Review Article
Food Science and Technology

ISSN 0101-2061 (Print)
ISSN 1678-457X (Online)

DOI: https://doi.org/10.1590/fst.79921



# Research on rumors surrounding food safety based on information source differences (a review)

Mohammed Ali Bait Ali SULAIMAN[1], Rabia SALMAN[2], Muhammad Salman SHABBIR[3]*, Ahmed Faisal SIDDIQI[4], Mazhar ABBAS[5], Saliha Gul ABBASI[6], Khalil-ur-REHMAN[7], Muhammad ASHRAF[8]

**Abstract**

Food is a basic human right since it is necessary for survival. Unsafe food threatens billions of people throughout the world. Every year, hundreds of thousands of people grow sick and die. Microbial, chemical, personal, and environmental hygiene are all issues that the food chain faces from farm to fork/plate. Human tragedies and economic disasters have been reported in the past as a result of purposeful or inadvertent personal behavior and government inability to ensure food safety and quality. The issue of food safety has gotten a lot of press. As a result, a Food Safety Information Platform (FSIP) based on machine learning and open data with a Chatbot based on cloud computing (MLODCCC) architecture was developed, which includes a nice Facebook hyperlink and chatbot interface for locating trustworthy food safety knowledge. Rumors about the safety of food goods instill fear in people, leading to a broad boycott and, as a result, significant economic loss. This study looked into the function of rumors among friends. The findings suggested that people choose to use news media information in interaction with friends because it is seen to be more reliable than other resources.

**Keywords:** rumor; reputational damage for food; risk; information supply functions.

**Practical Application:** Rumors regarding the safety of food products induce anxiety in the public, resulting in a widespread boycott and severe economic loss. The function of rumors among friends was investigated in this study.

## 1 Introduction

Hundreds of millions of people throughout the world are at danger of consuming contaminated food (Barboza et al., 2021; Ngafwan et al., 2021; Zhao & Talha, 2021). Every year, millions of people fall ill and hundreds of thousands die as a result of consuming tainted food. As a result, healthy diet saves lives. Individual and societal health benefits from safe food. Food safety supports economic growth in areas where it is practiced and improved (Koszewska & Kuzak, 2021). Sound research and just law enforcement are required for a safe food supply. With technological advancements, new rules must be implemented to ensure a continuous supply of safe and healthy food items for people's health and welfare. Food safety should be considered from the outset when developing solutions for sustainability and food security. Food security instruments and initiatives must be compatible with food safety, public health, and long-term sustainability. If effective food safety policy and risk communication are to be established and executed, it is critical to first understand consumer responses to diverse food safety problems (Hossen et al., 2020).

This paper provides a summary of consumer perceptions of food safety, as well as the importance of consumer risk psychology in influencing risk-related behaviors and risk communication best practices. Numerous empirical studies of food safety in the eyes of the public have concentrated on food technology, food-related hazards, and perceived risk connected with food. Furthermore, public confidence in the various organizations and celebrities responsible for ensuring food safety, as well as trust in the information supplied by various information sources that communicate concerning food-related hazards, is seen as critical for public confidence in food safety and consumer appraisal of the effectiveness of food risk management methods. As food chains become more global, it's more important than ever to comprehend cross-cultural variations in consumer risk perceptions and food trust, as well as how they affect consumer conduct. Consumers' judgements on the approval of certain foods and production technologies are abundantly clear to be founded on a complex interplay of risk and benefit perceptions linked with certain food options.

*Received 07 Oct., 2021*
*Accepted 11 Dec., 2021*
[1]*College of Commerce and Business Administration, Dhofar University, Salalah, Oman*
[2]*School of Management, Universiti Sains Malaysia, Penang, Malaysia*
[3]*Department of Management, College of Commerce and Business Administration, Dhofar University, Salalah, Oman*
[4]*UCP Business School, University of Central, Lahore, Punjab, Pakistan*
[5]*Department of Management & MIS, College of Business Administration, University Sains Malaysia, Saudi Arabia*
[6]*Department of Management Sciences, The University of Azad Jammu & Kashmir, Muzaffarabad, Pakistan*
[7]*Lahore Leads University, Lahore, Pakistan*
[8]*Department of Management Sciences, COMSATS University Islamabad, Vehari Campus, Vehari, Pakistan*
*Corresponding author: salman.shabbir@gmail.com; salman.shabbir55@gmail.com

In Japan, due to the accident at the Fukushima Daiichi Nuclear Power Station in 2011, radioactivity was detected in agricultural products in Fukushima Prefecture and the Kanto region, and shipments were restricted until the amount of radioactivity was not a health problem (Morino et al., 2011; Tsujikawa et al., 2016). Even after the shipping restrictions were lifted, people became anxious about the agricultural products produced in these areas and refrained from buying once the radioactivity was detected. Such economic damage that accompanies disaster information and environmental information is called reputational damage (Nakayama et al., 2019; Niwa, 2012; Tajima et al., 2016). When reputational damage occurs, it is not necessarily caused by reputation, but reports and facts about triggering incidents and disasters precede, reducing the risk of disasters that actually occur. The evasive action taken by many to attempt has caused the problem of resulting economic damage.

