

Radboud University



**Privacy Concerns and New Technologies from the Perspective of Message Framing and
Involvement: A Case Study of Drones**

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Abstract

In this communication focused study, the effects of message framing and outcome-relevant involvement on privacy concerns of new technologies are explored by an experimental survey. The new technology of drones is applied as a case to examine the variables as a specific case scenario. Framing is perceived as a variable that can influence the amount of individual's privacy concerns towards new technologies. Although prior studies have explored the topics of privacy concerns and involvement before, this study is unique in combining the variables outcome-relevant involvement, framing and privacy concerns in one study with the aim of examining an interaction effect. The study reveals an existent effect of outcome-relevant involvement on privacy concerns regarding new technologies. Thus, this study carries scientific relevance in displaying an interaction between the level of personal involvement of an individual regarding privacy and the level of privacy concerns individuals carry towards new technologies. Finally, as the study did not find a significant framing effect due to insignificance of a manipulation intention, no further conclusions can be drawn on a framing effect.

Keywords: communication, framing, outcome-relevant involvement, new technologies, drones, privacy concerns.

Introduction

We live in a risk-averse society in which there are growing concerns, awareness and mindfulness towards risk, especially towards those associated with new and emerging technologies. This study finds its foundation in the observation that literature on the public acceptance of new technologies and drones in specifically, appears to be scarce (Chamata, 2018). As Aydin (2019) found that privacy concerns can affect the public's perception of drones, this study finds its theoretical relevance by scrutinizing the factor privacy concerns in terms of attitude towards privacy, as part of the acceptance process of the technology of new technologies. The technology of drones is applied as a case scenario to new technologies. Hence, the choices regarding examining specific types of involvement and framing types are based on the characteristic of privacy concerns of new technologies. Thus, this study applies outcome-relevant involvement and attribute framing in an experimental study.

Theoretical Background

Framing in Communication Research

In communication research, message framing refers to the phenomenon that individuals react differently to one of two equivalent representations of a message, for which each version is either positively or negatively formulated (Hoeken, Hornikx & Hustinx, 2017). More specifically, message framing refers to only one side of the information being available to an individual, thus framing effect can be defined as the observed difference in subject's responses to the different versions of a frame (Braun, Gaeth & Levin, 1997; Hoeken, Hornikx & Hustinx, 2017). The underlying assumption of framing is that the message outcome is the same, regardless of how it is formulated. Levin, Gaeth and Schreiber (2002) created a typology of the three generally accepted framing types, which include goal framing, risky choice framing and attribute framing. The types of message framing are applied in various fields of studies, ranging from health communications to consumer behavior.

Goal framing applies when a message frames either negative or positive consequences for the subject when performing a particular act to achieve a specific aim. For example, related to health studies, it was found that women are more inclined to undergo breast self-examination when information was focused on the negative consequences, opposed to when exposed to positive consequences of breast self-examination (Meyerowitz and Chaiken, 1987). That the

negative message information is more effective, suggests that people are generally more loss-averse and usually want to avoid loss over achieving gains.

Risky choice framing effects appear when the readiness of a subject to take a risk is dependent on whether the outcome is positively or negatively framed (Levin, Gaeth & Schreiber, 2002). For example, in health research Tversky and Kahneman (1981) found that individuals are more inclined to take risks when outcomes of a certain action are negatively framed than when positively framed.

Attribute framing formulates messages with either positive or negative descriptions of key attributes of an object. The findings by Levin et al. (2002) present that an attribute framing effect occurs "when evaluations of an object or event are more favorable if a key attribute is framed in positive rather than negative terms" (p. 413). This type of framing has been studied in consumer behavior, as for example Levin et al. (2002) found that subjects perceived it more favorable to describe the key attribute of ground beef as a percentage in lean rather than a percentage in fat. This indicates that positive framing is more effective when one wants to evoke positive attitudes towards a product or object. Hence the first hypothesis can be hypothesized as follows:

H1: Positive attribute message framing of drones reduces individual's privacy concerns of drones

Involvement

Petty & Cacioppo (1981) conducted extensive research in attitude change, as attitude is one of the main determinants of behavioral change. They propose two different routes for message processing: The central processing route and peripheral processing route. The researchers describe these processing routes by the Elaboration Likelihood Model, explaining how attitudes of individuals can be changed by the different message processes (ELM) (Petty & Cacioppo, 1986). This dual processing model suggests that an evaluation or opinion about a particular object or concept can either be evaluated by careful reasoning through the central message processing route or based on heuristic cues through the peripheral processing route.

In peripheral processing, understanding of the actual text is not necessarily needed; individuals instead make decisions and process a message based on peripheral cues such as positive words or images. The models suggest that the more individuals evaluate a message

carefully, the less the impact of peripheral cues will be.

Motivation is an important factor for individuals to decide to evaluate a message through careful reasoning through the central route. In turn, the ELM model presents that an important factor influencing motivation is involvement (Petty & Cacioppo, 1981). Involvement reflects that when individuals perceive the outcome of engaging in a certain situation relevant to themselves, they will be more motivated to apply the acceptance process of careful consideration of the message through the central processing route, meaning it is harder to influence them. Depending on the subject of the text or situation, the individual will determine their own level of personal relevance in terms of involvement with the issue at hand. Based on the latter, a possible prediction that can be derived from the ELM model is that for high involvement individuals framing has no effect because the subject's reasoning of the message includes a consideration of the same benefits and losses.

