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Online Information Sharing About Risks: The Case of Organic Food

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Individuals have to make sense of an abundance of information to decide whether or not to purchase certain food products. One of the means to sense-making is information sharing. This article reports on a quantitative study examining online information sharing behavior regarding the risks of organic food products. An online survey among 535 respondents was conducted in the Netherlands to examine the determinants of information sharing behavior, and their relationships. Structural equation modeling was applied to test both the measurement model and the structural model. Results showed that the intention to share information online about the risks of organic food was low. Conversations and email were the preferred channels to share information; of the social media Facebook stood out. The developed model was found to provide an adequate description of the data. It explained 41% of the variance in information sharing. Injunctive norms and outcome expectancies were most important in predicting online information sharing, followed by information-related determinants. Risk-perception-related determinants showed a significant, but weak, positive relationship with online information sharing. Implications for authorities communicating on risks associated with food are addressed.

KEY WORDS: Online information sharing; organic food; risk communication

1. INTRODUCTION

Nowadays, there is an abundance of risk information available in a large number of channels and individuals have to make sense of this overload of information. There are three important means to make sense: information seeking, information processing, and information sharing. There is ample research into information seeking and processing, and their determinants. Information sharing, however, is less well understood. This holds in particular for the determinants of this behavior. The popularity of the Internet as a source for food information[1–4] and its interactive features[5] make it relevant to focus on information sharing in an online context about food issues. In this study, we aim to add to the existing literature by investigating the determinants of online information sharing and we present a theoretical model of *online* information sharing. We applied structural equation modeling to understand the relationships between the determinants. Organic food products and their risks were chosen as the topic for the study. Food is a subject that concerns everyone.[6] Organically produced foods are becoming more and more common; at the same time, one might expect the public to underestimate their risks. To our best knowledge, online information sharing, outside a work team context, about a risk that is likely to be underestimated, is a novel topic.

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Most research on information sharing has been conducted in relation to the sharing of information in teams or workgroups in order to study its impact on group performance. A meta-analysis[7] showed a strong effect of information sharing on performance. Task demonstrability, well-structured and cooperative discussion, overlapping information distribution, being informationally independent, and membership similarity were positively linked to information sharing. A review article[8] on offline information sharing outside the work environment (i.e., interpersonal communication) showed that consumers share information depending on the situation. For example, they share information about food most often when they are in a restaurant. Five main motives to share information were extracted: impression management, emotion regulation, information acquisition, social bonding, and persuasion.

Little attention has been given to what motivates individuals to share information online in a broader societal context. The available research on the motives to share information via social media mostly focused on the characteristics and gratifications of the media channel,[9] and it did not specify the topic and content of the information that was to be shared. An exception is a study by Yang *et al.,*[10] who used the Risk Information Seeking and Processing model (RISP model) that has been extensively used to understand information seeking and processing behavior,[11] to examine information sharing regarding climate change. It was found that social norm and information seeking activities were most strongly related to information sharing. In the food domain, the RISP model has been tested on eating Great Lakes fish,[12,13] examining the risks of eating poisoned fish, and potential parasitic infection from drinking tap water. These studies, however, focused on information insufficiency and information processing behavior, not on information sharing or seeking.

The popularity of the Internet and social media made it relevant to focus on *online* information sharing. The Internet has become one of the main sources of food information[1–4] and social media provide consumers with an easy-to-use tool to communicate their ideas. They can now respond to information that is available online and post messages, pictures, and videos publicly themselves. With the emergence of social media, the one-way information flow, from communicator to consumer, thus changed into a new and dynamic environment that enabled individuals to post, spread, and exchange information rapidly with thousands of other consumers.[5] Research has shown that consumers value food risk information coming from social sources, such as family and friends.[14]

New food products, such as organic foods, are currently entering the market on an almost daily basis. Consumers have to decide whether or not to buy these products. Previous research showed that consumers evaluate organic agriculture as quite positive.[15,16] They perceive organic food to be of higher quality,[16–18] to taste better,[19–22] to be healthier,[20,21,23] and more nutritious compared to conventional food products[20] and to be better for the environment[21,24] and animal welfare. With respect to Dutch consumers, research showed that organic products were associated with animal welfare, price, health, pesticides, and naturalness. Organic vegetables were linked to human health, while organic meat was associated with animal welfare.[25] Dutch authorities are positive about organic production techniques and are funding new initiatives in this respect (www.bionext.nl). Overall, the attitude regarding organic products in the Netherlands is positive. Newspapers have, however, also reported on scientific research that casts doubts on the claims that organic products are more healthy and better for the environment.

There are, however, possible risks attached to organic production.[26] Although, for example, pesticides are used in traditional agriculture to reduce the risk of bacterial contamination, organic agriculture is characterized by the absence of pesticide use, which might lead to an increased risk of microbiological contamination.[27] Scientific evidence of the relationship between eating organic food and an increased risk of microbiological contamination is inconclusive.[28] Some researchers[29] believe that organic food increases the risk of microbiological contamination and thus food poisoning, while others[30] believe that this risk is comparable to the risk of conventional foods. Organic foods are also manufactured with extra attention for the environment, biodiversity, and animals.[31] Animals are bred in an organically responsible way. These animals can, for example, roam freely. The downside of this is that they have a higher risk to get infected. In addition, on average, organic eggs have a larger negative effect on the climate compared to nonorganic eggs.[32] To enable consumers to make well-informed decisions on the purchase and consumption of organic foods, risk communicators thus need to inform consumers of the possible risks and benefits involved. It should be

made clear that organic does not automatically mean safe.[26]

In this study we examined online information sharing about the risks of organic food products. We aimed to gain insight into *the characteristics of this behavior* and into *the main determinants that motivate consumers to share information about these food risks online*. We applied structural equation modeling (SEM) to understand the process underlying information sharing.

