# Is Smart City Enschede Ready for the Use of Safety and Security Drones?

Master thesis Psychology: Conflict, Risk and Safety

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## Abstract

This research examines the public acceptance regarding the use of drones by the municipality of Enschede. Using six virtual reality environments combined with a questionnaire, the authors examined 120 participants. The participants were assigned to a virtual reality context (Event, Business park or Park) and either received transparent information, for example about why and how drones are used and information about privacy from the municipality of Enschede, or participants received a neutral message, consisting of irrelevant information. Compared to an Event, participants indicated to accept drones less in a business park and least in a park. Further analyses showed higher transparency beliefs about the organization (in this case: municipality of Enschede) led to higher trust, perceived control, and acceptance of drones by the organization. Additionally, a notable finding is that participants indicated to think drones are useful, but they were not satisfied with the use of safety and security drones. Further, participants were most interested in information about 'why' drones are used, especially in the contexts Business park and Park. One of the recommendations is that organisations who are implementing drones should take into account the context in which the drone will be used when communicating to the public, because the public has different information needs in different contexts. Further recommendations will be discussed.


## Introduction

Several cases are known in which civilians are fed up with the use of drones and therefore they shot down drones using an airgun. These people clarified to the press the drones were flying in their private properties and therefore their privacy was being violated. A boy, 19 years old, who also shot down a drone, stated he felt spied upon, and therefore decided to use his airgun(Witteman, 2017).

Although these civilians had trouble accepting the use of drones, the will of governments to use drones for safety and security applications is growing: on January 10th, 2017 the mayor of Enschede, van Veldhuizen, stated the municipality of Enschede wants to be the first in the Netherlands to get a drone regulation. Among other things, this would mean drones could be used to improve detection and prevention of crime and improve future assessments and management of situations (Rahman, 2016). However, diverse and varied criticism from a number of different quarters have been raised (e.g. from people posting on social media; columnists in newspapers to scientists in publications and politicians in their statements). Whereas proponents mainly see the positive impact on safety and security issues in society, opponents or critics have raised their concerns about feelings of fear and concerns about effects with respect to privacy.

In the field of drones little systematic research has been done about the public acceptance and underlying psychological mechanisms. However, other areas provide knowledge about acceptance of new systems and their underlying concepts, such as transparency, trust and perceived control. In the current study this knowledge will be used and built upon.

In this study a contribution will be made to the understanding of whether and when people accept government's use of drones. The specific focus here is examining different situations in which drones are used and within these situations different information-disclosing strategies will be explored. As will be argued in the following, it is expected that a transparent information-disclosing strategy, in which information about why and how drones are used, by who etcetera, will lead to more acceptance, especially in situations in which the presence of a drone is perceived as logic or understandable. So the main question this study will focus on is:

*How does acceptance of government's drones vary with context and what information disclosure strategy contributes to the acceptance of government's use of drones?*

## Theoretical Framework

**Positive and negative effects of government's use of drones**. First some possible positive and negative effects of government's use of drones will be discussed, starting with positive effects. First of all, drones could be cheap surveillance tools, which could save the country money. They could for instance replace or help security personnel. Furthermore, drones could make it more likely to detect or prevent crime, collect and process more data in a better way, improve future assessments and management of situations, and they could assist safety and security employees (Rahman, 2016). An example of these positive effects is the use of drones by firefighters: these drones are equipped with cameras and sensors that are able to collect information about possible toxic substances in the air. Live video footage and information about the air can be sent to the firefighters so they can be prepared better.

In contrast to these positive effects, Rahman (2016) provides negative effects as well. Drones could cause fear of being followed, because drones are capable of discreet and mobile surveillance. Second, drones could raise fear of mass surveillance, because they could cover a greater scope in an area. Third, drones could cause concerns over abuse or misuse of footage, because drones could be perceived as 'hidden humans', which means, people know somebody is controlling the drone but this person in unknown. Lastly, drones could be perceived as faceless extensions of police officers, therefore people could feel a more impersonal and distant relationship with the police and community (Rahman, 2016).

In addition, Custers (2016) listed eight negative effects with respect to privacy, of which three will be explained in short, because these are most at stake when drones are being used by the government: The Chilling effect, Function creep and Privacy of location and space. The chilling effect is a term used to describe people being more self-conscious and less free-wheeling when they know they are being watched by authorities (Zheng, 2016). Function creep refers to governments using drones in the first place for accepted purposes, like during tracing a missing person, but quickly drones will be used for more controversial purposes, such as mass surveillance (Stanley & Crump, 2011). Privacy of location and space refers to the right that a person should not be identified or monitored when moving in public, semi-public or private places (Finn, Wright, & Friedewald, 2013).

**Context.** Drones have multiple applications and therefore could be applied in different contexts, among others things, in the field of military, surveillance, public safety and security, and mapping (Odido & Madara, 2013). When it comes to implementing drones in the municipality of Enschede, the latter three will be most important. Examples of possible context in which drones could be used are a park (mapping; surveillance), an event (public safety and security; surveillance) and a business park (public safety and security). These three contexts (Park, Event and Business park) will therefore be used in the current research.

These different contexts are expected to require different implementation techniques (Introna & Nissenbaum, 2010), because people hold certain expectations about different contexts. A new system, such as a drone, implemented in the wrong way could violate reasonable expectations, which could lead to people being less willing to accept the new system. One could imagine a drone could be interpreted differently when seen in a park than seen during a festival. The next two paragraphs provides an explanation for this difference.

To predict which expectations people will hold about different contexts, literature on Closed Circuit Television (CCTV) is used. Taylor (2010) found people to feel less safe when filmed in private environments than in public places. Findings showed that people even tend to behave more negatively when filmed, because they see the presence of a CCTV in a public place as a sign of distrust. People may think that they are filmed because they would show unacceptable behaviors and because of that, they are likely to actually express more unacceptable behaviors, because of the so called *self-fulfilling prophecy* (Taylor, 2010).

Similarly, in another research Taylor (2011) found individuals who gave 'logic reasons', for the presence of a CCTV (*"The CCTV is there to prevent crime",* p. 309), to not have a problem with its presence, while individuals who gave 'illogical reasons' for the presence of a CCTV demonstrated more negative affect about the camera presence ("*someone could be watching you whenever they want (…) It's like being followed and you don't know. You think you're alone and you're not. It's weird!"*, p. 308).