Moreover, research conducted by Jung and Villegas (2011) suggests that high-involved individuals showed more positive attitudes toward a loss-framed message than towards a gain-framed message, and low-involved participants had a more positive attitude towards gain-framed messages. Likewise, Maheswaran and Meyers-Levy (1990) found that when high-involvement takes place, messages that are framed negatively through goal framing are more effective for manipulating attitude change than messages that are framed positively. Accordingly, positively framed messages were found to be more persuasive when issue involvement is low. These findings show a trend in positively framed messages being more effective when goal framing is applied. Nevertheless, it is important to note that their study only included women in the sample thus the generalizability of the results is questionable, hence it is relevant to repeat similar measurements in a study with a mix of male and female participants. Moreover, since the studies applied goal framing as manipulation, it would be interesting to see what results would be generated by manipulation with a different framing type, in this case attribute framing.

Outcome-Relevant Involvement

The latter presents that previously published studies on the effect of involvement are not showing consistent results. In fact, all the studies reviewed so far suffer from the fact that there is no overall agreement amongst the conceptualization of involvement amongst scholars. Whereas Cho and Boster (2005) found that high-involved individuals are not affected by any frame effect

at all, on the contrary Bosone and Martinez (2017) found that high-involved individuals are only influenced by a negative frame. Therefore, the idea that involvement should be categorized in different types was first challenged by Johnson and Eagly (1989). Their meta-analysis on the effects of involvement on persuasion acknowledges the wide variety of studies in the field of involvement regarding the diversity of terms used to explain and refer to issue involvement. Due to the observation that with different types of involvement different effects occur, in their study, they break down involvement into more specific involvement types, among which value-relevant involvement and outcome-relevant involvement. Value-relevant involvement occurs when the topic of persuasive communication is linked to important values. Outcome relevant involvement occurs when the topic of the message is linked to the recipient's currently important goals or outcomes (p.292). Additionally, Petty and Cacioppo (1981) describe outcome-relevant involvement related to the personal importance of an issue to an individual, and "Outcome-Relevant involvement can either enhance or inhibit persuasion because it promotes issue-relevant thinking." (p. 237), stating the effect of outcome-relevant involvement on issues that are of personal relevance to an individual. This implies that a message can be adjusted to a person's involvement, manipulating different responses. In this study, outcome-relevant involvement applies to study privacy concerns, as privacy concerns are not a personal value but rather an outcome of a person's evaluation.

Cho and Boster (2005) studied the division of issue involvement types and framing, and they found that high outcome-involvement diminishes the framing effect. Combining this to the findings of attribute framing that positive frames are more persuasive, one would expect that the positive frame will only be effective for low outcome-relevant involvement individuals.

Bosone and Martinez (2017) applied goal framing in their study and suggest that framing effects only show a significant result when individuals consider the issue to be highly relevant to themselves. These findings suggest that framing effects tend to be stronger for high-involved individuals. As these findings are contradictory to the findings of other studies in the field, this research further explores whether the inconsistent findings also apply to attribute framing.

Technology: Message processing and attitudes

The findings that low-personal relevance issues are unlikely to be processed cognitively due to a lack of motivation can specifically be linked to the acceptance of technology because, according to the Technology Acceptance Model (TAM), motivation is a part of external factors influencing acceptance. Davis (1989) developed this model to explain user acceptance of information technology. Since drones are considered as a continuously innovated and newly developed technology, the TAM could provide an explanation for the acceptance or rejection of people towards drones. The original model approaches the acceptance of technology by individuals with two factors: perceived usefulness and perceived ease of use. These factors are dependent on external variables, and in the case of the acceptance of the new technologies, external factors could be perceived risk, gender, age and personal relevance of the related issues. Based on the influence of the external variables, privacy concerns seem to be associated with the TAM.

However, modern technology provides new challenges to the rather simple approach of the model, since concerns about risks related to privacy and security are more connected with emerging technologies. Hence, Chamata (2018) states that the TAM is not complete enough to base the acceptance of modern technologies on. Hence, this study can be valuable by further exploring the relevant factors influencing technology acceptability in the context of emerging technologies, such as privacy concerns.

In line with the TAM model, Godoe and Johansen (2012) state that general attitudes towards new technologies depend on both personal and systematic factors. Personal factors that can evoke negative attitudes towards new technologies are the feeling of discomfort, which is reflected in a perceived lack of control due to new technologies (Parasuraman & Colby, 2001, p.41). Moreover, insecurity in terms of distrust and skepticism regarding a technology impacts the attitude towards new technologies as well (Parasuraman & Colby, 2001, p.44). On the other hand, more systematic factors as ease of use and play a role as well, as the TAM model explains.

Respectively, besides exploring framing, involvement effects and privacy concerns, previous studies in the field of privacy concerns and technology offer reasons for examining contextual demographic variables. For example, Schütz and Wiedemann (2008) found that variations in goal-framing of risk issues related to nanotechnology influence risk perceptions of an emerging new technology that is still largely unknown to the public. Although the findings could not confirm the effect of framing, they did suggest that the context in which the technology

is introduced does play a role in risk perception. Accordingly, it can be assumed that when presenting new technologies, the context in which a technology occurs does play a role in perceived risk, which in turn affects attitudes towards the technology. Henceforth, this study purposely collected contextual demographic data in terms of age, nationality, gender and technological background.

