



Public Opinion Risk and Guidance Study of Emergent Events Based on System Dynamics

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Abstract. The Internet has become the main expression of public sentiment and public opinion by virtue of its own advantages, which can be communicated to the government and society. At the same time, their own views have also become the main place for the intensification of contradictions, and its rapid spread and influence have caused the wide attention of the society from all walks of life. So correctly guiding public opinion has an important role in the politics and economy in our country. Taking an accident as an example, this paper divides the variables that affect public opinion into government, media, netizens and public affairs. A causal loop diagram is established according to the logical relationship between variables, based on system dynamics theory and VENSIM software. The changing trend of public opinion risk can be seen through the simulation results. By comparing the simulated results of the public opinion heat with the official data on the Zhiwei events, the trend is roughly consistent, which verifies the accuracy of the model.

Keywords: Public opinion guidance; Emergency events; System dynamics; Public opinion risk.

1 Introduction

After 2005, with the increasing popularity of the network, various online public opinion monographs and papers have shown a substantial growth trend [1-6]. According to the results of literature statistics[1-10], from 2011 to the last two years, the literatures and monographs related to “public opinion” mainly focus on the research on the essential characteristics of public opinion in emergencies, the legal regulation of public opinion, the evolution law of public opinion, the principles and strategies of public opinion response, the evaluation indicators and evaluation methods of public opinion and other fields. It can be seen that most people pay attention to the outbreak and communication mechanism of public opinion, and the research on public opinion risk management and public opinion guidance needs to be studied in depth.

The purpose of this paper is to deeply explore the various factors needed to control public opinion guidance, and carry out specific analysis and determination to fully understand the complexity and diversity of public opinion guidance. This paper apply the

theory and method of system dynamics. Through Vensim software modeling a public opinion guidance and risk analysis is discussed.

2 System Dynamics Modeling of Public Opinion Guidance System

2.1 Modeling process using system dynamics

- (1) Identify research questions and system types;
- (2) Describe variables in the system and their relationships through mind mapping and other tools to build conceptual models;
- (3) Determine the main variables for definition and quantification;
- (4) Based on the basic concepts and variable types, a mathematical model is established to describe the change relationship between variables;
- (5) Assign values to parameters in the model, which may include initial state, rate of change, and magnitude;
- (6) Verify and debug the established model to determine its stability and rationality;
- (7) Using computer software for simulation analysis;
- (8) Optimize and improve the constructed system according to the simulation results;
- (9) The above steps provide the basic process and method of system dynamics modeling, which helps researchers understand and analyze the dynamic behavior of complex systems, and propose corresponding decision-making and management strategies.

2.2 Structure of System Elements

A network opinion guidance system for public emergencies has been set up, which includes 10 state variables, 3 rate variables, 6 auxiliary variables and 8 constants, as shown in Table 1.

Table 1. Structure of system elements

classification	Variable composition
state variable	Network public opinion heat, government information increase, government information release quantity, government information silence quantity, media information quantity, media information increase quantity, media information decrease quantity, microblog information quantity, microblog increase quantity, microblog silence quantity
Rate variable	Government attention, media attention, netizens' participation, netizens' emotional intensity, netizens' vulnerability

instrumental variable	Government credibility, public opinion regulation level, time distance, space distance, social distance, hypothetical
constant (quantity)	Media silence coefficient, information silence coefficient, microblog silence coefficient, government response intensity, event handling intensity, event risk, event risk, event sensitivity

3 Evolution Case Analysis of Network Public Opinion on Public Emergencies

3.1 Empirical Case Preparation

The Xiangshui explosion accident refers to a heavy explosion that occurred in Xiangshui Town, Wujin District, Changzhou City, Jiangsu Province, on March 21, 2019. The explosion have resulted in 78 deaths, hundreds of injuries, and severe environmental pollution. At the time of the accident, an explosion have occurred in the production room of the company, causing several serial explosions. Nearby residential areas, schools, enterprises and institutions have been badly affected. The explosion have caused a fire that lasted for several hours, and the whole chemical park have been on fire enveloped in flames and smoke. The nearby residents have been forced to evacuate.

An investigation later have found that the explosion have been caused by a leak in the company’s chemical storage tank. And then it has been hit by a fire source that caused an explosion. Most of the people who have died in the accident were on-site workers and nearby residents. The accident has also triggered widespread concern and reflection on the safety management system of Chinese chemical enterprises, prompting the government to strengthen the safety supervision of chemical enterprises.

3.2 Simulation Using VENSIM Software

The table functions in VENSIM software are used to reflect the evolution of online public opinion popularity, the number of government information released, the number of media information, and the number of microblog information during the life cycle of online public opinion respectively, as shown in the Figures. In the Figure 1, the horizontal coordinate is the time of event occurrence, and the vertical coordinate is the popularity of online public opinion, which is a dimensionless value for measuring public opinion.