The preceding paragraphs can be linked together: the context 'park' could be perceived as a more private context than the other two: event and business park. Further, people could be able to come up with more logical reasons for drones at events and business parks, while that would be less so in the more private context, such as a park. Therefore, the context in which a drone is being used could result in differences in acceptance rate, in other words: the public could be more willing to accept drones during an event than in a park, because an event is a public place while a park is a more private place and the public could be able to come up with more logic reasons for drone presence during an event than in a park. Thus, this evidence suggests that individuals in the context 'park' would be less willing to accept government's use of drones, while individuals in the contexts 'event' and 'business park' would be more willing to accept government's use of drones (hypothesis 1).

Information-disclosure strategy. In addition to different contexts, the information-disclosure strategy of the government is also believed to be a factor in the process of accepting government's drones. Because, as mentioned above, the implementation process of new systems could be determinative regarding public acceptance of a new system (Introna & Nissenbaum, 2010). A large body of research exists concerning the acceptance of new systems, the overall findings suggest acceptance can be achieved via a pathway of transparency, followed by trust and a pathway of transparency, followed by perceived control. In the next subparagraphs these two pathways will be explained further, followed by practical recommendations for implementing transparency and for achieving higher levels of trust and perceived control.

Transparency. Transparency is believed to be an underlying factor in this process of acceptance, because it could (re)establish trust in organisations (e.g. Bennis, Goleman, & O'Toole, 2008; Fombrun & Rindova, 2000; Jahansoozi, 2006; Tapscott & Ticoll, 2003; Walumbwa, Avolio, Gardner, Wernsing, & Peterson, 2008) and it could evoke a sense of perceived control (Baronas & Louis, 1988). First the concept transparency will be discussed, followed by its influence on trust and perceived control. Transparency is considered to consist of three underlying concepts: disclosure, clarity and accuracy. *Disclosure* is defined as the perception that relevant information is received in a timely manner (e.g., Bloomfield & O'Hara, 1999; Clark Williams, 2008). This implies that information should be shared in an open manner and well-timed. *Clarity* is defined as the perceived level of lucidity and comprehensibility of information received from a sender (Schnackenberg & Tomlinson, 2006). Information should be presented more clearly by organizations for it to be transparent (Winkler, 2000). *Accuracy* is defined as the perception that information is correct to the extent possible given the relationship between sender and receiver (Schnackenberg & Tomlinson, 2006). Walumbwa et al. (2008) stress the importance of accuracy, because information cannot be seen as transparent when it is purposefully biased or unfoundedly contrived. Communication that includes these three concepts is believed to be transparent and to (re)establish trust in the organisation that is the sender of the communication.

Trust. Trust, in turn, plays a major role in overcoming risk perceptions and in the acceptance of new technologies (e.g., Gefen, Karahanna, & Straub, 2003; Pavlou & Geven, 2004). In the field of implementing new systems there are two kinds of trust at stake: organisational trust, which is the amount of trust in the organisation, and system trust, the amount of trust in the new system. However, according to Li, Hess and Valachich (2008) the latter does not seem to be important. In their research about trust in new information systems, the subjects were not concerned about the new technology itself, but in particular about how the organisation (government) would design and use

such a system. In other words, organisational trust seems to be more important than system trust when implementing a new system.

Trustworthiness of an organisation is conceptualized in three dimensions: *goodwill (or: benevolence), integrity,* and *competence* (Mayer, Davis, & Schoorman, 1995). Goodwill refers to "*the extent to which a trustee is believed to want to do good to the trustor, aside from an egocentric profit motive"* (Mayer et al., 1995, p. 718). Integrity refers to "*the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable"* (Mayer et al., 1995, p. 719). Competence refers to "*the group of skills, competencies, and characteristics that enable a party to have influence within some specific domain*" (Mayer et al., 1995, p. 717). Thus, when the public is convinced of the goodwill, integrity and competence of an organisation, it will trust the organisation and therefore the public would be more willing the accept the implementation of a new system by the organisation (in this study: the implementation of drones by the government).

Perceived control. Besides trust, transparent information-disclosure could also have a positive impact on acceptance of a new system via perceived control. In the following, this process will be explained step-by-step.

Transparent information from the organisation, for example about the course of implementation and by addressing possible concerns about the impact of the new system, leads to what is called 'user involvement' (Baronas & Louis, 1988). User involvement, in turn, is predicted to increase the acceptance of new systems because it develops realistic expectations about the system (Gibson, 1977), it provides an area for bargaining and conflict resolution about design issues (Keen, 1981), it leads to system ownership by users (Robey & Farrow, 1982) and it decreases resistance to change (Lucas, 1974).

Furthermore, user involvement increases a sense of control, which means that people have the feeling they could influence or predict the situations they are in. Baronas and Louis (1988) found in their research about system implementation that a sense of control was increased when users were more involved: the treatment group members were more satisfied with the implementation of a new system than control group members were and treatment group members preferred the new system over the old system, while the reverse applied for the control group. The treatment group received a modified implementation process, designed to increase the perceived sense of control, while the control group received an unmodified implementation process. So, this means that an increased sense of control (through user involvement) leads to higher acceptance of a new system.

In addition, another research field provides useful results about the same issue: a field study was done to examine effects of various operations of personal control on reactions to stress (Mills & Krantz, 1979). In their study, blood donors were provided with accurate information and they could choose the arm to be used while donating blood while other blood donors did not receive information or a choice. Results revealed moderate levels of choice and information are optimal for coping with stress, probably because the donors experienced higher levels of control over the situation when they received some information and choice.

In the current study the results and evidence of the previous three paragraphs will be focused on the current topic: the use of drones by the municipality of Enschede. In the current study an increased level of perceived control is being pursued by giving participants in the experimental conditions a smartphone. This smartphone provides the respondents with the choice to look for information. Furthermore, the respondents are able to click on several menus, so they have the option to look for the information they think is most interesting.

Thus, transparent information-disclosing strategies of the government will lead to individuals being more willing to accept government's use of drones, due to higher levels of trust in the organisation and perceived control, compared to individuals who did not receive transparent information (hypothesis 2).

Information-disclosure recommendations. Existing literature on related topics provide recommendations about different kinds of information-disclosure strategies. The following subparagraph provides the most befitting.