Rumor damage is not a problem peculiar to Japan. For example, in the case of enterohemorrhagic Escherichia coli infection that occurred mainly in northern Germany in May 2011, after the Hamburg city authorities announced that the source of infection was cucumber from Spain, it was announced cucumber was not the cause thereafter (Bruckner & Checchi, 2011). As a result, the Spanish side indicated its intention to claim damages. Since the magnitude of such economic damage can lead to problems between nations, elucidation of the mechanism of occurrence is an urgent issue. Rumors are a process in which speculation is circulated and shared among people in response to news reports about incidents and disasters.

When the above cases are put together, it is suggested that the content that is sometimes rumored in people's daily conversations about a certain incident causes reputational damage. What is important here is that even if the rumor is uncertain as to whether it is true or false, if the person who obtained the information feels uneasy, people will take risk-avoidance actions, and financial damage may result. In other words, when a candidate gets information, it may lead to risk aversion if the information makes her feel anxious, even though it depends on the source of the information and the method of obtaining the information. In fact, it has become clear that when information related to food safety is acquired, the negative emotions and feelings of insecurity that it feels suppress purchasing intentions (Chandra & Pal, 2019; Larson, 2020; Poddar et al., 2018).

Furthermore, if an individual obtains information on food safety, the anxiety won't spread if he/she does not share the topic. The unfavorable situation of increasing the number of people being aggravated should be suppressed. From such an angle, it may be possible to suppress the decline in purchasing intentions that occur by the risk aversion behavior caused by anxiety. However, even with uncertain risk information, people talk about such information in everyday conversation (Czarnecki, 2020; Detwiler, 2020; Newell, 2018). What must be considered here is the reason why this kind of information is taken up as a topic in conversation. Therefore, in this research, we examine what role the information related to food safety is taken up in people's daily conversations and consider the influence of the source of information (Ji, 2018).

### *1.1 Rumor content attributes and features*

The content attributes of rumors have five aspects: "interesting," "arousing anxiety," "certainty," "importance," and "plausibility." It was shown that there are four functions, "entertainment function", "information providing function", "information gathering function", and "conversation function". Regarding the content attributes of rumors, the highly evaluated aspects differ depending on the type of rumor (Cai et al., 2014; Song et al., 2021). Now, we would like to consider what aspects of the content attributes and functions of rumors are evaluated higher than other aspects of the information related to food safety handled in this study. By doing so, we believe that it will be possible to clarify the reason why information related to food safety is talked about in people's conversations.

Rumors of non-everyday anxiety are defined as "rumors of disturbing content such as incidents, accidents, and dangerous places." The rumor of non-everyday anxiety has the characteristics of low "fun," high "unsubstantiated," and high "importance" in terms of content attributes (Inako, 2019). In terms of functions, it has the characteristics of high "information provision function" and low "entertainment function," and "conversation function." From this point of view, as for information related to food safety, "fun" and "anxiety arousal" and "importance" will be highly evaluated, and "information providing function" is high in terms of function, and "entertainment function" and "conversation function" will be highly evaluated. In addition, considering that information is exchanged between two or more people, it is considered that there is no difference between "information providing function" and "information gathering function" because the conversation can be a place to provide information and collect information at the same time. Therefore, in this study, it is presumed that the "information providing function" and the "information collecting function" are similarly highly evaluated (Bordia & DiFonzo, 2004; Denef et al., 2013).

Information related to food safety is closely related to the daily lives of people, so it can be a common topic among people of different genders and ages, but it is also a problem related to health risks. Considering this point, when comparing "entertainment function," which is a function that makes the conversation interesting, and "conversation function," which is a function that becomes a topic in conversation, it will not be evaluated in the same way, and "conversation function" will be evaluated higher than "entertainment function."

### *1.2 Effects of information acquisition*

Evaluation of information content attributes and conversational functions may be affected by the form of information acquisition. To examine this point, in this study, we will take three forms of information acquisition: conversations with close friends, Tweets on Twitter by unknown persons, and news. Twitter is a kind of social media that can post short sentences of up to 140 characters and send them to an unspecified number of others (Fu & Sun, 2021). The information that is sent is called a Tweet. Since the user uses an arbitrary account name, the user cannot be identified from the Tweet. Users can register an account of their interest and receive information that flows from it. This is

called "follow." It is also possible to stream information from the account that the user follows to the person who follows him or her, that is, to his or her followers. Due to this nature, the greater the number of followers that enter between the originator of the information and the recipient of the information, the higher the probability that the originator of the information and the recipient of the information is mutually ignorant (Rybczyk et al., 2020; Sverguzova et al., 2021). For this reason, some of the information on Twitter, not only can the caller not be identified, but also the truth of the information cannot be confirmed.

Considering the above characteristics of Twitter, if the source of information is an unknown person and the means of receiving information is Twitter, it is likely that the reliability of the information is low and recognized depending on the source of information. Furthermore, since people do not confirm the authenticity of the information they receive on Twitter, they send the information to others; it can be said that there are certain questions about the authenticity and reliability of the information (Gao et al., 2020).