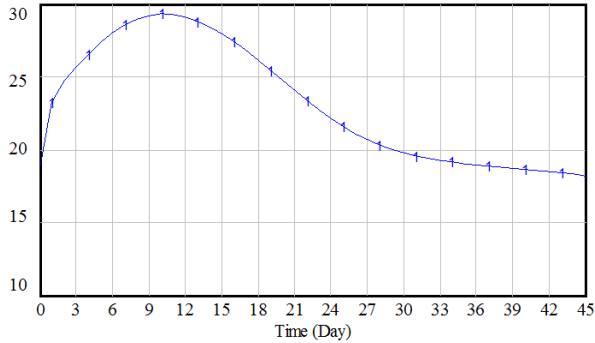


Fig. 1. Simulation diagram of network public opinion heat of Xiangshui Event

The network public opinion data combined with the Zhiwei Event platform is shown in Figure 2, where the horizontal coordinate is the time of event occurrence, and the vertical coordinate is the event popularity. The formula is customized by the website algorithm model.

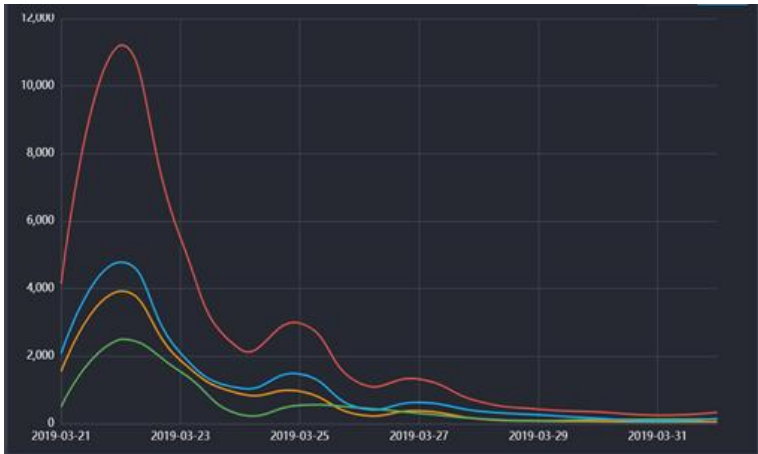


Fig. 2. Network public opinion reference chart of Xiangshui Event

Comparing the research results of this paper with the data charts of Internet websites, both charts show a similar trend. As time goes by, the popularity of public opinion shows a trend of first increasing and then decreasing and gradually fading. However, there are some differences in specific details, which are due to the problems of data collection method, time, sample and sample size. It reflects the gap between the model assumptions and the actual situation. However, the common trend shown overall validates the reliability and accuracy of the model as well as its comprehensiveness. In addition, there are other variables that can reflect the popularity of public opinion, such as the number of government information released, the number of media information, and the number of microblog information, as shown in Figure 3-Figure 5. The horizontal coordinate is the time of event occurrence, and the vertical coordinate is 10,000.

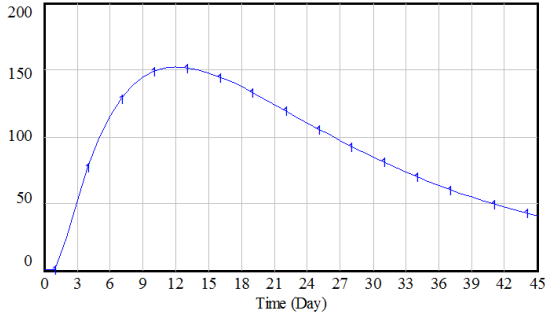


Fig. 3. Simulation diagram of the quantity of government information released in Xiangshui event

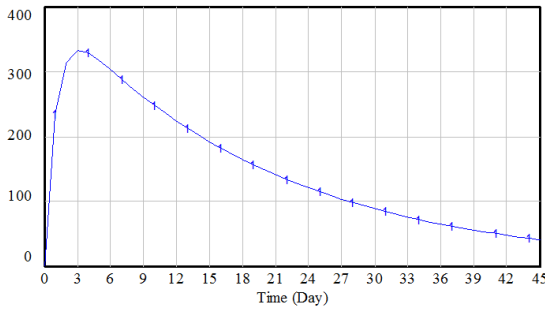


Fig. 4. Simulation diagram of the number of media information released in Xiangshui event