First of all, Kitchin (2014) emphasizes the importance of attention in communication about feelings of privacy, data collection and data analysis to evoke positive feelings about the new system. Similarly, research on the use of CCTV shows the presence of CCTV's could evoke positive feelings, provided that the goal of it is clear and when people have a positive imagine of the authority responsible for placing the CCTV (Taylor, 2010; Van der Sar, Mulder, & Choenni, 2011). Additionally, Li et al. (2008) suggest to provide transparent information about key stakeholders and the decision making process and the constructs 'competence', 'benevolence', and 'integrity' of the organisation should be implemented in the information for the public. Lastly, Rahman (2016) specifically provided recommendations about the implementation of drones: messages should include benefits, trade-offs and safeguards, further, the public's concerns and feedback should be incorporated. In addition it is important to establish or build relationships between government and citizens, therefore the public should be convinced that drones will be used as tools to solve or ensure security, in good faith, instead of misconceiving drones as 'big brother in the sky' (Rahman, 2016).

Based on the information provided in this section a conceptual model has been developed, see figure 1.

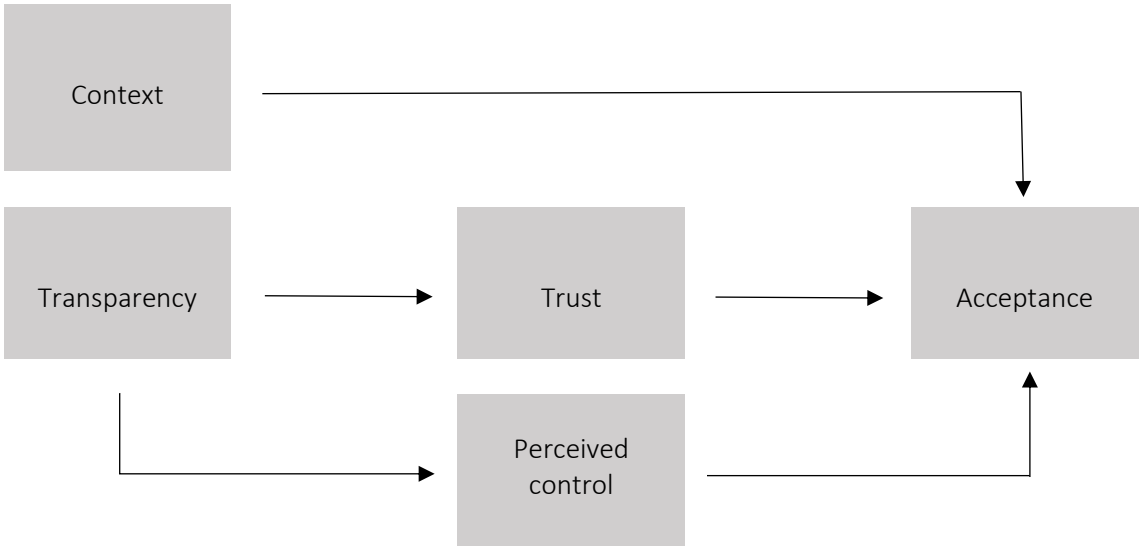


*Figure 1: Conceptual model with 'Acceptance' as dependent variable, 'Transparency' and 'Context' as independent variables and 'Trust' and 'Perceived control' as mediators.*

## The Current Study

Based on the theoretical framework the following hypotheses are postulated:

H1: Individuals in the context 'park' would be less willing to accept government's use of drones, while individuals in the contexts 'event' and 'business park' would be more willing to accept government's use of drones, because a park could be perceived as a more private context, while an event and business park could be perceived as more public spaces and because people could be able to come up with more logical reasons for drone presence in the contexts event and business park compared to the context park.

H2: Transparent information-disclosing strategies of the government will lead to individuals being more willing to accept government's use of drones, due to higher levels of trust in the organisation and perceived control, compared to individuals who did not receive transparent information.

In addition, an explorative question is postulated: *What information are people most interested in concerning the implementation of drones by organisations?*

The hypotheses were tested in an experimental study. More precisely, participants were randomly placed in one of six virtual reality environment conditions. These conditions are represented in figure 2. Thus, in total there will be three contexts (Event, Business park and Park) in which respondents could either receive an app in which the organisation uses a transparent information-disclosure strategy (treatment group) or in which the respondents receives a neutral message (control group). The explorative question will be answered using data from the treatment group. This group, that receives the app with information, has the option to choose what information they want to read about the use of drones by the municipality of Enschede.