One of the characteristics of Twitter is that it is fast in transmitting the information. Companies, etc. sometimes use this feature, and some private railway companies in the Kanto region, for example, are working on streaming train delay information via Twitter from their official Twitter accounts. This kind of rapid response is sometimes used by people, especially in times of disaster. For example, when the Great East Japan Earthquake occurred, Twitter actively exchanged information on traffic information, evacuation information, support for goods, etc. prior to news reports by the press and the government immediately after the earthquake, and a large amount of information flowed in a short period of time. However, some of the information transmitted by civilians contained false information, which confused the situation.

From these points, it is possible that people believe that information circulated by private individuals on Twitter is not useful because it is high in breaking news but because it is low in reliability depending on the source of information. At the same time, it may be a clue to know information that is being talked about outside of one's known network, and it may have the effect of enlivening conversations with others and creating a topic. However, when thinking about information related to food safety handled in this study, where the information itself causes people to be anxious, anxious due to the unknown origin of the information originator overlaps, and anxiety may be greater than when receiving the same information from news reports, announcements by public institutions, or conversations with known people, it is also undeniable (Andrews et al., 2016). Therefore, it is important to understand the characteristics of evaluation of information when information related to food safety is received in the form of information transmitted by unknown persons through Twitter in order to consider the damage to food reputation.

Compared to Twitter, the news is reported that the reliability of information can be guaranteed due to its high public nature, so the reliability as a source of information is recognized higher than that of social media, including Twitter. In addition, since the report is based on interviews, it is likely that "certainty," which is the certainty of information, will be highly recognized. And in the case of close friends, if uncertain information is provided to the other party, it may damage the other party's trust and worsen the relationship. If we look at it differently, we can expect that the other party will not be able to provide uncertain information. On the other hand, Twitter posts made by unknown persons have doubts about their credibility, and it is not known what kind of person the informant he directly contacted is. In addition, it is difficult to directly verify the authenticity of the information from the other party, and even if the information is leaked as a prank, it is difficult to directly verify the information from the information transmitting party. This is different from the case of acquiring information from news and close friends. Considering these points, it is assumed that "certainty" and "plausibility" are less likely to be recognized when Twitter is a source of information than when it is news or information from a close friend (Arif et al., 2017; Wang et al., 2021).

Among the three sources of information that will be discussed in this study, we would like to think from the viewpoint of the difference between receiving information from unknown people through Twitter and the other two types of information acquisition: news and conversations with close friends. When information related to food safety becomes a topic in a conversation, "certainty" and "plausibility" would be lower than when information was obtained from news or conversation with a close friend if the information was received through a post by an unknown person via Twitter. As mentioned above, Twitter has different characteristics as a source of information from news and close friends. It is difficult to directly verify the authenticity of the source of information, which may be one reason that makes it less reliable as a source of information. For these reasons, news and close friends are relatively more reliable than Twitter, and because of this, there is also the possibility of even more anxiety. In the case of information related to food safety handled in this study, anxiety is more likely to heighten because it is information obtained from such reliable sources, and as a result, when these sources are sources, they are recognized as interesting information or difficult to be recognized as information that excites conversation, even though they may be talked about in conversation with others for the purpose of information exchange. There is a possibility to be. Reflecting these points, if the information is obtained from news or close friends, the evaluation of "entertainment function" and "conversation function" for that information will be relatively lower than that of Twitter, and the "information-gathering function" and "information providing function" will be relatively higher. In other words, if Twitter is a source of information, it will have lower "information collection "and "information provision" and higher "entertainment" and "conversation" than other sources.

### *1.3 Hypothesis of this study*

In this study, we set up a fictitious scene in which the information "radioactivity was detected in milk" was obtained, and we examine whether there are 1) differences in evaluation of content attributes and 2) differences in the function of the information in conversation with others. Specifically, based on the discussion so far, the following hypotheses will be examined.

**Hypothesis 1a:** Regardless of the form of information acquisition, "importance" and "anxiety arousal" are higher than other attributes about the content attribute of the rumor

**Hypothesis 1b:** "Certainty" is lower than other forms of information acquisition when the information acquisition form is a post to Twitter by an unknown person

**Hypothesis 2a:** Regardless of the form of information acquisition, the function of the rumor is higher than the other functions of "information provision function" and" information collection function," followed by "conversation function" and "entertainment function."

**Hypothesis 2b:** Among the features of rumors, "information gathering function" and "information providing function" are lower than those of other information acquisition forms when the information acquisition form is posted to Twitter by an unknown person.

**Hypothesis 2c:** Among the features of rumors, "conversation function" and "entertainment function" were higher in the case of posts on Twitter by unknown persons than in other information acquisition forms.

In addition to examining the above hypotheses, in this study, we will explore what aspects of the content attributes and functions of rumors that information on food safety itself has in each form of information acquisition reduces the willingness to purchase.