Accordingly, Petronio (2002) explains with the boundary rule formation theory how individuals make decisions about their privacy based on criteria they perceive as important at the relevant time. The theory argues that people consider the following five criteria to establish personal rules about disclosure of their privacy: Cost-benefit ratio, context, motivations, gender and culture. These criteria form interesting variables to research attitude towards drones and privacy concerns, because the results overlap results from other studies concerning privacy concerns and risk perception. From this explanation, one can conclude that people determine potential privacy concerns based on outcome-relevant involvement, as outcome-relevant involvement is defined as applicable when an issue is relevant to a person's current goals or outcomes (Johnson & Eagly, 1989, p.292). Based on the latter the following hypothesis can be derived:

H2: High outcome-relevant involved individuals have more privacy concerns regarding drones than low outcome-relevant individuals.

Information Salience

Leong, McKenzie, Sher & Müller-Trede (2017) found that the order in which information occurs can affect attribute framing effect as well. The researchers found that when exposed to a message, individuals begin by retrieving favorable information before considering unfavorable information, this results in overall more favorable information being retrieved and recalled (Leong et al., 2017).

Additionally, in line with outcome-relevant involvement theory Braun et al. (1997) present how important information salience is when applying the attribute framing method. The framed attribute is not always as meaningful to different subjects, as the more salient the framed attribute is, the more individuals will weigh the attribute in their decision-making process. In the case of our study, the more important privacy concerns are, the more the effect of attribute

framing will be on the participants. Furthermore, Braun and colleagues (1997) state that for attribute framing it is important to keep the depth of message processing of subjects into account because attribute salience and the influence of the subjects' personal needs have a significant impact on the message processing progress. The framing method to highly involved individuals appeared to be perceived as a reason for more central careful processing of the message. Relating back to the theory of motivation and involvement, information salience shows that the more the personal relevance in terms of involvement with the attribute for an individual, the more in-depth they will be processing the message, and the more attention they pay to the framed attribute which in turn makes it more difficult to manipulate their way of message processing.

To conclude, overall prior studies found that for high-involved participants there was no significant framing effect, and framing was only found to be effective for low-involved subjects (Braun et al, 1997; Cho & Boster, 2005). Hence H3 is hypothesized as follows:

H3: Individuals with high outcome-relevant involvement are not affected by the framing effect as opposed to individuals with low outcome-relevant involvement.

Expertise

In compliance with involvement theory, research conducted by Lidynia, Philipsen and Ziefle (2017) on acceptance and perceived barriers of drones, presents that laypeople without specialized knowledge were less acceptant towards drones, whereas people with more professional knowledge about drones were not. Respectively, a high level of expertise in the technology domain was proved to positively affect the acceptance of new technologies and drones (Lidynia, Philipsen and Ziefle, 2017). These findings are contrary to the findings of Biek, Wood and Chaiken (1996) who found that more prior knowledge generates more negative responses because of more careful consideration of the message. They suggest that when processing a message, knowledgeable people use their knowledge to evaluate all information in the message critically. Therefore, knowledgeable people are able to detect manipulation effects (Biek et al., 1996), and henceforth it can be presumed that the framing effect will not apply to participants with expertise. Thus, H4 can be constructed as follows:

H4: Privacy concerns of people with technological expertise are less influenced by the framing effect than people without technological expertise.

Attitude Towards New Technologies: Drones as a Case Study

Throughout the years, the use of drones has expanded around the world. Even though, the existence of drones can be traced back to the development of airplanes in 1930, concerns and uncertainty around the technology still rise due to the rapid innovations around the technology (Rule, 2015). As a result, new technologies and application areas of drones are constantly emerging. The advancement of drones started with large drones for military purposes, but as technology advanced drones became smaller and accessible for private and commercial usage (Takashi, 2012). Nowadays, drones are equipped with a variety of sensors, for example cameras and heat sensors, which enable collection of data. This data is utilized in a wide range of fields, for instance for private photos or videos but also for official surveillance by the police or government (Takahashi, 2012). As this specific attribute of data collection by drones raises concerns about privacy violations regarding individual's personal information, the public perceives drones as a risky technology directly interfering with their privacy (Aydin, 2019). Thus, the researchers conclude that specific concerns related to drones are those of privacy concerns. Based on this, in this study attitude towards the technology of drones will be studied in terms of privacy concerns.

Renn and Benighaus (2013) found that people evaluate technological risks through a set of attributes of the subject at hand. These findings suggest that through attribute framing one could manipulate crucial attributes of drones in order to determine whether a specific attribute influences concerns about the technology. In this case the specific attribute of data collection applies because earlier studies link this attribute of new technologies to privacy concerns (Aydin, 2019). As Boucher (2016) found that people felt that domestic drone development represented a threat to their privacy, this study will explore privacy concerns with respect to drones with a domestic application. These drones are defined as "small, unmanned aircrafts capable of delivering packages or capturing photos" (Rule, 2015).

Privacy Concerns

Prior research conducted by Xu, Diney, Smith and Hart (2011) explored how individual privacy concerns can be measured. Based on the wide variety of definitions and applications of the concept of privacy, the researchers adapted a conceptualized definition of privacy concerns, and defined privacy concerns as "consumers' concerns about the possible loss of privacy as a result of information disclosure to a specific external agent." (Xu et al., 2011, p.800).