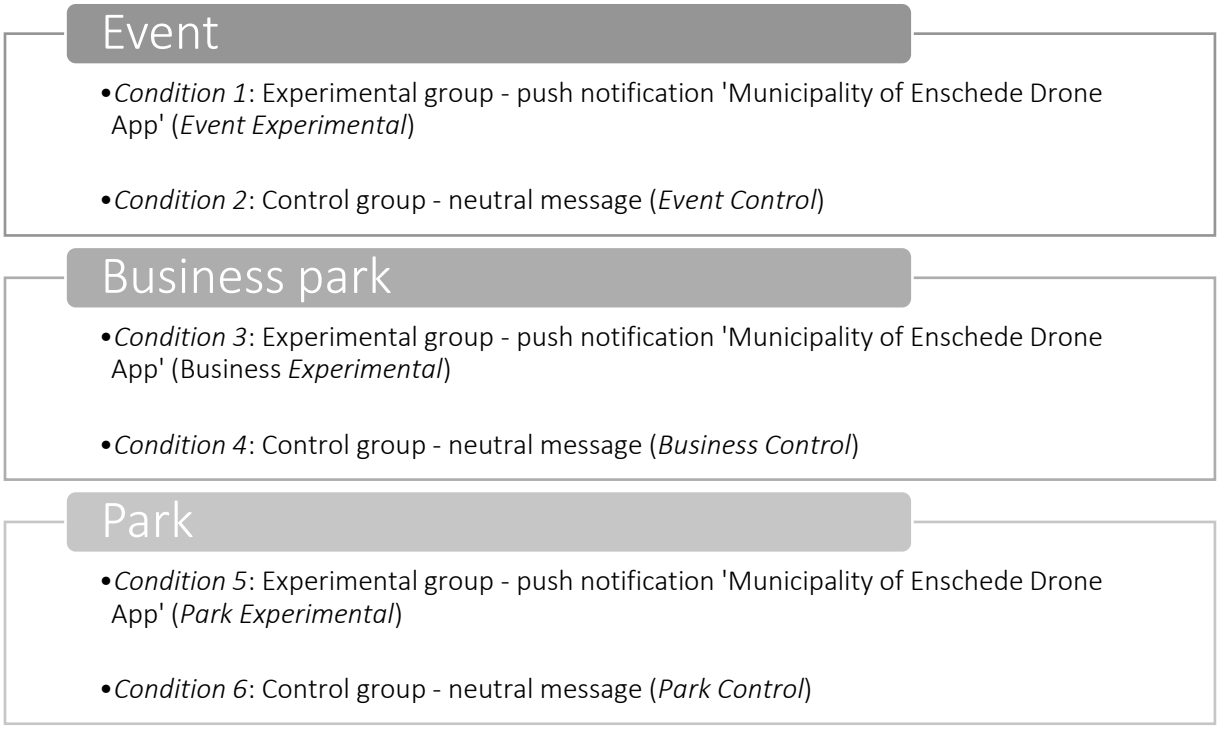


*Figure 2: Conditions in virtual reality environment.*

## Method

### Participants and Design

120 particpants (69 F, 51 M, $M_{age}$ = 24.30, *SD* = 6.58, range = 19 - 61 y) participated in this study. 21.67% of the participants received partial course credit in exchange, because they were recruited through 'Sona', the others were recruited through convenience sampling. 66.67% (*N* = 80) of the participants were inhabitants of the municipality of Enschede, 9,17% (*N* = 11) lived in Germany and the others (24.17%, *N* = 29) lived in other cities in The Netherlands. The distribution of highest completed levels of education was: 2,5% (*N* = 3) intermediate vocational education; 43,3% (*N* = 52) secondary education, 13,3% (*N* = 16) had a bachelor's degree, 31,7% (*N* = 38) had a master's degree; and 9,2% (*N* = 11) had a doctoral degree. The participants were randomly assigned to distributed across the cells of a 2 (Transparency: yes versus no) * 3 (Context: Event versus Business park versus Park) between-participants design with acceptance as dependent variable. Inclusion criteria were: living in, or visiting Enschede on a regular basis (at least once a year) and eighteen years or older. Everybody who started the study also finished it, thus there was a response rate of 100%.

## Procedure

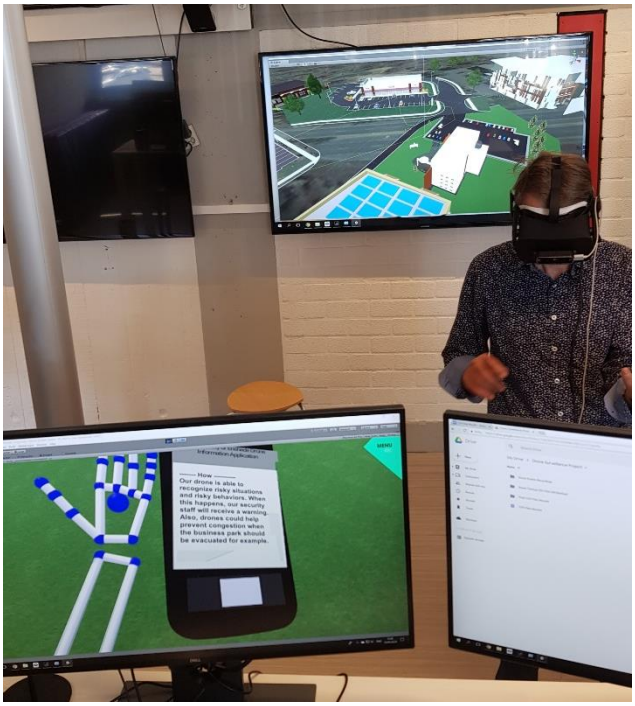

*Figure 3: A participant in the virtual reality environment Business park.*

First of all, participants received an introductory text about the experiment, but the aim was not entirely told, because this could have had influenced the outcomes. Besides, participants were given some information about the study (voluntary participation, duration, anonymity). Participants could than agree to the informed consent. Afterwards, participants were assigned to one of six virtual environments. Depending on the environment they were assigned to, the participants received some practical information (for instance: how to use their smartphone). In virtual reality participants could take a look at their smartphone, depending on the condition participants received different information. Appendix B gives an overview of the information the respondents received in the experimental conditions and Appendix C shows the neutral message for the control conditions. The respondents were exposed to different stimuli during their stay in virtual reality, appendix D consists of the timeline and stimuli. In the following, the procedures of the experimental conditions will be described, followed by the control conditions.

*Experimental groups.* Participants assigned to the experimental groups were placed in a virtual environment in which it seemed the participants were at an event (Event Experimental), at a business park (Business Experimental) or in a park (Park Experimental). After a while they were presented a push notification of the 'Municipality of Enschede Drone App'. This app held information that was supposed to enhance transparency perceptions (an excerpt from this information was: '*Maybe you wonder why the municipality of Enschede uses drones during festivals. We do this to make festivals a nice and safe place for everyone.'*) and perceived control (an excerpt from this information was: '*The sensors of the drones are capable of recognizing certain behaviors, which could end up in unrest. When our drone recognizes such behaviors, our security staff will receive a warning, which they can act upon.').* Users could decide for themselves which information they wanted to read, because they had the possibility to click on options in a menu (*Who, Why, How, Privacy, Images/map, and Feedback*). Log data was collected from the clicking behavior of the participants. After a while the app disappeared, thereafter a drone appeared in the sky and flew by. After, the experiment was over. Figure 3 shows a participant while being in virtual reality, at that moment he is reading the menu 'How'.

*Control groups.* Similarly, participants assigned to the control groups were placed in the same virtual reality environments (festival, business park, park). These participants, on the other hand, did not receive a push notification of the 'Municipality of Enschede Drone App', but they received a push notification which included a neutral message (an excerpt from this message was: *'Hi! How are you doing today? Did you already take a look around you, to see in what environment you are?'*). After a while, this message disappeared and the same drone as ascribed above appeared in the sky and flew by. After, the experiment was over.

After, both participants from the experimental groups and the control groups received the questionnaire described under section Measures. Finally, after completing the questionnaire,

participants received a debriefing, describing the entire goal of the study and the reasons for not disclosing the true purpose in the beginning. De debriefing also included an explanation for measuring the different constructs and contact details of the researcher.

Materials. The experiment partly was conducted in a virtual reality environment. To create this environment, 3 locations (event, business park, park) were created in 3D. 3D characters from reallusion were built in with Iclone7 and character creator 2. This was made possible by the DesignLab of the University of Twente. Furthermore, during the experiment participants wore the oculus CV1. Figure 4, 5 and 6 respectively show the Event, Business park and Park in the virtual reality environment. Figure 7, 8 and 9 respectively show the neutral text message, which the respondents in the control group receive, the main menu, which the respondents in the experimental groups see on their virtual phone and the menu 'How'.