The results of this study are very relevant to risk communicators. Knowledge about consumer online information sharing behavior and its instigators will enable them to enhance online sharing behavior, thereby facilitating well-informed decision making regarding food choice among the general public. This consumer information sharing behavior might be useful to risk communicators to make consumers aware of chronic risks attached to certain food products, as well as to quickly spread the word during times of food crises.

1.1. Information Sharing

Sense-making is the process by which individuals give meaning to the world around them, and sense is the outcome of this process. Sense-making involves recognizing a problem, seeking, finding, and integrating new information in such a way that there is no substantial contradiction between the newly encountered information and one's own opinion and beliefs.[33,34]

Information sharing is an important means to sense-making, as are information seeking and processing. Information sharing is related to sense-making in two ways. First, the exchange of information (two-way interaction) between the consumer and other individuals or organizations is a means to collective sense-making.[35,36] Sense-making does not only involve one's own observations, but the observations of other consumers as well.[37] Information exchange enables consumers to make sense of information from a variety of sources in collaboration with others. Secondly, information sharing is a behavioural outcome of sense-making. After sense-making, the individual can decide to share information with others.[10] In this way sense-making can be viewed as the observable behavioral aspect of information processing. Information seeking and processing are extensively studied,[11] but (online) information sharing has been given little attention.

1.2. Determinants of Information Sharing

We developed a structural equation model with four categories of determinants: individuals' beliefs about sharing, social determinants, information-related determinants, and risk-perception-related determinants. These determinants are all predicted to affect information sharing, directly or indirectly (Fig. 1).

The model consists of 11 explicit paths, hypothesizing a direct effect of a variable on another variable. Many more hypotheses are, however, implicitly tested. These relate to variables that are not directly related by a path. In these cases, when evaluating the model, the hypotheses are tested that there is no direct effect of variable X on Y.[38]

1.2.1. The Individual's Beliefs About Sharing

Personal outcome expectancies were hypothesized to be a significant determinant of information sharing: the higher the outcome expectations, the more the individual would be inclined to share information (H1). The expected consequences of sharing information were divided into three major categories: physical effects, social effects, and self-evaluation effects.[39,40] Most research showed personal outcome expectancies to predict online information sharing directly,[39,41–44] while the results of some studies pointed to indirect effects via a general evaluation of the usefulness of sharing.[45,46] This general evaluation towards sharing can be viewed as the result of the outcome expectancies, that is, after evaluating the expected outcomes the consumer has formed an opinion about the usefulness of information sharing (e.g., the general evaluation), and has been found to predict information sharing.[41,42,45,46]

1.2.2. Social Determinants

Food choices are oftentimes the result of a social process. The individual who is responsible for preparing the meals often takes the decisions about the foods in consultation with the other household members. In addition, perceptions of risk are socially constructed within a certain culture.[47] This makes it essential to take social influences into account when investigating the determinants of information sharing behavior. We identified three potentially relevant social predictors: descriptive norms, injunctive norms, and sociability.

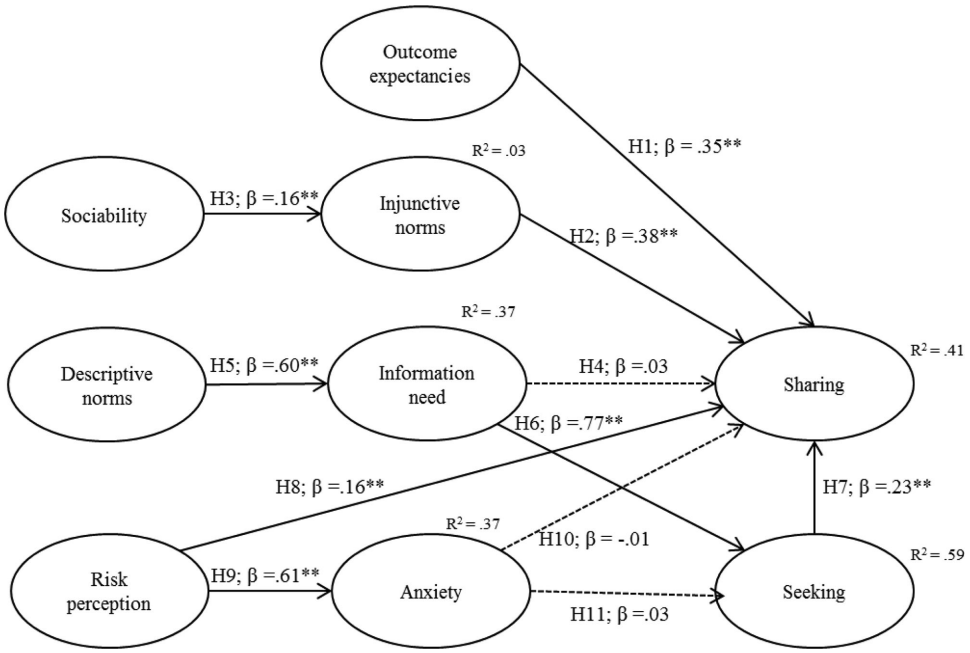

Fig. 1. Model of online information sharing, including standardized path coefficients and squared multiple correlations.

The theory of planned behavior as well as the RISP model, which was based on the principles of the theory of planned behavior, emphasize the importance of *social norm* on behavior. A distinction can be made in injunctive norms and descriptive norms. Injunctive norms refer to the extent to which individuals feel pressured into engaging in a particular behavior, whereas descriptive norms refer to the individual's beliefs about how widespread the behavior is among a particular reference group.[48] Injunctive norms thus involve the perceived (dis)approval of others, whereas descriptive norms refer to the individual's perception of what others do.[10,49,50] In both cases, it is the perception of the individual that counts.[48] In line with the literature,[10,42,51] we hypothesized that *injunctive norms* were directly related to information sharing behavior (H2).

We hypothesized *sociability* to be an important construct in relation to information sharing. Sociability is a subdimension of extraversion. Individuals who score high on this trait enjoy social interactions and feel positive about talking about their daily lives with others.[52] We therefore expected that these individuals would also perceive more pressure from their social environment (i.e., injunctive norm) compared to consumers who score low on sociability (H3).