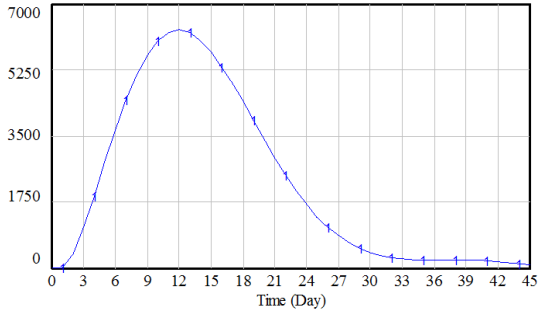


Fig. 5. Simulation diagram of micro-blog information quantity of Xiangshui event

In the output simulation charts, the Figure 3-Figure 5 can all reflect the changing trend of public opinion, including the number of government information released, the number of media information released and the number of microblog information, which are generally in line with the characteristics of the incubation period, outbreak period and extinction period of public opinion heat. As can be seen from the Figures, media information reaches the peak first and responds fastest, while the number of information released by the government and the number of microblog information generally show

a similar trend to the popularity. Due to the different subjects of variables, there is a certain gap between the trends and values of different tables, but they can generally reflect the changing trend of public opinion.

3.3 Strategy Analysis of Online Public Opinion Guidance for Public Emergencies

1)Methods of Public Opinion Guidance for Public Emergencies.

According to the modeling analysis of the system dynamics, it can be seen that the public opinion of public emergencies is influenced by various factors, and the sensitivity of different influencing factors is different, so the privacy guidance methods should be diversified.

According to SCCT theory, our country's public emergencies can also be divided into three types. According to the different types the different and diversified guidance methods are taken. For the victimized crisis, the government should emphasize the disaster relief measures and the current situation of disaster relief, improve the awareness of safety through media and other channels, and reduce the spread of panic. For the accident crisis, a combination of methods should be used. If the bad image has been created, the denial method or support method should be adopted. If the organization has not produced a bad image, the reconstruction method should be adopted. For the wrong type of crisis, the government should mainly adopt the reconstruction method. It should be noted that the consistency of communication methods should be maintained, and the three methods of denial, dilution and reshaping should not be used together, while the two communication strategies of dilution and reshaping can be appropriately mixed according to the different scenarios.

2)Improving the Construction of Online Public Opinion System for Public Emergencies.

According to the model established by the system dynamics, it can be seen that public opinion guidance is a complex and dynamic negative feedback process, so the perfect system can respond in a timely and efficient manner.

The following methods can be adopted: improve the network public opinion monitoring and early warning mechanism, and use advanced technical means such as big data to conduct real-time monitoring and analysis of network public opinion, so as to provide information and data basis for emergency response. In addition, the cross-departmental cooperation can be strengthened to establish an emergency response network of government, media, social organizations, etc., to realize information sharing and improve the efficiency of information processing. It is also necessary to strengthen the training and response of emergency response ability, organize exercises regularly, simulate the response process under various incident conditions, and improve the proficiency and operation level of relevant personnel, so as to effectively respond under the condition of real events. The establishment of a diversified public relations team of talents can effectively control and resolve public opinion crises and maintain social stability in view of different specific events.

3)Monitoring Media Silence and Enhancing Netizens' Awareness and Ability of National Security.

In the causality diagram constructed, the silence coefficient of media and microblog information greatly affects the development of public opinion. If the media selectively ignores or does not report the true information and keeps silent about the rumors, then the rumors will have more space to spread on social media. In this case, the media silence coefficient is positively correlated with the spread of rumors. On the contrary, if the media take a serious attitude towards rumors and other information and reveal the truth in time, the silence coefficient of the media will be negatively correlated with the spread of rumors. In addition, through model analysis, increasing media attention can greatly improve the heat of public opinion, so the media's attention to correct information plays an important role in the process of public opinion dissemination. In addition, according to the number of emotion germination of netizens after receiving information, that is, the silence coefficient of microblog, it can also become one of the bellwethers of rumor invasion.

4)Relying on the Government'S Credibility.

In this process, only by relying on the credibility of the government the blindness of the masses can be avoided. In the process of public opinion control, its handling effect has a significant relationship with the credibility of the government. Therefore, it is necessary to communicate information openly and transparently, resolutely crack down on relevant government corruption, and establish a clean and efficient government image. In addition, the government needs to keep its promises with citizens and match words with deeds to ensure the smooth completion of the implementation plan. The government should actively listen to the voices of the public and establish a good communication channel with the public, so that timely and effective information feedback can be more efficient and high-quality in the process of public opinion response and guidance.

4 Conclusion

The general framework of the public opinion guidance system is constructed in this paper. And the different elements of public opinion are considered, and the influences as well as the relationships between variables are analyzed. The risks and the corresponding guiding strategy is proposed through the simulation process of the actual case.

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