is possible to analyzed if KMp should be carry out from a financial point of view.

Stage 2 – Ranking of reasons by the degree of their danger. During the ranking of reasons by the degree of their danger, each expert are conducting pairwise comparison of reasons by the degree of their danger for KMp (step 1) and create the matrix H_r (step 2) for each r region. The expert's mark define as h_{ij}^r, where i – is the expert number, j – the reason number, r – the region number:

$$h_{ij}^r = \begin{cases} 1, \text{ if } I_i \text{ equal to } I_{i+1}; \\ 2, \text{ if } I_i \text{ more dangerous than } I_{i+1}; \\ 0, \text{ if } I_i \text{ less dangerous than } I_{i+1}; \end{cases}$$

$$H_r = \left(h_{ij}\right)_{\substack{(i=\overline{1,a}) \\ (j=b)}} = \begin{vmatrix} h_{11,} & h_{12,} & h_{1b} \\ h_{21,} & h_{22,} & h_{2b} \\ \dots & \dots & \dots \\ h_{a1,} & h_{a2,} & h_{ab} \end{vmatrix},$$

Furthermore, the system agrees the expert score with one of the well-known harmonization computer algorithms. As a result of the Stage 2 implementation, will be obtained a matrix of reasons, according which it is expedient (or inexpedient) to conduct KMp.

Stage 3 – Determination the objectives of the KMp. At this stage, a set of objectives is created ($\boldsymbol{C}$):

$$\boldsymbol{C} = \{\bigcup_{i=1}^{c} \boldsymbol{C}_i\} = \{\boldsymbol{C}_1, \boldsymbol{C}_2, ..., \boldsymbol{C}_c\}, \boldsymbol{C}_i \subseteq \boldsymbol{C}, i = \overline{1,c}$$

by experts. The set of objectives is a possible consequence of the reasons for conducting the KMp (step 1). Moreover, by experts are creating the set of focus group (who are the target of influence) ($\boldsymbol{G}$):

$$\boldsymbol{G} = \{\bigcup_{i=1}^{g} \boldsymbol{G}_i\} = \{\boldsymbol{G}_1, \boldsymbol{G}_2, ..., \boldsymbol{G}_g\}, \boldsymbol{G}_i \subseteq \boldsymbol{G}, i = 1, g,$$

(step 2) and criteria ($\boldsymbol{Kr}$):

$$\boldsymbol{Kr} = \{\bigcup_{i=1}^{r} \boldsymbol{Kr}_i\} = \{\boldsymbol{Kr}_1, \boldsymbol{Kr}_2, ..., \boldsymbol{Kr}_r\}, \boldsymbol{Kr}_i \subseteq \boldsymbol{Kr}, i = \overline{1,r},$$

that is, the parameters by which the objectives and tasks of the KMp will be selected.

As a result of the Stage 3 implementation, will be formed objectives, the focus groups who are the objects of influence are identified and the criteria (for choosing objectives and tasks) are selected.

Stage 4 – Determination of the KMp tasks. At the step 1, experts form a set of tasks ($\boldsymbol{A}$), which are connected to the objectives of the KMP (the objectives were identified in step 3), for assessing the KMP's tasks:

$$\boldsymbol{A} = \{\bigcup_{i=1}^{y} \boldsymbol{A}_i\} = \{\boldsymbol{A}_1, \boldsymbol{A}_2, ..., \boldsymbol{A}_y\},\ \boldsymbol{A}_i \subseteq \boldsymbol{A},\ i = \overline{1, y}.$$

At the step 2, the proportion of agreed positive scores $x_{A_i}^{v}$ to the criteria of each v task of each agent A_i according to all the criteria is calculated:

$$x_{A_i}^{v} = \frac{\sum \beta_{A_i Kr_i}^{v}}{\sum a_{A_i Kr_i}^{v}},\ i = \overline{1, v}.$$

As a result of Stage 4, the tasks to be achieved during KMp are formed.