1.2.3. Information-Related Determinants

Information-related mechanisms, such as information need and information seeking, were predicted to be important indirect determinants of information sharing. To the best of our knowledge, these determinants have been largely neglected in research on information sharing.

Information need was included in the model as a significant determinant of information sharing. Information need is a direct measure related to information insufficiency, which is the core of the RISP model and can be described as the gap between perceived knowledge and an information sufficiency threshold. If individuals believe that they do not have enough information, they will be motivated to gain information, and hence start to search for it.[53–55] It was hypothesized that individuals who experience a high level of information need would be more inclined to share information (H4).

We further hypothesized *descriptive norms* regarding sharing information about organic foods to be a significant determinant of information sharing: the more favorable the *descriptive norms*, the higher the intention to share information. This relationship is predicted to be indirect via information need (H4, H5).

We hypothesize a positive relationship between *information need* and the intention to seek (H6). It was hypothesized that individuals who experience a high level of information need would be more inclined to seek information.

Information seeking was hypothesized to be a determinant of information sharing. Yang *et al.*[10] found that *active information seeking* was one of the most important determinants in predicting information sharing regarding climate change. It was therefore predicted that *information seeking* was directly related to information sharing and that individuals who were likely to search for information would also be likely to share this information with others (H7).

1.2.4. Risk-Perception-Related Determinants

On the basis of the RISP model, we included two determinants that relate to the perceived risks of organic food produce: risk perception and anxiety.

Risk perception has been found to evoke feelings of anxiety in general, as well as in relation to food issues,[6,13,55] which in turn influenced information seeking.[6,56] One could argue that risk perception may directly affect information sharing. When individuals have a high level of risk perception they may feel the need to share risk information with others. In addition, this process may also go via anxiety. That is, higher risk perception is associated with higher levels of anxiety, which in turn may lead individuals to share information with others. We therefore hypothesized that risk perception affected information sharing behavior both directly (H8) and indirectly, through anxiety (H9, H10).

Anxiety was also included in our model of information sharing. Yang *et al.*[10] showed that *negative affect* was positively related to information sharing: the more negative feelings consumers experienced towards climate change, the more inclined they were to seek information and share information about this topic with others. We hypothesized similar relationships with information seeking (H11) and sharing (H10). We detailed negative affect by focusing on the *anxiety* related to the risks of eating organic food.

2. MATERIAL AND METHODS

2. 1. Participants and Procedure

Respondents were recruited during November 2014 and January 2015 by an internationally well-known, ISO 26362-certificated research agency that conducted the research according to ethical standards. A random sample that was representative of the Dutch population of online media users was drawn from a large panel. Because prior research showed differential response rates for gender and age, the sample was stratified with respect to gender and age.[3] To ensure representativeness regarding gender and age, for each stratum, a predetermined target number of participants that had to be met was thus set. As a total of 97% of the Dutch population uses the Internet (CBS) and there is not much variation between SES groups, age (18–34 years: 26.5%; 35–49 years: 29.1%; 50+ years: 44.4%) and gender distribution of the Dutch population (male: 49.5%; female: 50.5%) were used as a reference points. A soft launch of the survey in which about 10% of the target group was approached was conducted to ascertain the quality of the questionnaire. The remaining 90% of the sample was then approached. Participants received an online invitation to participate and were requested to fill out an online questionnaire, which took about 20 minutes to complete.

The research sample consisted of 535 respondents who were aged between 18 and 87 years old living in the Netherlands (mean age = 48.9). The response rate was approximately 65–70%. This is the lower bound of the response rate as respondents were excluded from the questionnaire if their age-gender category already reached the required number of participants. Representativeness was evaluated by comparing the age and gender distribution with the set target distributions. Distribution across age categories was as follows: a total of 127 participants were aged between 18–34 years old (23.7%), 140 participants were aged between 35 and 49 years old (26.2%), and 268 participants were 50 years old or above (50.1%). This distribution differed slightly from the Dutch population, χ^2 (2) = 7.03, $p = 0.03$, in that the older individuals were overrepresented. With respect to gender, a total of 271 males (50.7%) and 264 females (49.3%) participated in this study. These percentages did not significantly differ from the Dutch population, $\chi^2 = 0.29$, $p = 0.59$. There was a broad range in educational level

[3]For more information about the difference between simple random sampling and stratified random sampling, please visit http://psc.dss.ucdavis.edu/sommerb/sommerdemo/sampling/types.htm and/or http://www.stat.yale.edu/Courses/1997-98/101/sample.htm

and household composition, and the participants lived across the country in areas of various degrees of urbanization.

A total of 79% of the participants indicated that they were mainly responsible for doing the grocery shopping in the last month, while 95% indicated that they were at least once a month responsible for grocery shopping. A total of 90% of the participants were responsible for cooking dinner at least once in the last week, with 31% being responsible for this every day. The largest part of the participants (34%) bought sometimes organic food, while only 2% bought organic almost always. Of the remaining participants 14% bought organic food often, 14% rarely, 21% almost never, and 14% never, bought organic food.

Respondents were asked about their responses when encountering information about the risks of organic food. All questions concerning organic food were about the risks of these products, while questions about the benefits were not asked in this study. The instruction of the survey focused on the risk–benefit tradeoff that they have to make regarding their food choices. To create awareness of the possible risks (and benefits) a description was provided, highlighting the most important risks and benefits associated with organic production. It was, for example, explained that the fact that organic farming does not use chemical pesticides (benefit) might imply larger risks of bacterial contamination compared to conventional food (risk).

2.2. Measurement

2.2.1. Outcome Variable: Online Information Sharing

The extent to which individuals were inclined to share information about the risks of organic food online was measured by eight items ($\alpha = 0.97$). Respondents indicated on a seven-point scale how likely it was that they would share an interesting message stating eating organic food has risks online. The items related to two modes of online information sharing: sharing publicly (four items), and privately (four items).