*Figure 4: Event environment with the drone in the air.*


*Figure 5: Business park environment with drone in the air.*


*Figure 6: Park environment with drone in the air.*

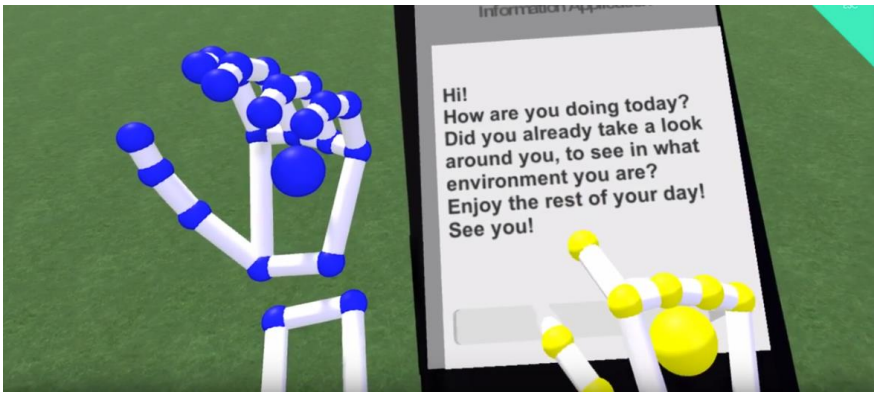


*Figure 7: Participant is reading the neutral message.*

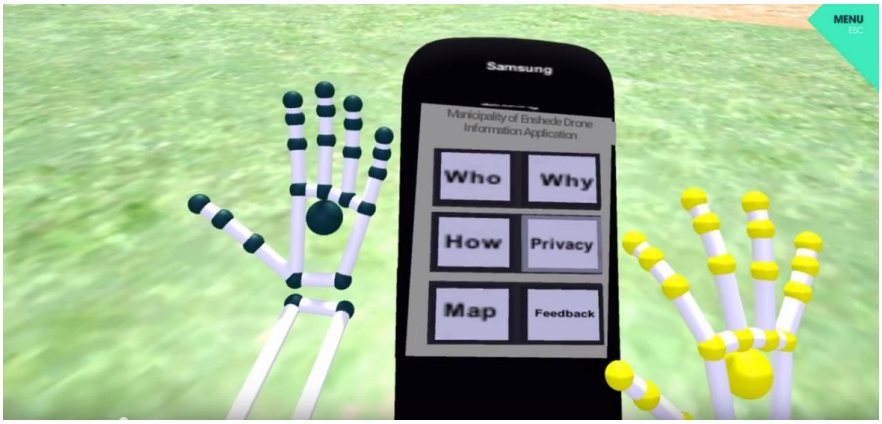


*Figure 8: Participant is in the main menu of the app with transparent information about the use of drones by the municipality of Enschede.*

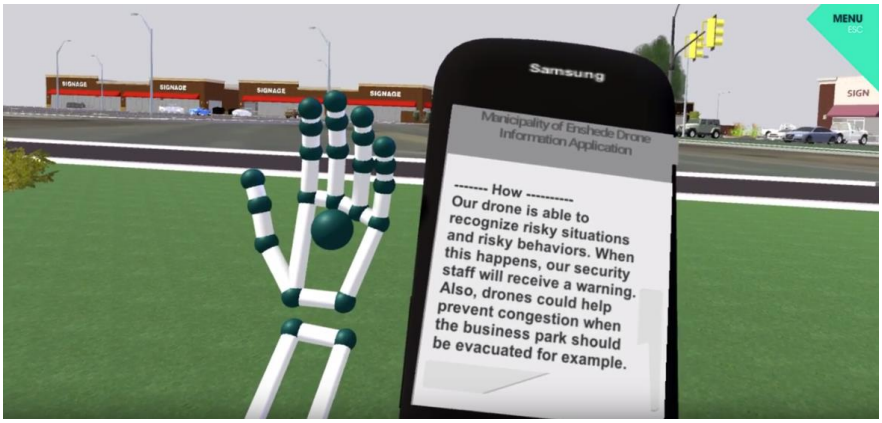


*Figure 9: Participant is reading the text 'How' in the application.*

Measures. The questionnaire existed of four separate measures (Transparency; Trust; Perceived Control; Acceptance), five questions about demographic data (age; gender; level of education; residence; frequency of visiting Enschede) and six statements as manipulation checks for the different contexts. Appendix E consists of the questionnaire. The measures will be described in the following.

*Transparency.* The level of Transparency, perceived by the participant about the organisation (in this case: Municipality of Enschede), was measured using a 7-point Likert scale (ranging from 1 = *strongly disagree* to 7 = *strongly agree*), using items from Rawlings (2008). Participants rated their level of agreement on four items such as "*The municipality of Enschede wants to understand how its decisions affect people like me"*. In the present study, Cronbach's alpha was .69 and Guttman's

Lambda 2 was .70.

*Trust.* To determine the participant's level of Trust in the organisation thirteen items from Rawlings (2008) were used, using a 7-point Likert scale (ranging from 1 = *strongly disagree* to 7 = *strongly agree*). A distinction was made between the three dimensions of trust (goodwill, integrity and competence) and overall trust. Goodwill was measured through three items such as "*I believe the municipality of Enschede takes the opinions of people like me into account when making decisions*". Integrity was measured through four items such as "*The municipality of Enschede treats people like me fairly and justly*". Competence was measured through three items such as "*I feel very confident about the skills of the municipality of Enschede*". Overall trust was measured through three items such as "*I trust the municipality of Enschede to take care of people like me*". ($\alpha$ = .87 and $\lambda_2$ = .88).

*Perceived control*. The participants' level of Perceived control was measured with five items, based on items from Ouwehand, De Ridder and Bensing (2006), on a 10-point Likert scale (ranging from 1 = *Not at all* to 10 = *A great deal*). A sample item is "*To what extent did you feel you could predict the situation?"*. ($\alpha$ = .74 and $\lambda_2$ = .75).

*Acceptance.* The Acceptance Scale (Van der Laan, Heino, & De Waard, 1997) was slightly adjusted and used to measure to what extent participants accepted government's use of drones, using nine Likert items. A sample item is "*My judgements of the drone of the municipality of Enschede is are…: Pleasant □□□□□□□ Unpleasant"* ($\alpha$ = .86 and $\lambda_2$ = .88). The nine items can be divided into two subscales: the Usefulness scale ($\alpha$ = .76 and $\lambda_2$ = .80) and the Satisfaction scale ($\alpha$ = .85 and $\lambda_2$ = .86).