## 2 Material and methods

Foodborne illness is a global problem. The young, aged, and ill are most susceptible. If food sources are insecure, people eat less nutritious diets and consume more hazardous foods, which offer health concerns due to chemical, microbiological, and other dangers. This results in greater healthcare expenditures and a drain on national income. Food safety in the twenty-first century should go beyond enhancing nutritional profiles, ingredient transparency, and harmful food restrictions to include frequent monitoring, surveillance, and enforcement of food items in the interest of public health and the prevention of foodborne diseases.

In 2014/9, an Internet research company, Macromill, was commissioned to conduct a web survey. All of the respondents are registered users of the company's research Monitor (Kobayashi et al., 2017).

### *2.1 Respondents*

This study obtained responses from 312 women in their 20s to 40s ($M_{age}$=34.38, SD=8.27), following a previous study dealing with food reputational damage. Respondents were randomly assigned so that the number of people who responded to each condition was equal in each age to any of the conditions of conversation with a close friend (102), posting on Twitter by an unknown person (104), and looking at the news (106). However, in the case of posts on Twitter by unknown persons, respondents were limited to those who have used Twitter. This is to prevent bias caused by responding without knowing what Twitter is like when responding.

### *2.2 Food risk information handled in this study*

In this study, the information that "radioactivity was detected in a production area of milk" was used as a subject in a fictitious scene. Since the existence of incidents and news reports is a prerequisite for research on reputational damage, it is necessary to select materials for which actual cases exist. In this regard, in 2011/4, the shipment was temporarily stopped due to the detection of radioactive substances in milk produced in Ibaraki Prefecture, and the shipment started again after safety was confirmed, and there is a case where the transaction was stopped one after another. However, in carrying out the web survey, considering that the survey could not be carried out without fictitious scenes due to the ethical rules on the side of the survey company and that respondents needed to be recognized as risk information regardless of the place of residence of the respondent, it was decided to "production area of milk drinking in Pu-dan."

### *2.3 Rating scale for the content attribute of a rumor*

The content attribute scale of a rumor is a measure to evaluate the content of a rumor. After the sentence "Please answer while imagining yourself in the next scene," the respondents read the teaching sentence of each assigned condition. For example, in the case of a close friend condition, "You heard a close friend talking one day, "radioactivity was detected from milk in the production area of the milk you normally drink." Also, in the case of a Twitter post by an unknown person and in case of a news condition. He then asked, "To what extent do the following things apply to your own thoughts about this story?" Based on the teachings of "What is interesting" (5 items), "arousal of anxiety" (5 items), "certainty" (5 items), "importance" (5 items), and "plausibility" (5 items), the respondents evaluated the extent to which the rumor applies to 5 aspects of the rumor in 5 stages: 1 does not apply at all and five applies. The word "rumor" is changed to "story" in this study in the original scale.

### *2.4 Rating scale for the function of a rumor*

The function scale of rumors is a measure to evaluate the function of rumors. We measure what it means to talk about that rumor with others. It consists of 4 aspects: "Entertainment function" (5 items) "information providing function" (5 items) "Information gathering function" (5 items) "conversation function" (6 items). The respondent said, "Please answer while imagining yourself in the next scene. After the sentence, each of them reads the teaching sentence of the assigned condition. For example, in the case of the best friend condition, "One day, you heard a close friend of yours saying, 'Radioactivity has been detected from the milk in the milk production area you usually drink' (Also, in the case of a Twitter post by an unknown person and in case of news condition. Then, "About this story, imagine that you talk to a close friend." At that time, how much does the following apply to your own thoughts? We evaluated each item of the functional scale of the rumor in 5 stages: "1 does

not apply at all" and "5 applies." The word "rumor "is changed to "story" in this study in the original scale.

### *2.5 Willingness to purchase foods that have been detected radioactivity*

The degree to which this milk was intended to be purchased was evaluated in 5 stages: "1 does not apply at all" and "5 applies".

## 3 Results and discussion

### *3.1 Content attributes of the rumor*

When factor analysis was carried out on the content attributes of rumors (generalized least squares method, Promax rotation), 4-factor solutions were obtained for each information acquisition form (Adachi, 2015; Cureton & Mulaik, 1975; Hendrickson & White, 1964; Jöreskog, 2003), but some items constituting the factors differed for each information acquisition form. For each form of information acquisition, a coefficient of each subfactor is calculated, and a = 0.47-0.93. As a result of calculating the reliability factor, a factor is obtained. It was less than 70 because for close friend conditions, certainty (a = 0.55), fun (a = 0.69) and in the case of, Twitter conditions in the case of certainty (a = 0.47), Interesting in the case of news conditions (a = 0.66), certainty (a = 0.64). However, for each condition of the information source, the items that increase the reliability factor are different when the item is deleted, and if the condition with a low-reliability factor is removed from the analysis, it becomes impossible to examine the hypothesis that is intended for this study, so in the analysis, we followed the previous studies. Factor analysis of variance revealed that the interaction was significant ($F(8, 1236) = 5.72$, $p < 0.001$), the main effect of the information acquisition form and the main effect of the content attribute of the rumor were both significant (information acquisition form $F(2, 309) = 21.08$, $p < 0.001$; rumor content attribute $F(4, 1236) = 1007.52$, $p < 0.001$) (Figure 1).