We also measured *with whom* (five items, seven-point scale) and *through which communication channel* (five items, seven-point scale) the participants were inclined to share information on organic produce. Please see Appendix for all items.

2.2.2. Determinants Related to the Individual's Beliefs About Sharing

Outcome expectancies was conceptualized to consist of four components: reciprocity (three items, $\alpha = 0.94$), social effects (three items, $\alpha = 0.94$), self-evaluation effects (three items, $\alpha = 0.97$), and a general evaluation of the usefulness of information sharing (four items, $\alpha = 0.97$). All items were measured on a seven-point scale. They were based on scales developed by Chui *et al.*[51] and Hsu *et al.*[39,41] The reliability of the total scale was good ($\alpha = 0.96$).

2.2.3. Social Determinants

Respondents were requested to indicate on a seven-point scale to what extent they agreed with four statements on *descriptive norms* with regard to information about the risks of organic products, for example: "My friends are interested in information about the risks of organic products" ($\alpha = 0.98$). These items were newly created for this study.

Injunctive norms were measured by four items on a seven-point scale. Respondents were asked to indicate to what extent they perceived their social environment to expect them to share information about the risks of organic food ($\alpha = 0.98$; adapted from Yang *et al.*[10]).

The HEXACO subdimension *sociability* was measured by four items (seven-point scale; $\alpha = 0.90$; based on De Vries *et al.*[52]). Items were adapted to the current purpose. Sociability measures the tendency to enjoy social interaction and talk to others.

2.2.4. Information-Related Determinants

Information need was measured by eight items measuring to what extent the respondents were *interested* in information about organic food and to what extent they *would like to know more* about organic food (seven-point scale; $\alpha = 0.97$; based on Kuttschreuter *et al.*[2]). By assessing consumers' interest in information and information needs we measure information need in a direct manner,[4] following

[4]Our measure is a direct measure of information need that relates to the conceptual idea of information sufficiency from the RISP model. Information insufficiency is often measured as a difference score between the perceived knowledge and the information sufficiency threshold of consumers. This type of measurement

the approach by ter Huurne[56] and Eagly and Chaiken.[57]

Information seeking was measured by four items regarding the participants' inclination to search for information about organic food and the risks involved therein (seven-point scale; $\alpha = 0.94$). Items were based on Hilverda *et al.*[58]

2.2.5. Risk-Perception-Related Determinants

Risk perception was measured by four statements regarding the negative consequences of eating organic food (seven-point scale; $\alpha = 0.94$). Participants indicated, for instance, to what extent they considered eating organic food to be detrimental to their health. Items were based on Hilverda *et al.*[58]

We measured *anxiety* by asking respondents to what extent they experienced four emotional states when thinking about the risks of eating organic food (seven-point scale, $\alpha = 0.98$). The items (anxious, concerned, afraid, and worried) were adapted from Kuttschreuter[6] and Yang *et al.*[10]

2.3. Analysis

Correlations between the determinants and information sharing were composed to examine their relationship with information sharing. Structural equation modeling was applied to test a model predicting online information sharing behavior. An initial model was composed based on a pilot study on a student sample and subsequently tested by means of AMOS 19 on a sample that was representative of the Dutch population of online media users. We used two-step modeling:[38] we first tested the measurement model (CFA), followed by a full structural model that included both the measurement and the structural model.

3. RESULTS

3.1. Information Sharing

Results showed that *online* information sharing on average was low ($M = 2.77$, $SD = 1.48$) and that participants were more inclined to share information privately (M = 2.96; $SD = 1.54$) than publicly ($M = 2.59$; $SD = 1.51$).

Table I. Means and Standard Deviation of with Whom and How Respondents Would Share Information about the Risk of Eating Organic ($n = 535$)

With Whom?	Mean	*SD*	How?	Mean	*SD*
1. Specific person	3.83	1.90	1. In a conversation	4.17	1.87
2. Family	3.79	1.85	2. By email	3.46	1.95
3. Friends	3.41	1.83	3. On Facebook	3.12	2.01
4. Colleagues	3.25	1.77	4. Via chat (e.g., Skype)	2.21	1.59
5. Public	2.77	1.72	5. Forum or blog	2.10	1.50
			6. On Twitter	2.02	1.50

Note. Seven-point Likert scales, ranging from 1 to 7.

In addition, it was examined with whom and how consumers would share risk information with others. Information sharing depended on the person with whom the information was shared (see Table I). Participants were most inclined to share information with a specific person ($M = 3.83$, $SD = 1.90$) or a family member ($M = 3.79$, $SD = 1.85$). The mean scores for sharing information with friends ($M = 3.41$, $SD = 1.83$) and colleagues ($M = 3.25$, $SD = 1.77$) were both below the mid-point of the scale. The participants indicated to be least inclined to share information publicly ($M = 2.77$, $SD = 1.72$).

Table I also shows the type of communication channel respondents would be inclined to use to share information about the risks of organic foods. They would be most inclined to share information in a conversation ($M = 4.17$, $SD = 1.87$) or by email ($M = 3.46$, $SD = 1.95$). Social media were less popular: all social media scores fell below the midpoint of the scale. Facebook ($M = 3.12$, $SD = 2.01$) scored quite high, compared to online chat ($M = 2.21$, $SD = 1.59$), forum or blog ($M = 2.10$; $SD = 1.50$), and Twitter ($M = 2.02$, $SD = 1.50$).

3.2. Information Sharing and its Determinants

Table II shows the means, standard deviations, and Pearson correlations of the determinants and online information sharing. Although, overall, the participants liked to engage with others ($M = 4.78$, $SD = 1.14$), their social environment did not seem to expect them to share food risk information ($M = 2.74$, $SD = 1.44$) and was only somewhat interested in information about organic food ($M = 3.55$, $SD = 1.41$). Expected outcomes were slightly below the middle of the scale ($M = 3.60$, $SD = 1.24$). Reciprocity outcome expectations dominated ($M = 3.94$, $SD = 1.34$), followed by general evaluation of

implies that consumers make decisions in a very conscious cognitive way, which might not always be the case. By measuring information need, we directly tapped into the needs of consumers, which were predicted to impact their information seeking and sharing behavior.