## Results

Table 1 shows the means, standard deviations and correlations between the variables and age and gender.

To test whether Context had a significant effect on Acceptance (hypothesis 1) and whether transparent information disclosure had a significant effect on the amount of Trust in the organisation, Perceived control and Acceptance (hypothesis 2) a Multivariate Anova was conducted, with Context and Transparency as independent variables and Trust, Perceived control and Acceptance as dependent variables. The results showed non-significant main effects of Context, Wilks' Lambda = .96, $F$ (6, 224) = 0.83, *ns*. and Transparency, Wilks' Lambda = .99, $F$ (3, 112) = 0.40, *ns*. Also, no significant interaction effect was found between Context and Transparency, Wilks' Lambda = .94, $F$ (6, 224) = 1.17, *ns.* Therefore, no support was found for hypothesis 1 and 2.

*Table 1: Means (M), Standard Deviations (SD) and Correlation between the Variables[a], Age and Gender.*

| Variables | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Context | 2.00 | 0.82 | | | | | | | | | | | | | | | | |
| 2. Transparency | 0.50 | 0.50 | 0.00 | | | | | | | | | | | | | | | |
| 3. Transparency_ construct | 4.92 | 0.83 | -.07 | .07 | | | | | | | | | | | | | | |
| 4. Trust | 4.72 | 0.64 | -.16 | -.09 | .59** | | | | | | | | | | | | | |
| 5. Perceived control | 3.12 | 1.60 | .05 | .01 | .32** | .25** | | | | | | | | | | | | |
| 6. Acceptance | 4.35 | 0.84 | -.12 | -.03 | .31** | .46** | .39** | | | | | | | | | | | |
| 7. Who | 17.5 | 9.84 | -.21 | .[b] | .12 | .04 | .02 | .29 | | | | | | | | | | |
| 8. Why | 23.58 | 12.12 | -.18 | .[b] | -.07 | -.01 | -.10 | .02 | .19 | | | | | | | | | |
| 9. How | 14.11 | 7.04 | -.24 | .[b] | .29 | .15 | .17 | .14 | .20 | .59** | | | | | | | | |
| 10. Privacy | 20.96 | 10.67 | .48** | .[b] | -.00 | -.17 | -.20 | -.03 | -.53* | -.26 | -.65** | | | | | | | |
| 11. Map | 15.06 | 7.36 | -.22 | .[b] | -.13 | -.21 | -.04 | .20 | .40 | .26 | .18 | -.19 | | | | | | |
| 12. Feedback | 10.43 | 5.74 | -.11.06 | .[b] | -.55 | .12 | .19 | -.35 | .27 | .61 | .28 | -.73 | -.18 | | | | | |
| 13. Age | 24.30 | 6.58 | .12 | .15 | -.15 | -.25** | -.12 | .05 | .16 | -.03 | -.13 | -.13 | .21 | -.07 | | | | |
| 14. Gender | 1.58 | 0.50 | .10 | -.02 | -.21* | -.16 | -.08 | -.06 | .20 | .04 | .16 | .26 | -.23 | -.11* | -.08 | | | |
| 15. Education | 4.56 | 1.57 | .12 | .09 | -.00 | -.24** | -.07 | .00 | .02 | -.01 | -.03 | .14 | -.42 | -.22 | .08 | .13 | | |
| 16. Frequency of visits | 1.49 | 0.88 | .35** | -.16 | -.14 | -.21* | .13 | .12 | .17 | .31* | .12 | -.02 | .45* | .05 | .33** | .06 | .04 | |

**. $p < .01$, * $p < .05$; *. $p < .05$ Scale categories: (1-7)

[a]. $N = 120$

[b]. Cannot be computed because at least one of the variables is constant.

**Additional analyses**

To answer the explorative question ('*What information are people interested in concerning the implementation of drones by organisations?*'), log data from the participants who received the Municipality of Enschede Drone App was analysed. These participants were given a virtual smartphone on which they could search for information about the use of drones by the municipality of Enschede (i.e. Why drones are used and by Who). The 'clicking behavior' on the virtual smartphone of the participants was saved as log data. This data consists of time intervals of the menus participants clicked on and the order in which participants clicked on different menu buttons. Descriptive statistics about how many times all menus have been clicked on and the time spent in these menus are showed in table 2. This overview shows that the menu Why was clicked upon the most and the respondents also spent most time in this menu, followed by the menu Privacy. The menu Feedback was used least and least time was spent in this menu.

*Table 2: Descriptive statistics of the 'Enschede Drone App' categories.*

| Category\Descriptives | N | Minimum (time in s) | Maximum (time in s) | Mean (time in s) | Std. Deviation (time in s) | Sum (time in s) |
|---|---|---|---|---|---|---|
| Who | 33 | 3.08 | 40.84 | 17.52 | 9.84 | 578.22 |
| Why | 48 | 4.70 | 59.38 | 23.58 | 12.12 | 1131.58 |
| How | 34 | 2.13 | 31.47 | 14.11 | 7.04 | 479.83 |
| Privacy | 37 | 2.38 | 43.43 | 20.96 | 10.67 | 775.46 |
| Map | 20 | 0.27 | 27.69 | 15.06 | 7.36 | 301.16 |
| Feedback | 9 | 3.78 | 18.18 | 10.43 | 5.74 | 10.43 |

Table 3 shows how many times participants clicked on the six menus on their virtual smartphone, divided over the three contexts (Event, Business park and Park). In addition, percentages are mentioned, showing the part of the total clicks, for instance, in the Context Park, the participants clicked 18 times on the menu Why, which is almost one third (32.73%) of the total menu choices.