Then, the simple principal effect test of the information acquisition form and the multiple comparisons (Bonferroni) were carried out. As a result, the simple principal effect was non-significant in "fun", but ($F(2, 309) = 1.06$, $p = 0.349$), all other content attributes were significant(anxiety arousal $F(2, 309) = 5.89$, $p = 0.003$; plausibility $F(2, 309) = 11.63$, $p < 0.001$; Certainty $F(2, 309) = 37.94$, $p < 0.001$; Importance $F(2, 309) = 17.74$, $p < 0.001$). For "anxiety arousal," information acquisition was lower in the case of Twitter posts by unknown persons than in the case of conversations with close friends or news (Conversation with close friends p = .020; News p = .005).

As for "plausibility," the news was higher in the form of a Twitter post by an unknown person than in the form of a conversation with a close friend (a Twitter post by an unknown person p=0.001; Conversation with a close friend p = 0.023). As for "certainty," the information acquisition form of Twitter is lower than that of conversations and news with close friends (both $p < 0.001$), it was higher in the case of news than in the case of a conversation with a close friend ($p < 0.001$). As for "importance," the information acquisition form was higher in the news than in the case of Twitter and close friends (both $p < 0.001$).

Then, multiple comparisons were carried out on the attribute content of the rumor for each information acquisition form. As a result, when the information acquisition form is a conversation with a close friend, "fun" is significantly lowest (all $p < .001$), the next significantly lower was the certainty (all $p < 0.001$). Following is "plausibility," the highest is "importance" and " anxiety arousal " (all $p < 0.001$); there was no significant difference between the two. From this result, Hypothesis 1a was supported.

In the case of posts on Twitter by an unknown person, "anxiety arousal" was the highest (plausibility p = .003; Fun $p < .001$; Certainty $p < .001$; Importance p = .001). On the other hand, the lowest significantly was "certainty" and "fun," which were significantly lower than all other attributes (plausibility $p < .001$; Importance $p < .001$)."Plausibility" was lower than "importance" ($p < .001$). These results support Hypothesis 1b.

As with posts on Twitter, "fun" is significantly lower (all $p < .001$), the next significantly lower was "certainty" (all $p < 0.001$). The highest was "importance," and there was no significant difference between "anxiety arousal" and "plausibility," but it was higher than "plausibility" (p = 0.011). It should be noted. There was no significant difference between "anxiety arousal" and "plausibility."

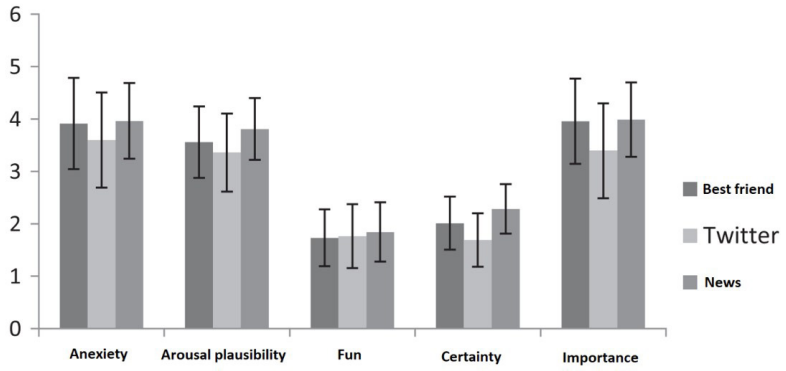


**Figure 1**. Evaluation of the attribute of the rumor for each information acquisition form.

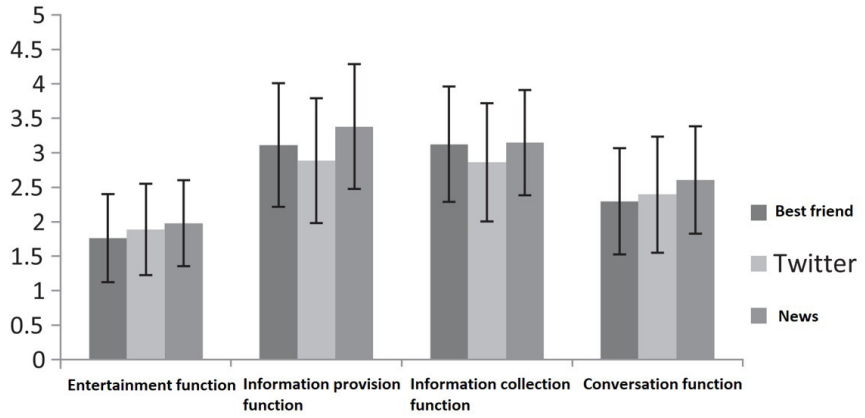


**Figure 2**. Evaluation of the function of each type of information acquisition.

### *3.2 Features of the rumor*

Factor analysis was also carried out on the function of rumor for each information acquisition form (generalized least squares method, Promax rotation). As a result, only the conversation condition with a close friend was a 4-factor solution, and the remaining 2-condition was a 3-factor solution. The 4-factor solution and the items constituting each subfactor were used. Then, the reliability factor of each subfactor was calculated for each information acquisition form and a = 0.76-0.90.