Table II. Means, Standard Deviations, and Pearson Correlations Between Determinants and Information Sharing ($n = 535$)

Constructs	Mean	*SD*	Correlations 1	2	3	4	5	6	7	8	9
1. Online information sharing	2.77	1.48	1								
2. Outcome expectancies	3.60	1.24	0.65^{**}	1							
3. Descriptive norms	3.55	1.41	0.52^{**}	0.49^{**}	1						
4. Injunctive norms	2.74	1.44	0.64^{**}	0.62^{**}	0.51^{**}	1					
5. Sociability	4.78	1.14	0.24^{**}	0.31^{**}	0.27^{**}	0.17^{**}	1				
6. Information need	4.20	1.39	0.46^{**}	0.21^{**}	0.59^{**}	0.34^{**}	0.22^{**}	1			
7. Information seeking	3.73	1.48	0.56^{**}	0.13^{**}	0.61^{**}	0.44^{**}	0.19^{**}	0.79^{**}	1		
8. Risk perception	2.53	1.20	0.09^{*}	-0.24^{**}	−0.04	0.14^{**}	-0.18^{**}	-0.23^{**}	-0.14^{**}	1	
9. Anxiety	2.03	1.29	0.18^{**}	-0.22^{**}	0.06	0.22^{**}	-0.09^{*}	−0.02	0.06	0.58^{**}	1

Note. ** . Correlation is significant at the 0.01 level; * . Correlation is significant at the 0.05 level.

sharing ($M = 3.64$, $SD = 1.58$), self-evaluation outcomes ($M = 3.53$, $SD = 1.43$), and social outcomes ($M = 3.26$, $SD = 1.32$). This means that the participants were most inclined to share information online with others because they anticipated to receive information in return, to a lesser extent because they perceived information sharing to be useful and to feel good about themselves (e.g., satisfaction), and the least to gain respect or maintain social relationships.

Information need ($M = 4.20$, $SD = 1.39$) was in the middle of the scale, whereas information seeking was slightly below the middle of the scale ($M = 3.73$, $SD = 3.73$). Risk perception and anxiety were both low ($M = 2.53$, $SD = 1.20$ and $M = 2.03$, $SD = 1.29$, respectively).

3.3. Relationship Between Information Sharing and Determinants

There were strong correlations between information sharing and individuals' beliefs about sharing, the social determinants, and the information-related determinants.

Information sharing correlated strongly with outcome expectancies of sharing ($r = 0.65$): the higher the expected outcomes, the more inclined (s)he was to share information online.

With regard to the social determinants, the descriptive norms ($r = 0.52$) and injunctive norms ($r = 0.64$) correlated strongly positively with information sharing. This means that the more interested and involved the social environment was perceived to be in the topic of organic food, and the more the individual felt that it was expected to share information about the risk of eating organic foods, the more likely the participants were to share information with others. Sociability was less important than descriptive and injunctive norms, but still correlated significantly with information sharing ($r = 0.24$).

Of the information-related determinants, information need ($r = 0.46$) and information seeking ($r = 0.56$) both showed strong correlations with information sharing. This means that a higher level of information need and a higher intention to search for information corresponded to higher levels of the intention to share information online.

The correlations between information sharing and the risk-related determinants were weak. Of these, anxiety showed a slightly stronger correlation with information sharing ($r = 0.18$) than risk perception ($r = 0.09$).

Table III. Model Fit of the Measurement Model and the Structural Model ($n = 535$)

	Thresholds for Acceptable Fit	Measurement Model	Structural Model
χ^2 (*df*)	–	3129 (*863*)	3635 (*882*)
χ^2/df	<3.00–5.00	3.63	4.12
RMSEA	<0.05–0.08	0.07	0.076
GFI	>0.90	0.77	0.75
CFI	>0.90	0.93	0.92
TLI	>0.90	0.92	0.91
NFI	>0.90	0.91	0.89

Please see Table II for the correlations between the determinants.

3.4. Model Testing

A model predicting online information sharing based on outcome expectancies, descriptive norms, injunctive norms, sociability, information need, information seeking, risk perception, and anxiety was tested. Please see Fig. 1 for the model and the results of its evaluation.

3.4.1. The Measurement Model

Generally speaking, the underlying constructs were measured by a set of single-item indicators. The exception was outcome-expectancy, where four composite indicators were used. The measurement model was tested and convergent validity and discriminant validity were evaluated.

Meeting the most commonly used criteria,[59] the measurement model proved to have a good fit[5] (see Table III for the observed fit indices and criteria applied to assess model fit). The root mean square error of approximation (RMSEA) was 0.07, indicating a good fit,[38] as did the normed chi-square of 3.63.[38,60] The Comparative Fit Index (CFI) was 0.93, the Tucker–Lewis Index (TLI) was 0.92, and the Normed Fit Index (NFI) was 0.91; all larger than the 0.90 Marcoulides and Schumacker[61] and Bollen[60] proposed as a cut-off point for a good fit. There were two fit indices indicating a poor fit. The chi-square statistic, χ^2 (863) = 3129, was significant and the value of the Goodness-of-Fit Index (GFI), a transformation of the chi-square, of 0.77 fell below the acceptability threshold. This was to be expected as the chi-square test (and consequently the GFI) are highly dependent on sample size and model size.[62] Considering our relatively large sample size, these measures of goodness of fit were less applicable to our study and the obtained values did thus not provide evidence for a poor model fit.

Convergent validity, assessed on the basis of CFA factor loadings, reliability, and average variances extracted,[63] was good, implying that the items are related to their predicted factor (construct) rather than to other factors. Factor loadings ranged between 0.70 and 0.98, and exceeded the satisfactory threshold of 0.70.[64] Cronbach's alphas and the composite CFA reliabilities were all above the cut-off point of 0.70. The average variances extracted (AVE) in the CFA were between 0.681 and 0.93, exceeding the acceptability value of 0.50.[62] Please see Table IV for factor loadings, composite reliabilities, and average variance extracted.