Clothier, Greer and Greer (2015) recognize that as a result of the rapid innovation around drones, there has been limited research related to the public perception and acceptance of drones. They studied public acceptance of drones in the light of risk perception. The researchers suggest that risk perception is a crucial driver behind the acceptance of drones. They found that the public is still unfamiliar with the phenomenon of drones, causing them to lack knowledge about the technology. Thus, the public still needs to form an opinion about the matter, and the results are expected to change over time, making it valuable to explore the topic further. Moreover, the researchers mention that the acceptance of new technologies and public acceptance are different amongst countries and depend on sociopsychological and cultural factors. Hence, a similar study conducted in for example, Europe could generate different results than the rather neutral results of this study conducted in Australia (Clothier, 2015).

Additionally, referring to technological acceptance and the effect of demographics, it has been found that millennials are different from other generations as they were born and raised with upcoming and changing technological innovations. Gibson and Sodeman (2014, p. 66) describe millennials as following: "Millennials (born between 1981-2000) were raised during the dot.com boom, and have seen the development of MP3 players, YouTube, and smartphones as well as the impact of technology in all aspects of their lives from healthcare, transportation, to communication.". Thus, one could suggest that millennials are likely to be more accepting towards new technologies, making age a relevant demographic variable to take into account in this study. Hence, millennials form the foundation of the sample for this study on new technologies, to prevent generation factors from influencing the effects.

To summarize, literature in communication research has explored the interaction of framing and involvement. However, for the different involvement types, different effects on attitude change were found, hence studying outcome-relevant involvement specifically can potentially add relevance to further explore the different implementations for involvement in the

communication field. Moreover, researchers mainly applied goal framing in their research, hence exploring the effect of a different type of framing, in this case attribute framing, adds to the study's theoretical relevance. This study aims to investigate whether there is a correlation between attribute framing, outcome-relevant involvement and privacy concerns. As framing is applied as a manipulating variable, this study suits an experimental design in order to examine the effects on privacy concerns.

The theoretical overview presented leads to the following research question:

RQ: How do message framing and outcome-relevant involvement influence individuals' privacy concerns regarding data-collecting drones?

In order to answer this research question, the following hypotheses are developed:

H1: Positive message framing of drones reduces individual's privacy concerns of drones;

H2: High outcome-relevant involved individuals have more privacy concerns regarding drones than low outcome-relevant individuals;

H3: Individuals with high outcome-relevant involvement are not affected by the framing effect as opposed to individuals with low outcome-relevant involvement;

H4: Privacy concerns of people with technological expertise are less influenced by the framing effect than people without technological expertise.

Method

Materials

The first independent variable in this study was the framing type, which operated at the nominal level. Participants were randomly assigned to a framing condition and were only exposed to one version of the message, which was either positively or negatively framed. The stimuli materials included an informative article about drones, including the definition of drones by Rule (2015) accompanied by a neutral picture of a drone. The last paragraph of the article was the manipulation part, which framed the data collection attribute of drones in either positive or negative light, through attribute framing (Levin et al., 2002). The stimuli were similar to all the respondents in all regards except two sentences in the final paragraph. The positive frame was applied in the following sentences: "Experts agree that a significant amount of data by drones is likely to be collected with informed consent. The latest studies have shown that informed consent for the storage of data collected by drones is obtained in about 85% of cases". On the other hand, the negative frame was applied in the following sentences: "Experts agree that a minor amount of data by drones is likely to be collected without informed consent. The latest studies have shown that informed consent for the storage of data collected by drones is obtained in about 15% of cases". The stimuli can be found in the appendix A.

The second independent variable outcome-relevant involvement was operationalized as a nominal variable as well and was measured by an eight-item seven-point Likert scale (strongly disagree – strongly agree. These questions were adapted from the scale developed by Cho and Boster (2005) and are included in appendix A as part of the survey. However, as outcome-involvement was operationalized as an interval variable in the experiment design, the variable required to be categorized first. Hence, in order to conduct a two-way ANOVA test, the variable needed to be transferred into a nominal variable. This was done by creating a median split (Allen 2017), which split the scale at the sample median using the median score to divide the sample. Firstly, the values of all eight items for outcome-relevant involvement (ORI) of each participant were added together to create an ORI total score, hence the median of all items together was calculated, which was found to be 38. Based on that median score every individual was categorized in either a high or low involvement category based on their individual ORI score respective to the total mean of all the scores together. Every score above 38 was considered as

high involved, and everything under 38 was considered as low involved participants. With this method a nearly equal distribution of high and low outcome-relevant involvement participants was found, with 91 (48.2%) participants being categorized in the high outcome-relevant involved category, and 94 (50.8%) participants in the low outcome-relevant involvement category regarding involvement with drones.

Subjects

In total, 236 participants for the study were selected by simple random sampling. However, only 210 of 236 participants had completed the survey and agreed to the terms and conditions, and 4 respondents did not give their consent to use their data in our survey, hence we left those out in analysis. Moreover, the sample was selected to be homogeneous in terms of characteristics relevant to technology acceptance. Research by Gibson and Sodeman (2014) showed that millennials as a population have similar acceptance attitudes towards new technologies. Thus, individuals born between 1981 and 2000 were selected to be part of the analysis only. In total, 3.8% of the collected respondents had an age of 19 or younger, 88.1 % was between the millennial age of 20 to 39, and 8.1% of the participants were 40 or older. Henceforth, only 185 participants were in the age range of millennials, thus only the relevant data of those 185 respondents underwent statistical treatment for this study. 111 (60%) of these analyzed questionnaires were filled in by females, 73 (39.5%) by males and 1 (0.5%) of the respondents selected 'other' when asked about their gender.