For the function of the rumor, the mean points were calculated for each subfactor and used for the analysis.2-factor analysis of variance revealed that the interaction was significant ($F(6, 927) = 5.19$, $p < 0.001$), the main effect of the rumor function($F(3, 927) = 365.25$, $p < .001$), main effects of information acquisition form ($F(2, 309) = 5.19$, $p = 0.006$) were both significant (Figure 2). The rumor function was then compared multiple times (Bonferroni). Suppose the information acquisition form is a conversation with a close friend. In that case, the entertainment function is lower than any other function (information-gathering function, information-gathering function, conversation function among all $p < 0.001$), the next low is the conversation function ($p <$ between the information gathering function and the information providing function)0.001), there was no significant difference between the information providing function and the information collection function. Similar results were obtained for posts on Twitter by unknown individuals.

If the information acquisition form is news, the entertainment function is lower than any other function (information-gathering function, information-gathering function, conversation function among all $p < 0.001$), the next low is the conversation function ($p <$ between the information gathering function and the information providing function)0.001), but the information providing function was higher than the information-gathering function ($p < 0.001$). From the above results, hypotheses 2a and 2b were supported.

### *3.3 Influence of the content attribute and function of the rumor on the willingness to purchase by each type of information acquisition*

In order to examine the effect of the content attribute and function of the rumor on the willingness to purchase, multiple regression analysis was carried out using the content attribute and function of the rumor as an independent variable and the willingness to buy as a dependent variable 3) (Table 1). As a result, all variables related to the content attribute and function of the rumor had no significant effect on the willingness to purchase when the information acquisition form was a close friend. In the case of a post on Twitter by an unknown person, certainty had a negative effect on the willingness to purchase ($b = –0.314$, $p < 0.01$). If the information acquisition form is news, anxiety arousal ($b = –0.494$, $p < 0.001$), plausibility ($b = –0.240$, $p < 0.05$), certainty ($b = –0.200$, $p < 0.05$) had a negative impact on the willingness to purchase.

**Table 1**. Influence of content attributes and functions of rumors on purchasing intentions by type of information acquisition.

| | Best friend | Twitter | News |
|---|---|---|---|
| **Rumor function** | | | |
| Entertainment function | .163 | –.002 | .204 |
| Information provision function | | | |
| Information gathering function | .003 | .234 | .227 |
| Conversation function | .034 | –.027 | –.173 |
| **The content of the rumor attribute** | | | |
| Anxiety arousal | –.135 | –.207 | –.494 |
| Plausible | –.121 | .072 | –.240 |
| Fun | .061 | .190 | –.052 |
| Certainty | –.206 | –.314 | –.200 |
| Importance | –.094 | –.182 | .132 |
| *F value* | (9, 92) = 2.858 | (9, 94) = 5.326 | (9, 96) = 7.188 |
| Adjusted coefficient of determination of degrees of freedom | 0.142 | 0.274 | 0.347 |

## 4 Conclusion

Food has become a key conduit for human exposure to pathogenic microbials responsible for foodborne disease as a

result of the globalization of the world's food commerce, with pathogenic microbials entering at several locations throughout the value chain. As a result, tracing and identifying microbials in foods, particularly pathogenic bacteria, back to their sources is difficult for food producers, processors, distributors, and consumers. Furthermore, physicians and epidemiologists are frequently confronted at the point of care with diagnostic and therapeutic ambiguity in patients with suspected foodborne infectious illnesses. As a result of the analysis, hypothesis 1a was supported that the content attributes of rumors, regardless of the form of information acquisition, are higher in "importance" and "anxiety arousal" than other attributes. Hypothesis 1b, which stated that if the form of information acquisition is a post on Twitter by an unknown person, the 'certainty' is lower than that of other forms of information acquisition, was supported as predicted. The hypothesis 2a, which states that regardless of the form of information acquisition, the function of the rumor is higher than the other functions of the information providing function and the information-gathering function, followed by the function of the conversation function and the function of the entertainment function, was supported. In addition, hypothesis 2b was also supported, saying that the "Information gathering function" and "information providing function" are lower than that of other information acquisition forms when the information acquisition form of a rumor is posted to Twitter by an unknown person. However, hypothesis 2c, that among the functions of rumors,' conversation function ' and 'entertainment function' are higher in the case of information acquisition by the unknown person posting to Twitter than in the case of other information acquisition, was not supported. Taking the above results together, it can be said that information that can lead to food reputational damage, regardless of the form of information acquisition, can be considered as important information that causes anxiety, and information that is taken up for information exchange, regardless of the form of information acquisition. However, given that the "conversation function" was less than 3% of the median for any type of information acquisition, it is considered that it is not a topic that promotes conversation with others. In addition, there was a difference in the reliability of information acquisition depending on the form of information acquisition, and it was considered that reliability was low, especially when it was acquired from a source with high anonymity. Therefore, it has been revealed that posts on Twitter by unknown people do not arouse anxiety as much as they do when they get information from public sources such as news.