Discriminant validity was assessed by comparing the Pearson correlations between all the constructs computed in SPSS (cf. Table II) with the square root of the AVEs obtained in AMOS (cf. Table IV). All square roots of AVE were found to be larger than the interconstruct correlations, pointing to satisfactory discriminant validity.[64] Given that our constructs were highly reliably measured, high levels of multicollinearity were tolerable.[65] Multicollinearity was nevertheless assessed by studying the correlations between the constructs. Correlations varied between −0.02 and 0.79, and of all 45 correlations only one[6] approached the threshold for multicollinearity of 0.80 suggested by Tabachnick and Fidell [66] and the threshold of 0.85 proposed by Hair *et al.*[63] The

[5]To improve model fit, for risk perception, information sharing, and information seeking the error terms of two indicators were allowed to covary. These relaxations of the measurement model error made sense conceptually. The relevant items with respect to risk perception both related to the risks of organic produce at a general level, whereas the other items focused more specifically on health risks. The relevant items with respect to information seeking both focused on disadvantages of organic produce, whereas the remaining items focused on preparing organic food in a way that one benefits the most. The respective information sharing items asked about sharing risk information with friends and with people the individual knew well; groups that are obviously connected.

[6]This was the correlation between information need and seeking information about organic food. Although information need measures the need for information and how interested consumers are in additional information, information seeking is about behavioral intentions. Information seeking is measured in a way that we tap into the behavioral intentions to search for information, which is conceptually different from the need for information.

Table IV. Factor Loadings, Composite Reliability Estimates, and Average Variance Extracted ($n = 535$)

Constructs	Standardized Factor Loadings	Composite Reliability	Variance Extracted
1. Online information sharing (8 items)	0.72–0.97	0.97	0.80
2. Outcome expectancies (4 subscales)	0.71–0.94	0.89	0.68
3.Descriptive norms (4 items)	0.92–0.97	0.98	0.91
4. Injunctive norms (4 items)	0.93–0.98	0.98	0.91
5. Sociability (4 items)	0.70–0.93	0.90	0.70
6. Information need (8 items)	0.81–0.94	0.97	0.79
7. Information seeking (4 items)	0.75–0.97	0.95	0.81
8. Risk perception (4 items)	0.82–0.97	0.94	0.78
9. Anxiety (4 items)	0.95–0.98	0.98	0.93

discriminant validity was therefore considered to be fine, which implies that constructs do not conceptually overlap.

Based on the above mentioned statistics, it was concluded that the constructs were measured in a reliable way and that the measurement model met the requirements for fitting the full structural model.

3.4.2. The Structural Model

The full model, visualized in Fig. 1, was tested. The fit of the model was first evaluated. RMSEA was 0.076, indicating a good fit. CFI was 0.92 and TLI 0.91, both exceeding the threshold of 0.90. The NFI was 0.89, closely reaching the threshold of 0.90. The normed chi-square of 4.12 also pointed to a good model fit. The chi-square statistic, $\chi^2(882) = 3635$, was significant, however, and GFI was 0.75, which was to be expected as we found the same results in testing the measurement model. The fit of the full model was therefore considered to be good.[7]

The model explained 41% of the variance in the outcome variable information sharing (see Fig. 1). With respect to the social determinants, 3% of the variance in injunctive norms was explained. With respect to the information-related determinants, the model explained 37% of the variance in information need and 59% of the variance in information seeking was explained. The model further explained 37% of the variance in anxiety.

Table V shows the standardized indirect, direct, and total effects of the determinants on information sharing, while Table VI shows the covariance between the exogenous predictors.

[7]Alternative models were tested, but did not produce a better model fit.

Table V. Standardized Indirect, Direct, and Total Effects of Predictors on Information Sharing ($n = 535$)

Indirect Effects		Direct Effects	Total Effects
Outcome expectancies	–	0.35	0.35
Descriptive norms	0.12	–	0.12
Injunctive norms	–	0.38	0.38
Sociability	0.06	–	0.06
Information need	0.17	0.03	0.21
Information seeking	–	0.23	0.23
Risk perception	−0.001	0.16	0.16
Anxiety	0.006	−0.008	−0.002

Table VI. Covariances Between Exogenous Predictors ($n = 535$)

	Covariances			
Constructs	1	2	3	4
Outcome expectancies	1.00			
Sociability	0.31**	1.00		
Descriptive norms	0.64**	0.37**	1.00	
Risk perception	−0.01	−0.22**	−0.08	1.00

**Covariance is significant at the 0.01 level (2-tailed); *covariance is significant at the 0.05 level (2-tailed).

Looking at the individuals' beliefs about sharing, it was found that outcome expectancies had a strong direct effect (direct effect = 0.35) on information sharing.

With respect to the social determinants, injunctive norms proved to have the strongest total effect on information sharing (total effect = 0.38): a large direct effect (direct effect = 0.38). This effect is comparable in magnitude to the effect of the individuals' beliefs on information sharing. Sociability had an indirect effect (indirect effect = 0.06) on sharing via injunctive norms. Descriptive norms had an indirect

effect (indirect effect = 0.12) through information need.

Information-related determinants also had an effect on information sharing. Information seeking had the largest effect (direct effect = 0.23) on information sharing. There was no significant direct effect of information need (direct effect = 0.03). This determinant affected information sharing via information seeking (indirect effect = 0.17).

With respect to the risk-perception-related determinants, there was a medium-sized direct effect of risk perception (direct effect = 0.16) on information sharing, while the other paths were insignificant. This implies that the risk-perception-related determinants were less important in predicting information sharing compared to the other categories of determinants.