In addition, the questionnaire asked about nationality, as previous research proposed that different results could be found for studies generated in Europe (Clothier et al., 2015). The distribution of nationalities was spread by 43.2% being German, 27.0% Dutch and 29.8% was identified as international, as 28 different nationalities were reported in small quantities.

Moreover, expertise regarding technology of participants was taken into accounts as earlier research found that a high level of expertise in the technology domain was proved to affect attitude towards new technologies (Ziefle & Schaar, 2010). Participants were asked whether their education or profession was related to the field of technology and science to determine whether expertise knowledge influenced the results. 37.8% of the participants indicated that their field of education or profession was related to the field of technology and science, and 63.2% of the participants replied with no.

Finally, a frequency analysis showed that 28.1% of the participants were working, 53% studying, 3.8% filled in other occupations (such as housewife), 12.4% of the participants were both working and studying and 2.7% did not share their occupation.

Design

As the aim of the independent variable framing in this study is capturing a manipulation effect on the amount of privacy concerns as a dependent variable, the suitable choice for a method is an experiment. Henceforth, the design of the study was a 2 (Positive vs. Negative Message Framing) x 2 (High vs. Low Involvement) between-subjects factorial design, by means of an experimental survey. Respondents were exposed to one level of the independent variable message framing, which was either a positive or negative framed news article. The distribution of the framing type was almost equal as 92 participants were exposed to the positive frame (49.7%) and 93 participants were exposed to the negative framed news article about drones (50.3%).

The outcome-relevant involvement variable was not manipulated, as all the participants were exposed to the same questions. In order to enable analysis of the findings, participants were categorized as either a high-involvement participant or low-involvement participant regarding privacy concerns, based on their answers to the questions.

Instruments

Privacy concerns (of drones) was the dependent variable in this study. The variable was operationalized at the interval level, with a four-item seven-point Likert scale (strongly disagree – strongly agree), with seven being a high score on privacy concerns and one being a low score regarding privacy concerns. The four questions measuring privacy concerns were derived from the study by Xu et al. (2011) as they found that privacy concerns could be measured through general questions about privacy, and accordingly developed questions for a measurement scale. The survey with the questions for privacy concerns can be found in the Appendix A.

To determine whether the Likert scale was a reliable measure Cronbach's Alpha was measured. In order to do so, the answers to the questions measuring outcome relevant involvement had to be inverted for all the answers to be evaluated as low-involved when respondents agreed with the statement. Hence, for the questions 2, 4 and 5 the Likert-Scale has been recoded switching the values from 1 to 7 around from 7 to 1. After variable inversion,

Cronbach's Alpha showed a good reliability of the 8 outcome-relevant involvement scale items, $\alpha = .844$. This means that the eight questions measuring outcome relevant involvement have internal consistency and measure the same concept. Additionally, a Cronbach's Alpha test for the reliability of the privacy concern scale items was conducted, the scale was found to be reliable as $\alpha = .854$.

Manipulation Check Tests

Reliability test: Cronbach's Alpha

To measure whether the manipulation worked, the internal consistency of the two manipulation-test items, "Do you think the tone of the text was positive or negative?" and "Do you think the text focused on the benefits of drones?" was measured first. Cronbach's Alpha $\alpha = .777$ showed highly reliable, meaning the two items measure the same thing and have internal consistency.

Independent sample T-test manipulation

An independent sample T-test test was conducted to test the outcome of the two manipulation check question items regarding the framing manipulation. Item 1 showed a nonsignificant result, presenting that the framing differences were not clear enough, and participants could not categorize whether the article was positively or negatively framed.

Item 2 showed a nonsignificant result as well. Meaning that participants could not distinguish whether the text was focused on the benefits of drones.

Altogether, the manipulation items were not capturing the manipulative intention of framing.

Procedure

The experimental survey was created in Qualtrics and distributed through a link. Participants were acquired with a compelling description on the online social media pages "Thesis / Survey Questionnaire Filling Group" and "Respondenten gezocht (onderzoek, enquête, vragenlijst, scriptie, afstudeer)" on Facebook, mentioning the worldwide applications of drones in the recent COVID-19 virus outbreak. The aim of mentioning the application of drones in the pandemic was to attract respondents to fill in the survey, although it could have influenced a more positive bias

towards drones already before starting the survey.

The reason for the survey was mentioned at the beginning, and participants were asked to give consent for the usage of their data before starting the survey. When the survey began, all participants read an introduction text about drones accompanied by a picture of a domestic drone. Participants were randomly assigned to one of two versions of the introduction text, as a participant either read a positively or negatively framed message at the bottom of the introduction article. After reading the framed message, the second part of the survey asked the participants to answer four questions related to their privacy concerns. The third part consisted of two manipulation check items measuring whether the participants recognized whether the tone of the text was positive or negative towards drones, *indicating whether the framing effect took place*. The next part consisted of eight items measuring outcome-relevant involvement of the participants about privacy concerns. Finally, the fifth and final part of the survey asked five questions about demographical data, such as age, gender and field of study or profession. In total it took approximately 10 minutes for participants to complete the survey.

Statistical treatment

Cronbach's Alpha, frequency analyses, independent samples t-tests, two-way analyses of variance (ANOVA) and analyses of covariance (ANCOVA) tests were conducted in order to answer the research question and find confirmations or rejections for the hypothesis.