*Table 3: Descriptive statistics of the amount of times participants clicked on the categories per context.*

| Context\Category | Who [N, (%)] | Why [N, (%)] | How [N, (%)] | Privacy [N, (%)] | Map [N, (%)] | Feedback [N, (%)] | Total [N, (%)] |
|---|---|---|---|---|---|---|---|
| Event | 13 (20.97%) | 13 (20.97%) | 16 (25.81%) | 12 (19.35%) | 7 (11.29%) | 1 (1.61%) | 62 (100%) |
| Business Park | 12 (18.75%) | 17 (26.56%) | 11 (17.19%) | 11 (17.19%) | 8 (12.5%) | 5 (7.81%) | 64 (100%) |
| Park | 8 (14.55%) | 18 (32.73%) | 7 (12.73%) | 14 (25.45%) | 5 (9.09%) | 3 (5.45%) | 55 (100%) |

To answer the explorative question, an overview was made of the order in which respondents clicked on the six menus. Figure 10, 11 and 12 respectively show which menus have been clicked on during the first click, second click and third click, distinguishing between the three contexts. In other words: as can be seen in figure 7, most respondents in the context Event chose to read the menu Who first. In contrast, most respondents in the context Business park and Park chose to read the menu Why first. What is striking is that respondents in the context Park chose the menu Privacy more often during their first and second click compared to the other contexts. Also, during the third menu choice the menu How was clicked on more often than during the first and second click in all three contexts.

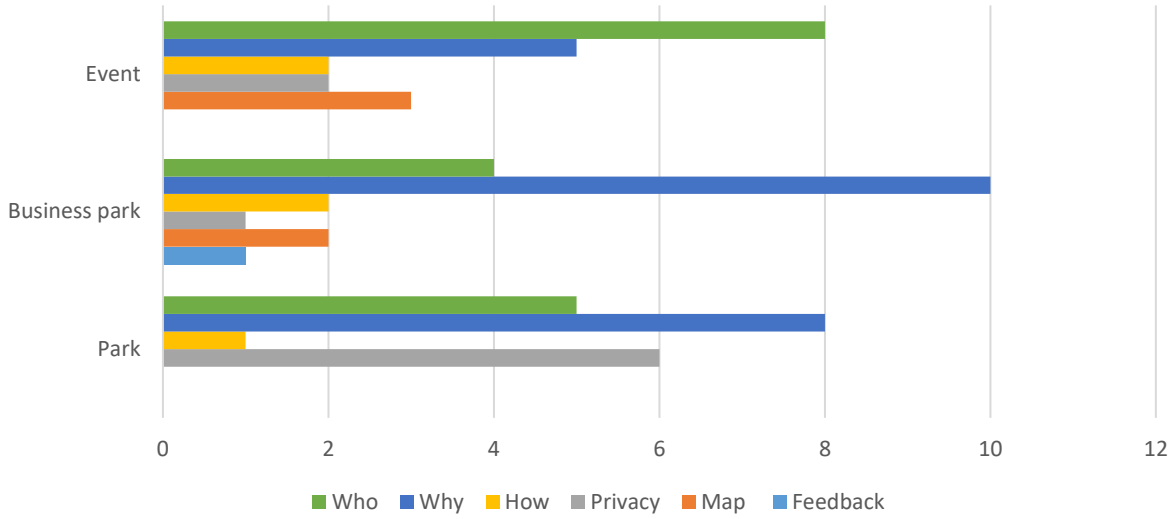


*Figure 10: The number of times respondents chose a menu during their 'first click' on their virtual smartphone.*

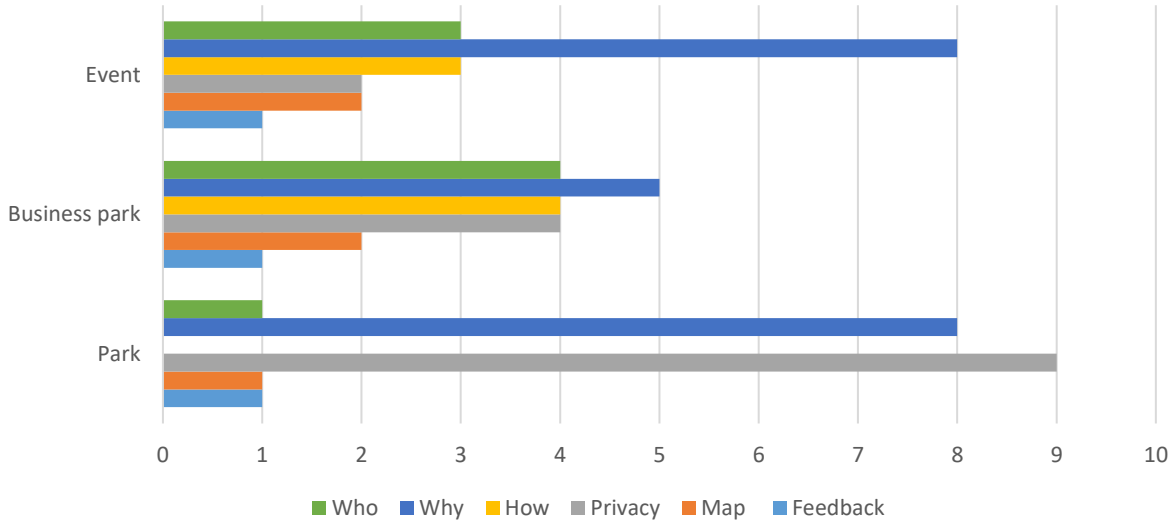


*Figure 11: The number of times respondents chose a menu during their 'second click' on their virtual smartphone.*

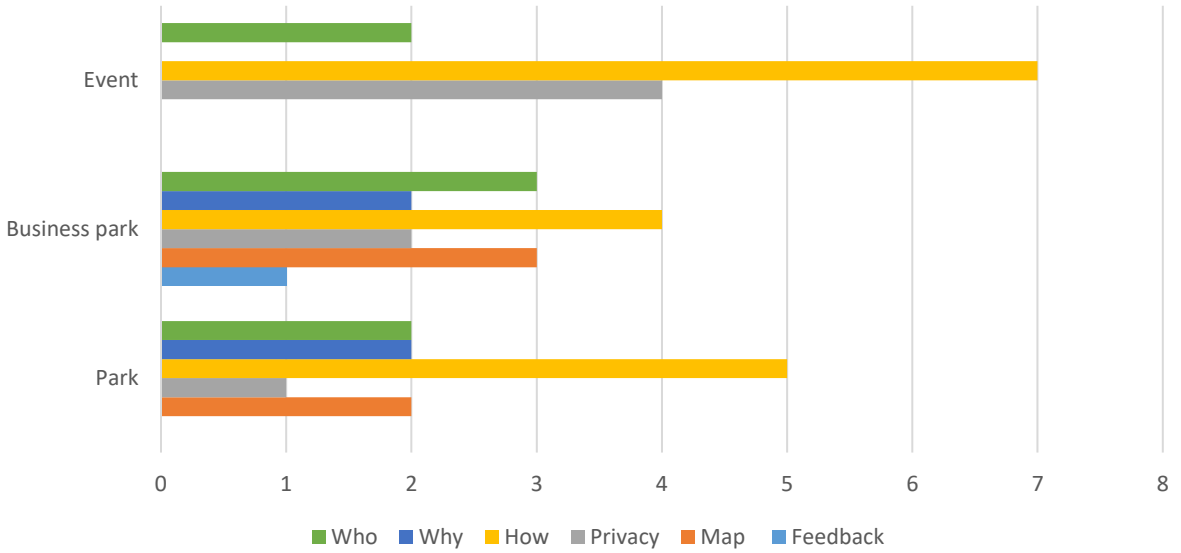


*Figure 12: The number of times respondents chose a menu during their 'third click' on their virtual smartphone.*

