Network Public Opinion Risk Model Simulation Research

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Keywords: network public opinion; public opinion risk; system dynamics

Abstract: Under the catalysis of the rapidity, interactivity and extensiveness of network communication, public opinion events have a rising risk and have a major negative impact on social stability. However, the risk is regular, whether it is from its own generation and evolution, or from our response and guidance, it has its roots. In view of the fact that the network public opinion risk is the result of multi-factor interaction, the system dynamics model is established from the modules of the speed of public opinion information diffusion, the publicity of the public opinion, the network media boosting effect, and the public opinion audience resonance degree, and the simulation is carried out by using Vensim PLE. The simulation results show that the variables such as public opinion sensitivity, subjective activity, media influence, and audience participation have strong interaction with network public opinion risk, which can have a greater impact on the latter.

1. Introduction

The interactive and flat complex communication mode of the Internet has profoundly affected the way and influence of sudden public opinion, and brought about tremendous changes in the overall communication activities [1]. Under the catalysis of the rapidity, interactivity and extensiveness of network communication, the risk of public opinion is rising continuously, which has a major negative impact on social stability. The solution of these problems needs to be based on the fundamental understanding of the mechanism of network public opinion risk. Based on the information propagation model of Shannon [2] and Defleur [3], this paper takes the system dynamics as the research perspective, and regards the network public opinion communication process as a system, by analyzing the influencing factors of network public opinion risk and the interaction between various factors. Relationship, with the help of causal map and stock flow graph tool to establish a model, and then through simulation to test the key influencing factors of network public opinion risk, provide a management reference for public opinion response measures.

2. Analysis of causality of network public opinion risk from the perspective of system dynamics

The system dynamics method is oriented to complex systems, and it is well coupled with theories of decision theory, information theory, system theory, and synergy. It is a simulation technology [4] suitable for solving "dynamic complex problems".The network public opinion communication has the characteristics of immediacy, dynamicity, interaction, correlation, etc., and has the characteristics of non-linear, high-order, multi-loop behavior, and the structural relationship and time evolution of the system dynamics. By using the system dynamics method to model and simulate the network public opinion risk problem, it can effectively segment and dynamically simulate its influencing factors, and visually display the evolution mechanism of network public opinion risk.

2.1 System Boundaries and Research Hypothesis

Classical system dynamics theory holds that people are bounded rational, it is impossible to build an all-encompassing model, or have the ability to analyze such a model. In order to clarify the system boundary and the research theme, this paper proposes the following research hypotheses:

H1: The network public opinion risk is directly affected by the public opinion communication

process.

H2: The interaction between the lyric information diffusion speed, the lyric subject communication ability, the network media boosting effect, and the sensational audience resonance level 4 modules and the internal elements of the module jointly determine the level of network public opinion risk. Other exogenous variables with low correlation are not included in the model.

H3: Does not consider system crashes caused by major changes in government policies and other abnormal conditions.

H4: Excludes the secondary impact of an event, that is, the analysis of the risk of a particular network's public opinion is not affected by the crossover of other current network public opinion events.

2.2 Causal relationship figure of network public opinion risk

The speed of public opinion information diffusion, the ability of public opinion communication, the promotion effect of online media, and the resonance degree of public opinion audience are the key modules affecting the risk of online public opinion. Next, the paper will analyze the influence mechanism by means of causality diagram.

Judging from the causal relationship figure of the speed of public opinion information diffusion, the sensational heat is directly affected by the risk of online public opinion, and the level of heat is a direct reflection of the magnitude of public opinion risk. The speed of public opinion information diffusion is increasing, the risk of online public opinion is increased, and the information entropy is increased. The increase of public opinion information entropy will inevitably lead to the reduction of the speed of public opinion information diffusion, which plays an important balancing role. (Fig.1).