Results

The aim of this study was to examine the influence of framing and outcome relevant involvement on privacy concerns, and to investigate whether an interaction effect between all three variables framing, involvement and privacy concerns exists.

A two-way univariate analysis of variance (ANOVA) was conducted to investigate the effect of the type of framing used (positive or negative) on privacy concerns. The ANOVA analysis revealed no significant effect of the type of framing on the degree of privacy concerns ($F(1,181) < 1$).

Furthermore, a two-way ANOVA was conducted in order to investigate the effect of outcome relevant involvement on privacy concerns. The results showed a significant main effect of outcome relevant involvement on the amount of privacy concerns ($F(1,181) = 11.48, p = .001$). Table 1 presents that participants with high outcome relevant involvement were found to have significantly more privacy concerns ($M = 12.98, SD = 4.31$) than participants with low outcome relevant involvement ($M = 10.81, SD = 4.55$).

Finally, a two-way ANOVA revealed that there was no interaction effect between all three variables (framing, outcome relevant involvement and privacy concerns), as the results were found to be nonsignificant ($F(1, 181) < 1$).

Table 1. Descriptives Outcome-Relevant Involvement, Framing Type and Privacy Concerns

Outcome-Relevant Involvement	Frame (n)	$M (SD)$ Privacy Concerns
High	Negative (41)	13.20 (4.26)
	Positive (50)	12.80 (4.29)
	Total (91)	12.98 (4.31)
Low	Negative (52)	11.13 (4.82)
	Positive (42)	10.40 (4.21)
	Total (94)	10.80 (4.55)

Covariate: Expertise

Furthermore, as 37.8% of the participants indicated that their field of education or profession was related to the field of technology and science, the effect of expertise of participants on the research results has been analyzed by means of an analysis of covariance (ANCOVA). To determine whether there was an interaction effect of the categorical variable expertise on the dependent variable privacy concerns a one-way ANCOVA analysis was conducted. The ANCOVA test revealed that after controlling for expertise related to the field of technology, there was no impact on the framing effect ($F(1, 182) < 1$). This means that the level of expertise did not impact the absence of a framing effect and that expertise did not affect privacy concerns. Table 2 displays the descriptive statistics of the ANCOVA tests on expertise.

Table 2. One-way ANCOVA descriptive statistics for the covariance expertise

Expertise (n)	<i>M (SD) Privacy Concerns</i>
With Expertise (70)	11.81 (4.64)
Without Expertise (115)	11.91 (4.51)
Total (185)	11.88 (4.55)

Discussion and Conclusion

The present study was designed to determine the effect of framing and outcome-relevant involvement on privacy concerns. The research question explored in this study was: *How do message framing and outcome-relevant involvement influence individuals' privacy concerns regarding data-collecting drones?* With respect to this question, it was found that a high level of outcome-relevant involvement resulted in more privacy concerns regarding drones. On the other hand, the outcome of privacy concerns appeared to be unaffected by framing. Moreover, further analysis showed that there were no covariance variables affecting these results, such as expertise and gender.

Based on these results, only H2 "*High outcome-relevant involved individuals have more privacy concerns regarding drones than low outcome-relevant individuals*", is confirmed. These findings show a main effect of involvement on privacy concerns, as participants who had more privacy concerns of drones when they were highly involved than low involved with their own privacy. These results provide important insights into the effects of involvement in communication research, as it confirms that outcome-relevant involvement can have an effect on privacy concerns, confirming the theory of the literature in the field.

Based on the insignificant findings regarding the effect of message framing on privacy and outcome-relevant involvement, H1 "*Positive attribute message framing of drones reduces individual's privacy concerns of drones.*" and H3 "*Individuals with high outcome-relevant involvement are not affected by the framing effect as opposed to individuals with low outcome-relevant involvement.*" cannot be confirmed, and are therefore rejected. Despite the fact that the instruments for creating the manipulation frames were based on previous literature and studies shown to be effective, the manipulation appeared to be insignificant in the present study. A possible explanation could be that the different versions of the framed articles did not differ enough to be characterized as either positive or negative, as the first part of the article was the same for both versions. Moreover, alongside the manipulation sentences, both articles included the same general information regarding drones, which could have created roughly the same picture of drones in the mind of subjects, relating drones to more negative traits than positive. Future studies can avert this by increasing the differences in each version of the article.

Additionally, the subjects might have been prone to bias as they were introduced to the survey with a text mentioning the applications of drones in the current battle against the

COVID19 virus. This might have impacted and biased the attitude of the respondents beforehand, by means of generating more positive bias towards drones as people perceive it crucial to fight COVID19. In order to in the first place prevent a bias from occurring, but also to capture whether a bias has truly effected the results, future research should keep into account to integrate as much as possible background variables into the actual questionnaire design, wherefore statistical measurements can be done to draw statistically supported conclusions.

Furthermore, the order of inferences in the message processing process might have mitigated the results. As Leong et al., (2017) found that the order in which information occurs can affect the attribute framing effect. In this case, the article contained more negative information and the first paragraph concluded with "Some people are scared of them (drones) and do not want to appear in the data because they are not able to give their consent", which could have impacted that people recall this information more than for example, the positive information in the positive frame.

Although there was no interaction found between framing, outcome-relevant involvement and privacy concerns, it is nevertheless worth noting that the negative frame had a tendency to generate more privacy concerns. This can be indicated as the mean score for the negative frame ($M = 12.04, SD = 4.67$) was slightly higher than for the positive frame ($M = 11.71, SD = 4.45$). Figure 1 in appendix B displays this tendency clearer by means of a graph, as the negative frame is constantly above the positive frame regarding privacy concerns. Whereas the difference was not found to be significant in the current sample, it could be that when working with a more homogenous probability sample, the differences might appear to be larger and potentially end up significant in future research.