With respect to the covariances between exogenous predictors (Table VI) it is noteworthy to mention the high covariance between descriptive norms and outcome expectancies (covariance = 0.64). This implies that descriptive norms regarding organic food and the outcomes expected from sharing information are closely related.

4. DISCUSSION AND CONCLUSION

4.1. Discussion of Empirical Results

Sense-making is an important concept in current society. That is, consumers have to make sense of the abundance of information available in a large number of channels to form an opinion and decide whether or not to buy a product. Information sharing, information seeking, and information processing are three important means to sense-making.[10,35,36] Although there is a lot of research conducted about information seeking and processing,[11] (online) information sharing has been given little attention.

To fill this gap, this study aimed to gain insight into *the characteristics of information sharing* and *the main determinants that motivate individuals to share risk information.* The study focused on the risks of organic products, which is motivated by the fact that Dutch consumers perceive organic foods positively, while they seem to be unaware of the possible risks involved.

Based on the theory of planned behavior[67] and the RISP model,[53] this study was the first to examine a model predicting online information sharing in relation to food risks. The model included the individual's beliefs about information sharing, social determinants, information-related determinants, and determinants related to risk perception. Structural equation modeling was used to test a model on a representative sample of Dutch Internet users. Constructs were reliably measured.

Results showed that sharing information on the risks of organic produce was low. Respondents were most inclined to share such information with a specific person in a conversation. Online information sharing and information sharing via social media were less popular. Facebook proved to be the most popular social media channel to share information.

The SEM analyses showed that both the CFA model and the structural model had a good fit. The model explained 41% of the variance in information sharing. This is comparable to the approximately 50% of the variance in information sharing about climate change reported by Yang *et al.*[10] Results further showed that outcome expectancies (H1) and injunctive norms (H2) were most important in predicting information sharing on food risks. Injunctive norms, that is, the individuals' perception of the expectations within their social environment that depended on sociability (H3), had the strongest direct influence on information sharing. This is in line with results found by Lin *et al.*,[42] Chiu *et al.*,[51] and Yang *et al.*,[10] who showed that injunctive norms were an important predictor of sharing information. This stands in contrast to results reported by Hsu and Lin,[41] who did not find an effect of injunctive norm on information sharing in blogs (on a diversity of topics). This can perhaps be attributed to the fact that Hsu and Lin explicitly focused on blog users, whereas the participants in our study would not easily engage in blogging.

Outcome expectancies also had an important role in predicting online information sharing. This is in line with previous studies.[39,41–44]

Information seeking had the third strongest direct effect on information sharing (H7). This effect was somewhat less important in predicting online information sharing than injunctive norms and outcome expectancies.

The fourth direct path, from risk perception to information sharing, was much weaker compared to the other paths (H8). Although risk perception had a strong direct effect on anxiety (H9), its indirect effect on information sharing was negligible. The same held for the direct (H10) and indirect effects (H11, H7) of anxiety on information sharing. The fact that risk perception and anxiety turned out to be less relevant might, perhaps, be explained by the fact our

study focused on a topic that individuals associate with benefits rather than risks.[25,58,68] This might also imply that consumers perceived this risk as an impersonal risk, that is, risks that are a direct threat to something other than the self, instead of a personal risk. Previous research[69] showed that injunctive norms were most important in predicting information seeking and processing in relation to impersonal risks, whereas other relations were less prominent. This might explain our low effect of risk perception and anxiety and the strong effect of injunctive norms.

In the structural model, there was a predicted path from information need to information sharing (H4). This path was, however, insignificant. This means that the effect of information need, and its determinant descriptive norms (H5), was indirect, through information seeking (H6, H7). The exact relationship between information seeking and sharing is not yet clear, however. The model hypothesizing a causal path from seeking to sharing fitted just as well as one hypothesizing a path from sharing to seeking and one hypothesizing common error variance. In line with the ideas of Veinot,[70] the fitted model seems most plausible: the higher the involvement within the social environment regarding organic foods, the more (joint) information seeking and the more information sharing. Further research might help to understand these relationships in detail.

An important subsequent question was what relationships the model did not explain and how these relationships can be understood. The modification indices showed in particular substantive residual correlations between injunctive norms on the one hand, and outcome expectancies and descriptive norms on the other. This implies that the perceived social pressure of the environment is related to the expected outcomes that consumers perceive and is closely related to the behavior in the reference group. There is a social aspect in outcome expectancy that may explain the residual correlation between injunctive norms and outcome expectancies. The same reasoning goes for descriptive norms: the social aspect of the descriptive norms is reflected in outcome expectancy and injunctive norms.

All in all, when all hypotheses were tested simultaneously, there was support for H1, H2, H3, H5, H6, H7, H8, and H9, but not for H4, H10, and H11. The acceptable fit of the model, further, indicated that there was not need to include any additional direct effects. This lends support to all the hypotheses on the absence of a direct effect. The theory of planned behavior and the RISP model thus proved to be very helpful in understanding information sharing behavior with respect to the risks of organic produce. This is a very interesting result. In the past, the RISP model was mainly used to explain information behavior in relation to topics with a negatively connotation, such as external safety,[56] influenza,[71] and climate change.[10] Our research adds to this research and showed that the RISP model was also useful in understanding information sharing regarding the risks of organic produce, which is perceived as very beneficial and of low risk,[25,58] resulting in hardly any anxiety among Dutch consumers.

4.2. Future Research

There are still a number of questions for further investigation. First of all, further research is needed to examine *why* consumers want to share risk information. In our research we focused on reciprocity and social and self-evaluation outcome expectancies as potential benefits of information sharing. Results suggested that reciprocity was the main motive to share information, which is in line with research by Liou *et al.*[72] Research by Baker and Moor[73] suggested, however, that individuals share information online to express emotions and gain social support. It would be worthwhile to investigate to what extent emotional expression is a relevant motive to share information in a food-risk-related context.