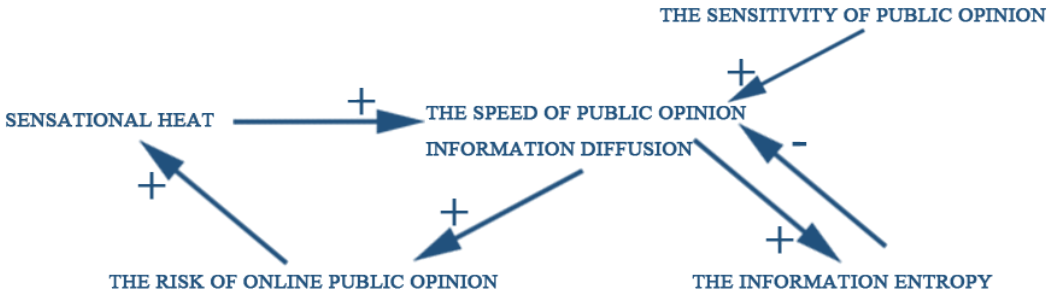

Figure. 1 Causal relationship figure of the speed of public opinion information diffusion

Judging from the causal relationship figure of the publicity of the public opinion, the subject authority is directly affected by the risk of online public opinion. The ability of lyrical subject communication is an important factor affecting the risk of online public opinion. The lyrical subject's communication ability is improved, and the network public opinion risk is increased. The lyric subject will reduce the attention to a certain lyric under the effect of information fatigue effect; while the subject's attention reduction will lead to the lyrical subject communication ability as time evolves. The reduction has an important balance (Fig.2).

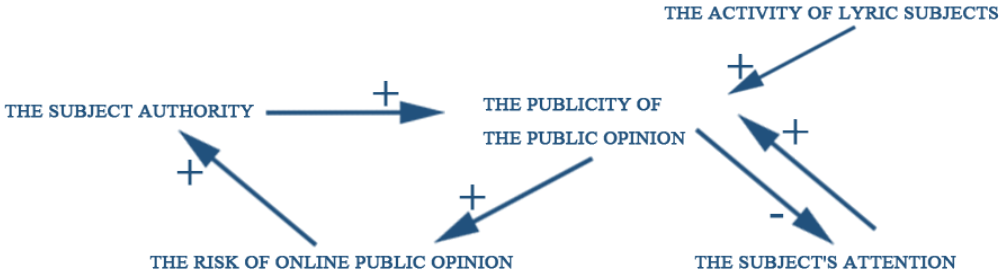

Figure. 2 Causal relationship figure of the publicity of the public opinion

From the causal relationship diagram of the network media boost effect, the information diffusion degree is directly affected by the network public opinion risk, and its size is an important manifestation of the network public opinion risk. The effect of online media boosting is an important factor affecting the risk of online public opinion. The network media boosting effect is improved, the network public opinion risk is increased, and the matching degree between the public opinion event and the media is gradually reduced, which plays an important balancing role for the network media boosting effect [5] (Fig. 3).

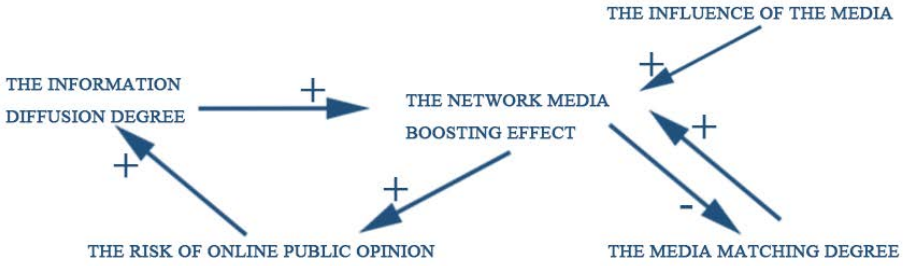

Figure. 3 Causal relationship figure of the network media boosting effect

Judging from the causality diagram of the public opinion audience resonance degree, the audience interaction is directly affected by the risk of online public opinion. The degree of resonance of public opinion audience is an important factor affecting the risk of online public opinion. The interest transfer of the public opinion audience will lead to the reduction of the resonance of the public opinion audience to the important balance [6] (Figure 4).