Finally, an ANCOVA controlling for the effect of expertise was insignificant, Hence H4 "*Privacy concerns of people with technological expertise are less influenced by the framing effect than people without technological expertise.*" is not confirmed. This is inconsistent with the research by Biek et al. (1996) that knowledgeable people evaluate information in the message critically and are less effected by the framing effect. An explanation for this could be that the participants had to self-evaluate whether their background was related to technology or science, which could generate subjective results. Moreover, that one's education or profession is not related to technology or science, does not mean that a person cannot have any other relevant knowledge regarding technology. Future research can take this into account by measuring

technological knowledge more objectively and be more specific about the aim to measure prior knowledge.

To conclude, the study is valuable to the field of new technologies in general, and that of drones in specific as literature on the public acceptance of drones appears to be scarce, and as new technologies keep emerging research is needed to stay up to date with new enhancements. Thus, this study can find its academic relevance by building on the existing models of technology and message acceptance by applying it on more recent and innovative technologies rather than the old technologies in prior research. Practical implementations for the study can be based on the findings of the effect of outcome-relevant involvement on privacy concerns. When promoting new technologies that are prone to evoke privacy concerns, the promoters can target each involvement group separately and adjust messages and advertisements based on the outcome-relevant involvement degrees of the target group. For example, for target groups with high outcome-relevant involved individuals the message should be formulated in terms of reducing privacy concerns, whereas for individuals with low outcome-relevant involvement regarding privacy it is not as important to focus on the effects of privacy concerns related to new technologies. These insights can be useful in the field of promoting new technologies as the study reveals factors evoking privacy concerns.

Limitations

To save time, the choice was made for a manipulation check embedded in the survey instead of a pre-test. One major drawback of this approach was that afterwards the framing manipulation effect was found to be insignificant, meaning that participants could not distinguish whether the message was formulated positively or negatively. Due to this unanticipated finding it could not be excluded if this was the only reason why the framing effect did not occur.

Another limitation to the study is that the survey was distributed to a relatively broad sample through simple sampling, with the only restriction and selection criteria being the millennium age. Future research can hinder this limitation of effecting the results, by incorporating more criteria for a narrower selection of a certain sample population. In addition, future research could focus on comparing different populations with that of millennials, in order to examine whether millennials are truly more acceptant towards new technologies than other populations might be.

Additionally, a limitation could be that the ELM model with the variables framing and

outcome-relevant was developed for the purpose of changing existing attitudes, As the majority of the respondents (62.2%) indicated to be unfamiliar with technology and science, one could argue that the topic of drones was rather obscure and complex, suggesting that the message was contributing more to attitude formation rather than changing an already existing attitude. Hence, another limitation to this study could be that the topic was simply too unknown to the audience to draw conclusions from the article. This is in line with the findings of Clothier et al. (2015), as they also found that in their study the Australian public was yet to be familiarized with the topic. This means that for a study with the different nationalities mainly being in Europe, similar results were found, adding to the generalizability of the theory and insights of Clothier et al. (2015).

Finally, the order of the survey parts can form a possible limitation for the manipulation test being insignificant. The two manipulation items were embedded in part 3 of the survey, asking questions about the text of part 1 of the survey, which was not visible any longer. It could be that participants could not recall the tone and main characteristics of the text anymore, and hence answered the manipulation check items incorrectly. This could mean that the study was impacted in terms of validity of the manipulation check, and that there could be other factors affecting the fact that the framing effect did not occur, besides the assumption that it is due to the insignificance of the manipulation check.

Altogether, judging from the results of this research it can be concluded that the aim of this study to determine the effect of framing and outcome-relevant involvement on privacy concerns is partly fulfilled. As on one hand the study did not find a significant framing effect due to insignificance of a manipulation intention, no conclusions can be drawn on a framing effect. However, the study did offer insights on the fact that the degree of outcome-relevant involvement affects individuals' privacy concerns regarding drones.

Appendices

Appendix A. Experimental Survey

Dear participant,

Thank you for taking part in this survey. We would like to inform you that your data is processed confidentially and anonymously. Further, you can quit the survey at any time. Please fill out the survey individually.

By clicking yes, I agree to the given terms above.

Part 1: News Article with manipulated sentence

Drones: "Drones are small unmanned aircraft capable of delivering packages and taking photos"
(Rule, 2015)

Positively framed message

Data collection by drones

April, 2020.

Over the years, the usage of drones has increased around the world. The development of drones started with large drones for military purpose. Nowadays, drones are equipped with a variety of sensors, for example cameras and heat sensors that collect and store data.

This data is used in many different fields; for instance, private photos or videos but also official surveillance by the police or government. Some people are scared of them and do not want to appear in the data because they are not able to give their informed consent.^[1]



Drone in the sky. Photo by Freepik.

The degree to which drones collect data with informed consent varies according to the field and purpose for which they are used. Experts agree that a significant amount of data by drones is likely to be collected with informed consent. The latest studies have shown that informed consent for the storage of data collected by drones is obtained in about 85% of cases. Some drones can transfer the data in real time or near real time, while others collect the data and store it for later analyses.

...