Motives to share information online might also depend on the specific social media channel. Oh and Syn[9] showed that Facebook users were more motivated by enjoyment, altruism, social engagement, and reciprocity compared to Twitter users, implying that different motives are prevalent for users of different social media channels. Some channels might thus be used more often to share information in the hope to receive information in return, whereas other channels might be used more frequently to maintain relationships or to express emotions. Further research is needed to examine how motives to share information differ among particular social media channels.

An interesting question is, of course, to what extent the model is generalizable to other food products, and to other risks. Our model related to organic foods that are characterized by a low level of perceived risks and anxiety. For other foods with a more negative image a different model might be more explanatory. Risk perception and anxiety might then have a larger effect on information sharing. The

question is also whether our model would also hold for another category of risks, for example, for those to which individuals are involuntarily exposed. Future research is indicated to investigate to what extent our model is applicable in other contexts and whether the estimated coefficients are of similar size as the ones found in the present study.

4.3. Implications for Risk Communication

Social media have substantively changed the way individuals interact with each other and with organizations. Individuals can now share their views and experiences publicly and compare them with those shared by others who are similar to them. This might stimulate them to make sense out of all the acquired information.

This consumer information sharing and exchanging behavior might be very useful to food risk communicators. Nowadays, food risk communication often aims at enhancing informed decision making regarding food choice. As public online information exchange stimulates consumer sense-making, it also enhances informed decision making. Stimulating information sharing might thus be useful as it helps consumers in making well-informed decisions. To stimulate information sharing, risk communicators should appreciate that the social environment plays an important role in online information sharing and make use of this information by, for example, targeting groups of individuals instead of merely focusing on the individual. Risk communicators should also explore the potentials of communication with consumer groups, for example, the consumer in his/her social environment, in addition to approaching consumers on an individual basis. Social media might be a useful tool for this purpose.

An option to facilitate consumer information exchange would be to allow consumers to react to information posted on one's website. Another option would be to be active on social media oneself, respond to consumer comments, and try to start conversations,[74] for example, when one would like to increase consumer awareness of risks attached to particular food products. Such a strategy might prove to be productive as well as efficient as it corresponds to the current way consumers are interacting with each other.

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APPENDIX: SCALES, ITEMS, AND RELIABILITIES OF CONSTRUCTS ($n = 535$)

	Characteristics	
Measures	Scale	Reliability
1. *Sharing of risk information* If I encounter an interesting message saying that eating organic food has risks, I would… (1) Post the link to this message on a forum of a specific target group, for example, pregnant women or people with chronic diseases (2) Share the message with someone I know well via email (3) Share the message with a good friend via Skype or another chat (4) Forward the link to this message to my friends (5) Post a link to this message on a public forum about food (6) Post the message on a blog that is available to everybody (7) Write a post on a public blog (8) Post a link to this message on a website about food that is publicly available	7-point Likert scale from 1 = *very unlikely* to 7 = *very likely*	0.97

Measures	Characteristics	
	Scale	Reliability
With whom? If you encounter an interesting message saying that eating organic food has risks, with whom would you share it? (1) Public (2) Friends (3) Family (4) Colleagues (5) Specific person *How?* If you encounter an interesting message saying that eating organic food has risks, how would you share it? (1) On Twitter (2) On Facebook (3) Via chat (e.g., Skype) (4) By email (5) Forum or blog (6) In a conversation		
2. *Outcome expectancies reciprocity*: When I share information about food risks… (1) I'll receive information in return (2) Other people will tell me what they know about these risks too (3) I expect that other people share such information with me in the future	7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*	0.96 0.94
Social: When I share information about food risks… (4) I'll gain respect (5) This is beneficial for my relationship with family members (6) This has positive consequences for my reputation		0.94
Self: When I share information about food risks… (7) This makes me feel good (8) I'll feel satisfied (9) I'll feel that I'm doing something important		0.97
General evaluation of sharing: If I encounter an interesting message about food risks… (10) I think it's useful to share the information (11) I think it's wise to share the information (12) I think it's helpful to share the information (13) I think positive about sharing the information		0.97
3. *Descriptive norm* (1) My friends are interested in information about the risks of organic products (2) People in my social environment are interested in the risks of organic products (3) My friends are concerned about the risks of organic products (4) In my social environment people are concerned about risks of organic products	7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*	0.98
4. *Injunctive norm* (1) I am expected to share information about the risks of food (2) Most of the people in my social environment expect me to share information about the risks of food products (3) My friends expect me to share information about possible food risks (4) My family expects me to share information about possible food risks	7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*	0.98

Measures	Characteristics	
	Scale	Reliability
5. *Sociability* (1) I like to tell to my friends what I've done (2) I enjoy having a lot of people around to talk to (3) I like to talk about what I've experienced (4) I enjoy talking with others about what I've experienced	7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*	0.90
6. *Information need* (1) I am interested in stories in the mass media on risks of organic products (2) News reports on the influence of organically producing food on food quality do interest me (3) News items on the risks of eating organic food products interest me (4) I am interested in news stories about how I can minimize the risks of organic food products (5) I would like to know more about how I can recognize an organic product (6) I would like to learn more about the advantages and disadvantages of eating organic (7) I would like to know more about the laws on organic food producing (8) I would like to learn more about the most important differences between organic and non-organic food	7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*	0.97
7. *Information seeking* I'm inclined to search for information about .... (1) The disadvantages of organic products (2) The way you prepare organic products while benefiting most (3) How to prepare organic food the best (4) The way to deal best with the possible risks of eating organic	7-point Likert scale from 1 = strongly disagree to 7 = strongly agree	0.94
8. *Risk perception* (1) I think that organic food is bad for my health (2) I think that there are many risks attached to organic food (3) I think that organic food has many disadvantages (4) I think that organic food is dangerous for my health	7-point scale from 1 = *strongly disagree* to 7 = *strongly agree*	0.94
9. *Anxiety* When I think about the risks of eating organic food products, I feel ... (1) Anxious (2) Worried (3) Afraid (4) Concerned	7-point scale from 1 = *strongly disagree* to 7 = *strongly agree*	0.98

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