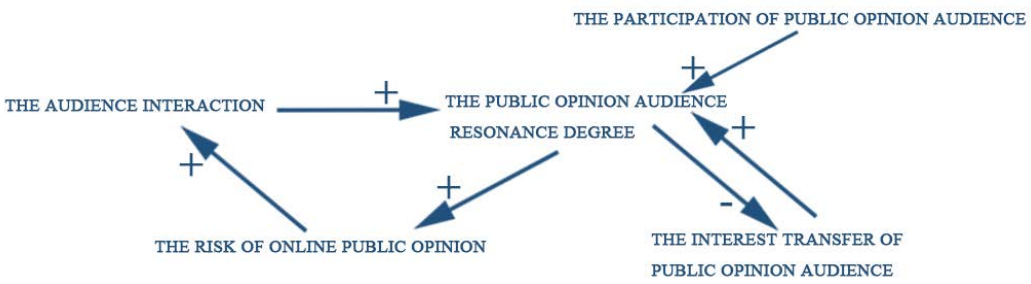

Figure. 4 Causal relationship figure of the public opinion audience resonance degree

3. System Dynamics Simulation Analysis of Network Public Opinion Risk

3.1 Model Construction

The Cobb-Douglas production function mainly deals with the relationship between the change in the number of elements used in production and the production capacity that can be produced in a certain period of time, with the same level of technology. In this paper, the research on network public opinion risk assumes that in the case of external influence variables, the speed of lyric information diffusion, the lyric subject communication ability, the network media boosting effect, and the public opinion audience resonance level involved in the evolution of network public opinion are discussed. The relationship between the variables contained in the four major modules and the risk of public opinion. The hypothesis of the relationship between the dependent variable and the independent variable is in line with the classical analysis paradigm of the Cobb-Douglas production function for analyzing the contribution of factor changes to output. Therefore, this paper abstracts the network public opinion risk into the output of the above four major module modules, which is described by the classic Cobb-Douglas production function, which is:

$$YQFX=\mu AX\alpha Z\beta M\gamma S\theta \quad (1)$$

In the above formula, YQFX refers to the network public opinion risk, where A is the network public opinion risk index affected by the four element modules, μ represents the influence of random interference ($0 \leq \mu \leq 1$), and α, β, γ, θ Represents the coefficient of action of the four major variables.

3.2 Model parameters

The classical Cobb-Douglas production function, based on the difference in the coefficient of action of the dependent variable, mainly discusses the influence relationship under three hypothetical situations, that is, the value of $\alpha+\beta+\gamma+\theta$ is greater than 1, equal to 1, and less than 1. Wait for three situations. In order to highlight the pertinence of the research, this paper selects the most typical situation that can produce amplification when it explores the influence of various evolution factors on the network public opinion risk. Drawing on the general practice of the Cobb-Douglas function, this paper assumes that $\alpha+\beta+\gamma+\eta>1$, let $\alpha=0.3$, $\beta=0.2$, $\gamma=0.3$, $\theta=0.4$, and set the value of the risk factor A to Medium level 0.5. In order to maintain the stability of the system environment, this paper assumes that a public opinion is not affected by the cross-effect of other public opinion propagation, and the value of random interference μ is set to 1. For descriptive auxiliary variables that are difficult to quantify, the range of values is uniformly set to [0, 1]. In this paper, the initial value of the stock variables of each element module in the system dynamics simulation model of network public opinion risk is set to 100, and the initial value of the risk network risk of the variable network can be obtained according to formula (1).