Stage 5 – Determination of strategies for the KMp implementation. The objectives of manipulating different groups are made at different times t_i and with different benefits. In accordance with the formulated objectives and tasks their strategies ($\boldsymbol{L}$) $\boldsymbol{C}_i \Rightarrow \boldsymbol{L}_i$, $\boldsymbol{A}_i \Rightarrow \boldsymbol{L}_i$ are selected and implemented. At the step 1, from the set of strategies experts select the strategy that require of the KMp conducting:

$$\boldsymbol{L} = \{\bigcup_{i=1}^{m} \boldsymbol{L}_i\} = \{\boldsymbol{L}_1, \boldsymbol{L}_2, ..., \boldsymbol{L}_m\},\ \boldsymbol{L}_i \subseteq \boldsymbol{L},\ i = \overline{1, m}.$$

At the step 2, the list of strategies are ranked:

$$f_{lp} = \begin{cases} 3,\ if\ a_l > a_p, \\ 2,\ if\ a_l = a_p, \\ 1,\ if\ a_l < a_{p.} \end{cases}$$

As a result of Stage 5, it is formed a number of strategies (possibly more than 1) on which KMp will be conducted.

Stage 6 – Selection the mass media for manipulation. At the stage 6, it is necessary to choose mass media ($\boldsymbol{Z}$) which will be used during manipulative influences [14].

Then, it is necessary to conduct an analytical study of mass media with further evaluation of the information influence effectiveness. At the step 1, a set of mass media is formed:

$$\boldsymbol{Z} = \{\bigcup_{i=1}^{z} \boldsymbol{Z}_i\} = \{\boldsymbol{Z}_1, \boldsymbol{Z}_2, ..., \boldsymbol{Z}_z\},\ \boldsymbol{Z}_i \subseteq \boldsymbol{Z},\ i = \overline{1, z}\ .$$

Step 2 – evaluation the effectiveness of manipulative actions can be presented as: $c_{Z_i G_i}^{R_i} = \frac{a_{Z_i G_i}^{R_i}}{b_{Z_i}^{R_i}}$, where $a_{Z_i G_i}^{R_i}$ – a score of z mass media in g focus group in r region,

$z=\overline{1,Z}$, $g=\overline{1,G}$, $r=\overline{1,R}$, $b_{Z_i}^{R_i}$ – a score of z mass media of population in r-region, $c_{Z_iG_i}^{R_i}$ – a compliance index of z mass media in g focus group in r region.

Thereafter, the mass media price matrix is created and stored in database of manipulation system:

$$D_{zp}=\begin{vmatrix} d_{1Z} & \dots & d_{1P} \\ \dots & \dots & \dots \\ d_{Z1} & \dots & d_{P1} \end{vmatrix},$$

where d_{zp} – publication price (unit of standard area, standard broadcast time etc.) in z mass media on p page (in p broadcast time etc.).

After that, an important action is the calculation of «cost per thousand» readers:

$$e_{Z_iG_ipR_i}=\frac{d_{Z_ip}}{b_{Z_iR_i}\times c_{Z_iG_iR_i}}.$$

According to the different price in different cities (regions), the «cost per thousand» quantity will difference. So, ind index can be presented as ind_{ZGR} and matrix IND converted into cube, but in our example, it is necessary to leave just two indices Z and G:

$$IND_{ZP}=\begin{vmatrix} ind_{1Z} & \dots & ind_{1P} \\ \dots & \dots & \dots \\ ind_{Z1} & \dots & ind_{P1} \end{vmatrix},$$

where ind_{zg} – the influence of z mass media on g focus group or its segment.

The ratio of advantages in g focus group for each studied above j criteria of $p_j(k,h)$ for pair of mass media alternatives A_k, A_h can be presented as

$$p_j^g(k,h)=\begin{cases} \dfrac{r_{kj}^g-r_{hj}^g}{m_j}, \text{ if } r_{kj}^g>r_{hj}^g, \\ 0-\text{if not}. \end{cases}$$

where m_j – the rating scale according to the j criteria, r_{kj}^g, r_{hj}^g – the value of the A_k, A_h options according to the j criteria in g focus group.