A feature of Twitter posts by people whose information acquisition form is unknown is that all ratings on the content attribute scale of the rumor were less than 3 of the medians. Suppose the information acquisition form is a close friend or news. In that case, the information obtained by posting to Twitter by an unknown person is not useful for information exchange. It is not evaluated as a topic that promotes conversation, considering that the information acquisition form was three or more in the information provision function and information collection function only. However, even if there is a certain reservation in the reliability of the information, it is shown that the content itself is information that tends to arouse anxiety, regardless of the form of information acquisition, and it is shown that it was three or more of the theoretical medians. In this regard, when considering the negative impact that such information flows on Twitter on people's purchasing psychology, it is not possible to reduce the willingness to purchase by sharing information obtained from Twitter through conversation with others, but it is limited to cases where you feel strong anxiety directly from the information flowing on Twitter, or when you feel anxiety about the situation in which such information is circulating. There is a possibility. There was a significant difference between the information acquisition mode for news and the conversation mode for close friends. Given that this is important information from reliable sources, it is considered that news is more valued for its conversational features because it helps to create a topic in a conversation, whether or not the conversation partner is a known human being.

## References


Adachi, K. (2015). A new algorithm for generalized least squares factor analysis with a majorization technique. *Open Journal of Statistics*, 5(03), 165-172. http://dx.doi.org/10.4236/ojs.2015.53020.

Andrews, C., Fichet, E., Ding, Y., Spiro, E. S., & Starbird, K. (2016). Keeping up with the tweet-dashians: the impact of 'official'accounts on online rumoring. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (pp. 452–465). New York: ACM. http://dx.doi.org/10.1145/2818048.2819986.

Arif, A., Robinson, J. J., Stanek, S. A., Fichet, E. S., Townsend, P., Worku, Z., & Starbird, K. (2017). A closer look at the self-correcting crowd: examining corrections in online rumors. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (pp. 155–168). New York: ACM. http://dx.doi.org/10.1145/2998181.2998294.

Barboza, G. R., Almeida, J. M., & Silva, N. C. C. (2021). Use of natural substrates as an alternative for the prevention of microbial contamination in the food industry. *Food Science and Technology*. Ahead of Print. http://dx.doi.org/10.1590/fst.05720.

Bordia, P., & DiFonzo, N. (2004). Problem solving in social interactions on the Internet: rumor as social cognition. *Social Psychology Quarterly*, 67(1), 33-49. http://dx.doi.org/10.1177/019027250406700105.

Bruckner, C., & Checchi, F. (2011). Detection of infectious disease outbreaks in twenty-two fragile states, 2000-2010: a systematic review. *Conflict and Health*, 5(1), 13. http://dx.doi.org/10.1186/1752-1505-5-13. PMid:21861869.

Cai, G., Wu, H., & Lv, R. (2014). Rumors detection in chinese via crowd responses. In X. Wu, M. Ester & G. Xu (Eds.), *2014 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2014)* (pp. 912–917). Piscataway: IEEE. http://dx.doi.org/10.1109/ASONAM.2014.6921694.

Chandra, P., & Pal, J. (2019). Rumors and collective sensemaking: managing ambiguity in an informal marketplace. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (pp. 1–12). New York: ACM. http://dx.doi.org/10.1145/3290605.3300563.

Cureton, E. E., & Mulaik, S. A. (1975). The weighted varimax rotation and the promax rotation. *Psychometrika*, 40(2), 183-195. http://dx.doi.org/10.1007/BF02291565.

Czarnecki, N. (2020). *Authority that matters: an ethnography of trust and food safety in Post-Soviet Georgia* (PhD Thesis). The University of Chicago, Chicago.

Denef, S., Bayerl, P. S., & Kaptein, N. A. (2013). Social media and the police: tweeting practices of British police forces during the August

2011 riots. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 3471–3480). New York: ACM. http://dx.doi.org/10.1145/2470654.2466477.

Detwiler, D. (2020). *Building the future of food safety technology: blockchain and beyond*. London: Academic Press.

Fu, W., & Sun, Y. (2021). Rumor investigation in networks. *Economic Modelling*, 98, 168-178. http://dx.doi.org/10.1016/j.econmod.2021.02.021.

Gao, J., Han, S., Song, X., & Ciravegna, F. (2020). RP-DNN: a tweet level propagation context based deep neural networks for early rumor detection in Social Media. *ArXiv.* Preprint.

Hendrickson, A. E., & White, P. O. (1964). Promax: a quick method for rotation to oblique simple structure. *British Journal of Statistical Psychology*, 17(1), 65-70. http://dx.doi.org/10.1111/j.2044-8317.1964.tb00244.x.

Hossen, M., Ferdaus, M., Hasan, M., Lina, N. N., Das, A. K., Barman, S. K., Paul, D. K., & Roy, R. K. (2020). Food safety knowledge, attitudes and practices of street food vendors in Jashore region, Bangladesh. *Food Science and Technology*, 41(Suppl. 1), 226-239. http://dx.doi.org/10.1590/fst.13320.

Inako, A. (2019). Different bonds around plutonium: physicists' and freelance journalists' tweets at the time of the 3/11 nuclear crisis. *Discourse, Context & Media*, 29, 100281. http://dx.doi.org/10.1016/j.dcm.2018.11.003.