3.3 sample selection and status setting

This article selects the “smuggling donation door” incident that appeared in November 2016 as sample data. On the morning of November 30, 2016, an article titled “XXX, you give me a stop!” smashed the circle of friends, and the father said that he the 5-year-old daughter was found to be seriously ill, and the medical expenses were unbearable. She chose to sell the papers to raise funds. After the netizens pointed out that the matter was a marketing tool, they were heatedly debated. The incident began to fertilize on November 30 and reached its climax on December 5, and gradually subsided on December 15. This article selects posts on Weibo that forward more than 200 posts about this lyric comment as a data source. The 16 days between November 30 and December 15 were abstracted into 16-time nodes, and the evolution of online public opinion risk over time was studied based on this. Using the system dynamics model to simulate the network public opinion risk needs to be based on the reasonable setting of the initial state of the model. In this paper, we use VensimPLE software to carry out simulation simulation, set the time unit to day, the initial time to 0, and the step and end time to 1 and 16.

3.4 Simulation Analysis

Many variables in the model have an impact on the evolution of risk. This paper mainly selects the three variables with the most controllability for analysis [7].

3.4.1 Changing public opinion sensitivity

Curve 1 in Fig. 5 indicates the trend of network public opinion in the initial state of the system. If the variable public opinion sensitivity is increased by 25% and 25%, respectively, the results of the simulation analysis are represented by curve 2 and curve 3 in Fig. 6. According to the simulation results presented in Figure 6, if the public opinion sensitivity increases by 25%, the network public opinion risk will increase significantly, and if the public opinion sensitivity decreases by 25%, the online public opinion risk will decrease slightly.The decrease of the level of the public opinion is not obvious, but the risk of the network public opinion is multiplied by the effect of the increase. This result also shows that the weakening of the risk of public opinion caused by the decline in public opinion sensitivity is a gradual process, and if it is improperly guided, it will trigger a strong rebound.

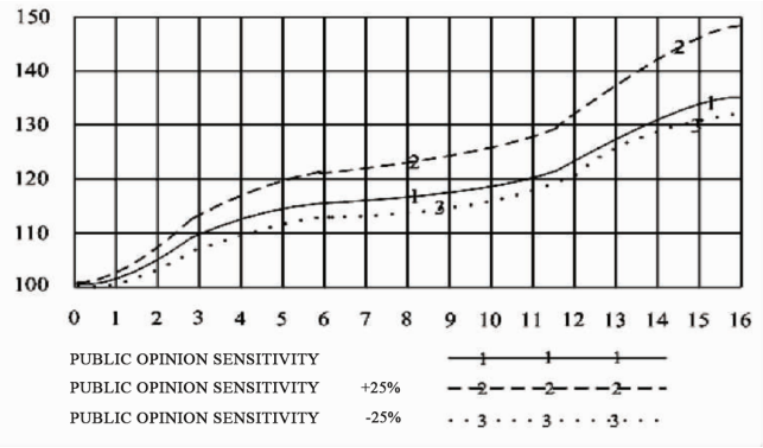

Figure. 5 Changes in network public opinion risk due to changes in public opinion sensitivity

3.4.2 Changing media influence

If the variable media influence is increased by 25% and 25%, respectively, the results of the simulation analysis are represented by curve 2 and curve 3 in FIG. According to the simulation results presented in Figure 8, regardless of whether the media influence increases by 25% or decreases by 25%, the network public opinion risk will show a large change consistent with its direction of change. This indicates that media influence has a direct impact on network public opinion risk, and network public opinion risk is very sensitive to changes in the influence of variable media. This result also shows that the authority and influence of the media has a great role in promoting the effective diffusion of information. Strengthening the control of media influence will have a significant effect on the reduction of online public opinion risk.

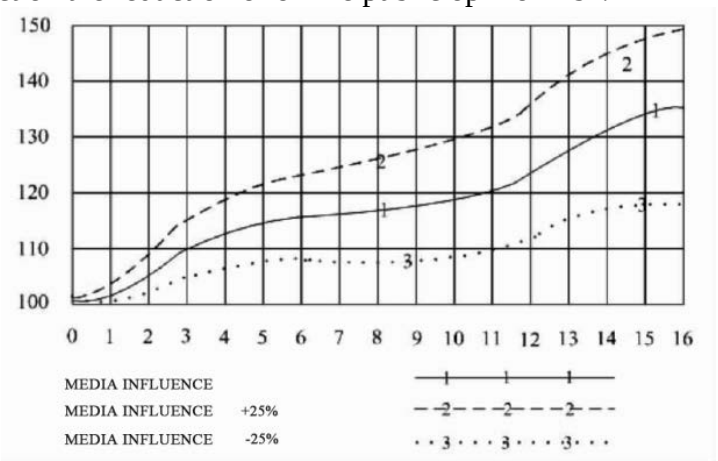

Figure. 6 Changes in network public opinion risk due to changes in media influence