The ratio of advantages over a pair of alternatives (A_k, A_h) taking into account all considered criteria can be defined as:

$$p^g(k,h)=\sum_{j=1}^{J}p_j^g(k,h)=\sum_{j=1}^{J}\begin{cases} \dfrac{r_{kj}^g-r_{hj}^g}{m_j}, \text{ if } r_{kj}^g>r_{hj}^g; \\ 0-\text{if not}. \end{cases}$$

The ratio of the dominance A_k alternative over A_h in g focus group can be presented by membership function $\mu_D^g(k,h)$ which characterizes the dominance intensity of k over h mass media:

$$\mu_D^g(k,h) = \begin{cases} p^g(k,h) - p^g(h,k), \text{ if } p^g(k,h) > p^g(h,k); \\ 0 - \text{if not}. \end{cases}$$

The best alternative corresponds to the condition:

$$\mu^*\left(A_k^*\right) = \max D_{k=1,..,m}\mu^*\left(A_k\right) = 1 - min\left\{ max\left[p(k,h)_{\substack{l=1,..,l \\ l\neq k}}^{k=1,..,m} - p(h,k) \right] \right\}.$$

As a result of Stage 6, the mass media which according to the criteria has the highest rating will be chosen. Moreover, isn't necessarily it will be one mass media for all disposition places. It is also possible to choose different mass media for different disposition places.

Stage 7 – Selection the manipulation method. In database the manipulative influence methods ($\boldsymbol{M}$) are stored. These methods can be presented as:

$$\boldsymbol{M} = \{\bigcup_{i=1}^{x} \boldsymbol{M}_i\} = \{\bigcup_{i=1}^{x}\{\bigcup_{j=1}^{e} \boldsymbol{M}_{ij}\}\} = \{\{\boldsymbol{M}_{11}, \boldsymbol{M}_{12}, ..., \boldsymbol{M}_{1e}\}, \{\boldsymbol{M}_{21}, \boldsymbol{M}_{22}, .., \boldsymbol{M}_{2e}\},$$
$$, ..., \{\boldsymbol{M}_{x1}, \boldsymbol{M}_{x2}, ..., \boldsymbol{M}_{xe_x}\}\}, (i = \overline{1,x},\ j = \overline{1,e}).$$

In database all methods are separated by certain characteristics and used by different mass media. Furthermore, each agent chooses the most effective method from the database that, in agent's opinion can use by mass media. After that, the list of criteria for which the method selecting are conducting will be formed.

$$M_j^i = \left(k_1\alpha_{1,j}^i + k_2\alpha_{2,j}^i\right) \times k_3\alpha_{3,j}^i,\ i = \overline{1,I},\ j = \overline{1,J},$$

where k_1 «the value» of l criteria ($l = 1, 2, 3$), α_{ij}^i – criterion value of j operative manipulative influences method according to i strategy for l criteria.

As a result of Stage 7, manipulative influence methods which will be implemented by the mass media chosen in step 6 will be chosen.

Stage 8 – Estimation of manipulative influence. If the initial evaluation of g focus group is presented as b_g ,then the task of manipulation is to change the group's opinion to $b_g + q_g,\ q_g \in Q_g,\ g \in N,$ where q_g – the change of initial opinion, thus q_g is the controlling influence.

As a result of the sequence of operational manipulative influences, the final opinion in some focus groups is formed: $\overline{B_q} = T(\bar{b} + \bar{q}),$ where q_g – the initial opinion of focus group, $\bar{q} = \prod_{g \in N} q_g.$ The target function of public opinion modification can be

represented as: $\Phi\left(\overline{B_q}, \bar{q}\right) = \max H\ (\overline{B_q}) - C\left(\bar{q}\right)$, where $H(\bullet)$ – received benefits (profit, votes in elections, change in certain officials or government, etc.) by an organization in whose interests the manipulative influence is conducted, which depends on the change of public opinion, $C(\bullet)$ – costs for manipulative actions.