^[1] Informed consent: "Agreement or permission to do something from someone who has been given full information about the possible effects or results" (Cambridge Dictionary, 2020).

Negatively Framed Message

Data collection by drones

April, 2020.

Over the years, the usage of drones has increased around the world. The development of drones started with large drones for military purpose. Nowadays, drones are equipped with a variety of sensors, for example cameras and heat sensors that collect and store data.

This data is used in many different fields; for instance, private photos or videos but also official surveillance by the police or government. Some people are scared of them and do not want to appear in the data because they are not able to give their informed consent.^[1]



Drone in the sky. Photo by Freepik.

The degree to which drones collect data with informed consent varies according to the field and purpose for which they are used. Experts agree that a minor amount of data by drones is likely to be collected without informed consent. The latest studies have shown that informed consent for the storage of data collected by drones is obtained in about 15% of cases. Some drones can transfer the data in real time, while others collect the data and store it for later analyses.

...

^[1] Informed consent: "Agreement or permission to do something from someone who has been given full information about the possible effects or results" (Cambridge Dictionary, 2020).

Part 2: Privacy Concerns

I am concerned that the information that is collected by the drones could be misused.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I am concerned that others can find private information about me due to drone surveillance.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I am concerned that the drones could save personal information about me, because of what others might do with it.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I am concerned that the drones could save personal information about me, because it could be used in a way I did not foresee.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

**Derived and adjusted from: Xu, H., Dinev, T., Smith, J., Hart, P. (2011). Information Privacy Concerns: Linking Individual Perceptions with Institutional Privacy Assurances. Journal of the Association for information Systems. 12(12), pp. 798-824.*

Part 3: Manipulation Check

Do you think the tone of the text was positive or negative?

Extremely Positive 1 2 3 4 5 6 7 Extremely Negative

Do you think the text focused on the benefits of drones?

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

Part 4: Outcome-involvement

Whether or not governments impose privacy regulations has little impact on my life.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

My life would be changed if privacy regulations were eliminated by the government.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Changes in laws for or against privacy regulations will have little effect on me.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

My life would be changed if privacy concerns were eliminated throughout the states.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

It is easy for me to think of ways in which privacy regulations may affect my life.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

My life would not change much if privacy regulations were adopted by the government.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

It is difficult for me to think of ways privacy regulations impact my life.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

All in all, the effect of changes in privacy regulations on my life would be little.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

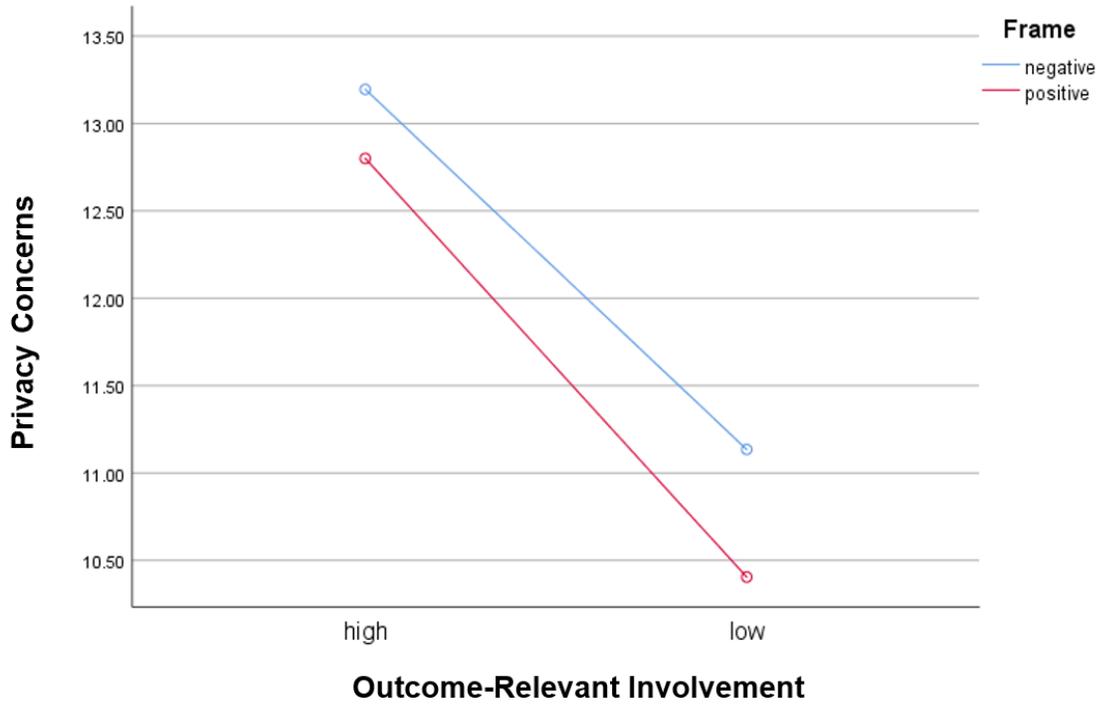
**Derived and adjusted from: Cho, H. & Boster, F. J. (2005). Development and validation of value-, outcome-, and impression-relevant involvement scales. Communication research, 32 (2), 235-264.*

Part 5: Demographic questions

- What is your gender? Male Female
- What is your age?
- What is your occupation? Work: Student
- What is your nationality?
- Is your education or profession related to the field of technology and science? Yes/No

Appendix B. Figure 1

Figure 1. Tendency towards an interaction effect of framing, outcome-relevant involvement and privacy concerns.



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