Ji, P. (2018). When SNS platform hosts complex source structures: how wechat frames the credibility assessment of food-safety information in China. *China Media Research*, 14(3), 57-72.

Jöreskog, K. G. (2003). *Factor analysis by MINRES: to the memory of Harry Harman and Henry Kaiser*. Retrieved from: https://www.ssicentral.com/wp-content/uploads/2021/04/lis_minres.pdf

Kobayashi, E., Sato, Y., Umegaki, K., & Chiba, T. (2017). The prevalence of dietary supplement use among college students: a nationwide survey in Japan. *Nutrients*, 9(11), 1250. http://dx.doi.org/10.3390/nu9111250. PMid:29140269.

Koszewska, J., & Kuzak, Ł. (2021). The problems of spatial planning and natural determinants of urban development: the case of Powiśle in Warsaw. *Journal of Water and Land Development*, 50(6-9), 1-9.

Larson, H. J. (2020). *Stuck: how vaccine rumors start–and why they don't go away.* New York: Oxford University Press.

Morino, Y., Ohara, T., & Nishizawa, M. (2011). Atmospheric behavior, deposition, and budget of radioactive materials from the Fukushima Daiichi nuclear power plant in March 2011. *Geophysical Research Letters*, 38(7), L00G11. http://dx.doi.org/10.1029/2011GL048689.

Nakayama, C., Sato, O., Sugita, M., Nakayama, T., Kuroda, Y., Orui, M., Iwasa, H., Yasumura, S., & Rudd, R. E. (2019). Lingering health-related anxiety about radiation among Fukushima residents as correlated with media information following the accident at Fukushima Daiichi Nuclear Power Plant. *PLoS One*, 14(5), e0217285. http://dx.doi.org/10.1371/journal.pone.0217285. PMid:31150483.

Newell, N. (2018). Biotechnology and food protection. In C. W. Felix (Ed.), *Food protection technology* (pp. 397–402). Milton: CRC Press. http://dx.doi.org/10.1201/9781351072076-48.

Ngafwan, N., Rasyid, H., Abood, E. S., Abdelbasset, W. K., Al-Shawi, S. G., Bokov, D., & Jalil, A. T. (2021). Study on novel fluorescent carbon nanomaterials in food analysis. *Food Science and Technology*. Ahead of Print. http://dx.doi.org/10.1590/fst.37821.

Niwa, S. (2012). Mental health problems after the 2011 Fukushima Dai-ichi nuclear power plant accident. *Nippon Shakai Seishin Igakkai Zasshi*, 21(2), 195-200.

Poddar, L., Hsu, W., Lee, M. L., & Subramaniyam, S. (2018). Predicting stances in twitter conversations for detecting veracity of rumors: a neural approach. In *2018 IEEE 30th International Conference on Tools with Artificial Intelligence* (pp. 65-72). Piscataway: IEEE. http://dx.doi.org/10.1109/ICTAI.2018.00021.

Rybczyk, A., Czerniejewski, P., Keszka, S., Janowicz, M., Brysiewicz, A., & Wawrzyniak, W. (2020). First data of age, condition, growth rate and diet of invasive Neogobius melanostomus (Pallas, 1814) in the Pomeranian Bay, Poland. *Journal of Water and Land Development*, 47, 142-149.

Song, Y., Kwon, K. H., Lu, Y., Fan, Y., & Li, B. (2021). The "parallel pandemic" in the context of China: the spread of rumors and rumor-corrections during COVID-19 in Chinese social media. *The American Behavioral Scientist*, 65(14), 2014-2036. http://dx.doi.org/10.1177/00027642211003153.

Sverguzova, S. V., Shaikhiev, I. H., Sapronova, Z. A., Fomina, E. V., & Makridina, Y. L. (2021). Use of fly larvae Hermetia illucens in poultry feeding: a review paper. *Journal of Water and Land Development*, 49, 95-103.

Tajima, K., Yamamoto, M., & Ichinose, D. (2016). How do agricultural markets respond to radiation risk? Evidence from the 2011 disaster in Japan. *Regional Science and Urban Economics*, 60, 20-30. http://dx.doi.org/10.1016/j.regsciurbeco.2016.06.004.

Tsujikawa, N., Tsuchida, S., & Shiotani, T. (2016). Changes in the factors influencing public acceptance of nuclear power generation in Japan since the 2011 Fukushima Daiichi nuclear disaster. *Risk Analysis*, 36(1), 98-113. http://dx.doi.org/10.1111/risa.12447. PMid:26224041.

Wang, W., Qiu, Y., Xuan, S., & Yang, W. (2021). Early rumor detection based on deep recurrent Q-learning. *Security and Communication Networks*, 2021, 5569064. http://dx.doi.org/10.1155/2021/5569064.

Zhao, Y., & Talha, M. (2021). Evaluation of food safety problems based on the fuzzy comprehensive analysis method. *Food Science and Technology*. Ahead of Print. http://dx.doi.org/10.1590/fst.47321.