The task of management is to choose an acceptable management method that maximizes efficiency $\Phi\left(\overline{B_q}, \bar{q}\right) \to max$. Then the value of operational influence can be determined by the ratio $D_i = -f\left(\delta_i^k\right)\left(x_i^k - x_i^{k+1}\right)$, where $f\left(\delta_i^k\right)$ – a function (table or algorithm) that reflects the difference in scores $x_i^k - x_i^{k+1}$ in the amount of operational influence, for example, the volume and number of compromising newspaper articles or news releases on the TV channel. If $x_i^k < x_i^{k+1}$, then $D_i = f\left(\delta_i^k\right)\left(x_i^{k+1} - x_i^k\right)$. The effectiveness l of influence E^l in period τ^k is determined in different ways, in particular, by the ratio:

$$E^l\left(\tau^k\right) = \begin{cases} \dfrac{w_l^k - w_l^{k+1}}{x_l^k - x_l^{k+1}}, if\ (w_l^k > w_l^{k+1}) \vee (x_l^k > x_l^{k+1}) \\ \dfrac{w_l^{k+1} - w_l^k}{x_l^{k+1} - x_l^k}, if\ (w_l^{k+1} > w_l^k) \vee (x_l^{k+1} > x_l^k) \end{cases},$$

where w_l^k – influence assessment in the period τ^k, x_l^k – the magnitudes of the produced influence of l type in the period τ^k, $l = \overline{1, L}$ – influence type.

4 Experimental study & discussion based on example of Ukrainian mass media

Considering the network-centered concept involves data analyzing and gathering from different regions for obtaining results on manipulative influences, it is proposed to calculate the influence of the mass media and its efficiency as an average of 3 regions for 4 newspapers and 3 manipulation methods selected by experts on previous stages. The influence of selected mass media presented in Tab. 2, 4, 6, 8; the effectiveness of influence showed in Tab. 3, 5, 7, 9. The value of operational influence will be determined by the number of articles (expert estimate).

Table 2. Influence of newspaper named „Facty“

	x_1^0	x_1^1	x_1^2	x_1^3
	1	3	4	5
D_i	n/a	2	3	4

Table 3. Effectiveness of Influence of newspaper named „Facty“

	w_1^0	w_1^1	w_1^2	w_1^3
The value of influence effectiveness presented in %	18	28	34	33
E_1^{Pi}	n/a	14	11,3	9

Table 4. Influence of newspaper named „Segodnya“

	x_2^0	x_2^1	x_2^2	x_2^3
	1	3	4	5
D_i	n/a	2	3	4

Table 5. Effectiveness of Influence of newspaper named „Segodnya“

	w_2^0	w_2^1	w_2^2	w_2^3
The value of influence effectiveness presented in %	11	14	18	20
E_2^{Pi}	n/a	7	6	5

Table 6. Influence of newspaper named „Komsomolska Pravda“

	x_3^0	x_3^1	x_3^2	x_3^3
	1	3	4	5
D_i	n/a	2	3	4

Table 7. Effectiveness of Influence of newspaper named „Komsomolska Pravda”

	w_3^0	w_3^1	w_3^2	w_3^3
The value of influence effectiveness presented in %	9	24	28	34
E_3^{Pi}	n/a	12	9,3	8,5

Table 8. Influence of newspaper named „Dzerkalo tyzhnia“

	x_4^0	x_4^1	x_4^2	x_4^3
	1	3	4	5
D_i	n/a	2	3	4

Table 9. Effectiveness of Influence of newspaper named „Dzerkalo tyzhnia”

	w_4^0	w_4^1	w_4^2	w_4^3
The value of influence effectiveness presented in %	10	20	30	40
E_4^{Pi}	n/a	10	10	10

The tables present the influence of mass media and the value of manipulative influence.

In fig. 2 graphically depicts the ratio of the value of operational influence, that is, the number of articles, to the value of the effectiveness of manipulative influence.