3.4.3 Changing audience engagement

If the variable audience participation degree is increased by 25% and 25%, respectively, the results of the simulation analysis are represented by curve 2 and curve 3 in FIG. According to the simulation results presented in Figure 9, regardless of whether the audience participation increases by 25% or 25%, the online public opinion risk will only show weak changes consistent with the direction of change. This indicates that the influence of audience participation on online public opinion risk is relatively indirect. This result also shows that the impact of audience participation on online public opinion risk is significantly lower than the impact of public opinion sensitivity and public opinion activity.

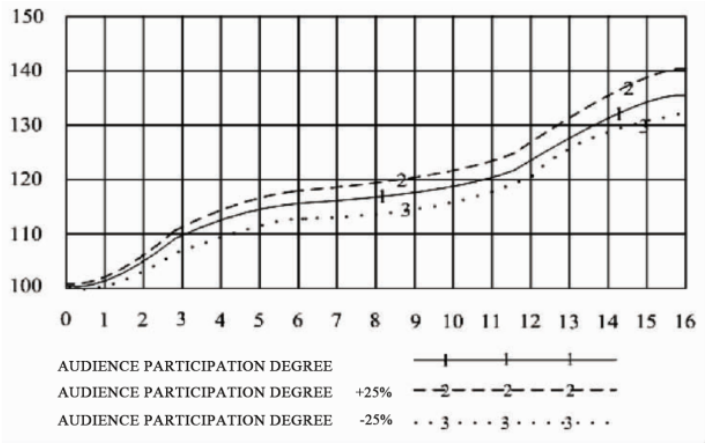

Figure. 7 Changes in network public opinion risk due to changes in audience participation degree

4. Conclusion

In this paper, the system dynamics is applied to the research of network public opinion risk, and the four major influence modules such as the speed of public opinion information dissemination, the ability of public opinion communication, the promotion effect of online media, and the resonance degree of public opinion audience are sorted out by quantitative thinking.The simulation results show that the controllable external variables such as public opinion sensitivity, media influence, and audience participation have strong interaction with the network publiSc opinion risk, and the overall impact on the latter is stronger. Therefore, to effectively reduce the impact of network public opinion risk, on the one hand, we must pay attention to the role of a certain variable within the module, on the other hand, we must pay attention to the impact of interaction between modules and modules, variables and variables.

References

[1] Xinzhou Xie, et al. Research on the influence and utilization of new media such as the Internet on social public opinion [M]. Beijing: Economic Science Press, 2013: 52, 127.

[2] Shannon C, Weaver W. The Mathematics Theory of Communication [M]. Urbana: University of Illinois Press, 1949: 37－39.

[3] Defleur L. Understanding Mass Communication [M]. Boston: Houghton Mifflin, 1981: 50－53.

[4] Haiying Ren, Shanbao Cheng, Lucheng Huang. Research on Industrialization Strategy of Emerging Technologies Based on System Dynamics [J]. Research Management, 2013, 34(5): 21-31.

[5] Tao Tang. New Features, New Challenges and Countermeasures of Mobile Internet Public Opinion [J]. Journal of Information,2014,33(3):113-117.

[6] Guohua Wang.The dynamic elements of emergency network grievances and their governance [M]. Wuhan: Huazhong University of Science and Technology Press, 2017: 143.

[7] Fuji Chen, Meng Ye. Research on the ability of government to respond to network public opinion from the perspective of system dynamics [J]. Journal of Information,2013,32(11):121-127.