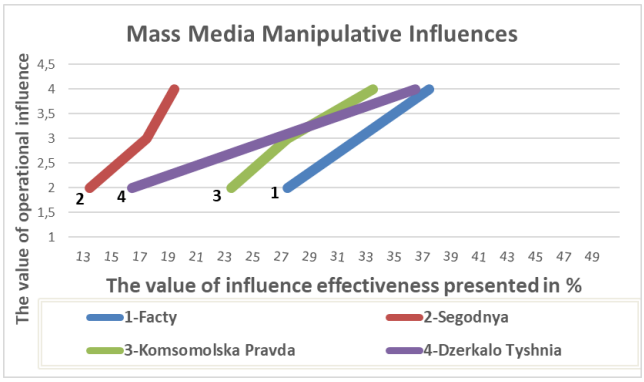

Fig. 2. Effectiveness of mass media influence

The smallest value of operational influence, namely, with the smallest number of articles that used manipu-lative methods, showed the mass media “Facty”: when the number of articles – 2, the effectiveness of manipulative influence equal to 28%. The other mass media “Segodny”, when the number of articles – 2; the effectiveness of manipulative influence equal to 14%.

5 Conclusions

In the paper the quantitative evaluation method of mass media manipulative influence on public opinion was developed. The method by means of evaluating financial expenditures, defining goals, objectives and strategies for manipulating, selecting mass media and classified methods of manipulation, based on the generated databases of causes, goals of the criteria, focus groups and mass media, allows to calculate the quantitative parameters that characterize the magnitude of manipulative mass media influences on public opinion. This method, in compare with analogs, could quantity evaluate a manipulative influence which realized by modern mass media and using manipulation influence methods on public opinion. The obtained results will be useful in information security field for evaluation harmful mass media influence on public

opinion or on consciousness individuals. In the next research, it is going to conduct an experimental study of the developed method for its verification, correctness confirmation, as well as the establishment of the practical application possibility for raising the information and psychological safety level of citizens, society and the state.

6 References

1. Peleshchyshyn, A., Sierov, O., Berezko, O., Peleshchyshyn, O., Tymovchak-Maksymets, O.. Processes of interactive social communications management in the conditions of an information society development. Monography. Lviv (2012).
2. Peleshchyshyn, A., Huminskyi, R., Tymovchak-Maksymets, O.. Search for discussion pages in social networks by global search engines. Ukrainian Scientific Journal of Information Security 19 (3), 181-187 (2013).
3. Peleshchyshyn A., Korzh, R., Huminskiy, R.. Definition of recommendations for information impact on the virtual community structure. Ukrainian Scientific Journal of Information Security 20 (3), 264-273 (2014).
4. Shiyan, A., Yaremchyk, Yu.. Model and methods for protection of structured social group from negative information-psychological impact. Ukrainian information security research journal 16(4), 311-317 (2014).
5. Shiyan, A.. Method of protecting a person from negative informational and psychological influence on the basis of activity typology. Information security 3(15), 92-99 (2014).
6. Shiyan, A.. Method of protection of unstructured social group from negative informational and psychological influence on the basis of human activity types. Information security 4(16), 169-175 (2014).
7. Gubanov, D., Novikov, D., Chkhartishvili, A.. Models of influence in social networks. UBS 27, 205-281 (2009).
8. Gubanov, D., Novikov, D., Chkhartishvili, A.. Social networks: models of informational influence, control and confrontation. Moscow (2010).
9. Ryabyy, M., Hatyan, O., Bagatskyy, S.. The model of PR-impact detection by means of Internet mass-media. Ukrainian Scientific Journal of Information Security 21(2), 131-139 (2015).
10. Polishchuk, Yu., Gnatyuk, S., Seilova, N.. Mass media as a channel of manipulative influence on society. Ukrainian Scientific Journal of Information Security 21(3), 301-308 (2015).
11. Oltarzhevsky, D.. Fundamentals and methods of modern corporate media. Free Press Center, Kyiv (2013).
12. Methods of evaluating the effectiveness of the use of various media to promote a culture of life safety, http://89.mch s.gov.ru/upload/site61/docment_file/HjSxq5ASwk.pdf, last accessed 2019/03/01.
13. Polishchuk, Yu., Gnatyuk, S.. Method of quantitative evaluation of the negative informational and psychological influence of mass media on public opinion. In: 8th International Scientific Conference ICS-2018, pp. 96-97. Lviv: Lviv Polytechnic Publishing, Lviv (2018).
14. Polishchuk Yu., Zhmurko, T.. Information-psychological security of society in the context of information warfare. Monography. Akademia Techniczno-Humanistyczna, Bielsko-Biała, (2016).