Regression analyses were employed to explore whether reading the different menus had an effect on Acceptance rate of drones by the respondents. Therefore, six regression analyses were performed with Who, Why, How, Privacy, Map and Feedback as independent variables and Acceptance as dependent variable. No significant effects were found: Who [$F$ (1, 31) = 2.89, *ns.*]; Why [$F$ (1, 46) = 0.01, *ns.*]; How [$F$ (1, 32) = 0.68, *ns.*]; Privacy [$F$ (1, 35) = 0.02, *ns.*]; Map [$F$ (1, 18) = 0.71, *ns.*]; and Feedback [$F$ (1, 7) = 0.98, *ns.*].

In addition, to explore whether the Context respondents were in had an effect on the information need, regression analyses were employed with Context as independent variable and with the different menus (Who, Why, How, Privacy, Map and Feedback) as dependent variables. Non-significant effects of Context on Who, Why, How, Map and Privacy were found: Who [$F$ (1, 31) = 1.43, *ns.*]; Why [$F$ (1, 46) = 0.01, *ns.*]; How [$F$ (1, 32) = 1.97, *ns.*]; Map [$F$ (1, 18) = 0.93, *ns.*]; and Feedback [$F$ (1, 7) = 0.03, *ns.*]. Further, a significant effect was found of Context on the menu Privacy: $F(1, 35) = 10{,}29$, $p < .05$. $M_{event} = 17.78$, $SD_{event} = 6.85$; $M_{Business\ park} = 13.78$, $SD_{Business\ park} = 9.04$; $M_{Park} = 29.32$, $SD_{Park} = 9.18$. Pairwise comparisons showed significant differences in time spent in the Privacy menu between the Context Event and the Context Park (Mean Difference: -11.54, $SD = 3.33$, $p < .05$) and between the Context Business park and the Context Park (Mean Difference: -4.00, $SD = 3.53$, $p < .05$). These results show participants in the Context Event and Business park spent less time reading the menu with information about Privacy than participants did in the Context Park.

Although no support was found for hypothesis 1 according to the manipulation of Context in virtual reality, the questionnaire consisted of several questions that did provide support for hypothesis 1. Participants were asked to indicate the extent to what they thought it was logic and understandable to use drones in different contexts (Event, Business park and Park). A one-way repeated measures Anova was conducted to compare the acceptance rates among the three contexts. The analysis showed the contexts differed significantly from each other, Wilks' Lambda = .33, $F$ (2, 118) = 121.08, $p < .05$. $M_{question\_Event} = 5.67$, $SD_{question\_Event} = 1.02$; $M_{question\_Business\ Park} = 4.09$, $SD_{question\_Business\ park} = 1.53$; $M_{question\_Park} = 3.66$, $SD_{question\_Park} = 1.60$. Pairwise comparisons indicated drones were significantly more accepted during events compared to Business parks (Mean difference: 1.58, $SD = 0.13$, $p < .05$) and compared to Parks (Mean difference: 2.01, $SD = 0.13$, $p < .05$). Also it showed drones were significantly more accepted at Business parks compared to Parks (Mean difference: 0.43, $SD = 0.12$, $p < .05$). So, in line with hypothesis 1, participants indicated drones to be most accepted during an event, followed by business parks and least in parks. Figure 13 provides a graphical display of the mean scores of acceptance rates in the three contexts, based on questions from the questionnaire.

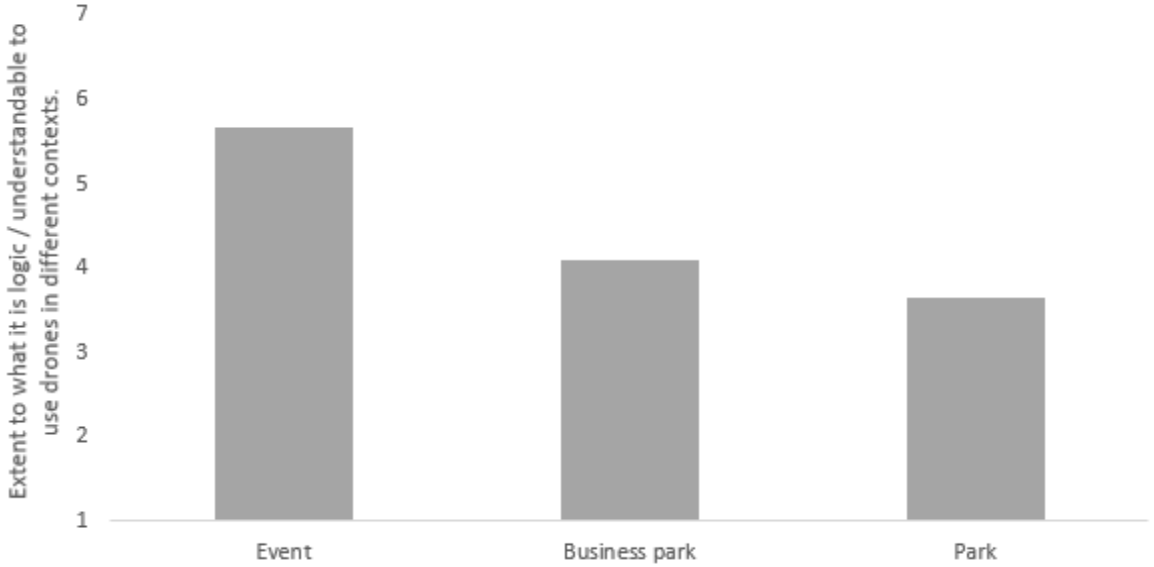


*Figure 13: Mean scores of the extent to what participants thought it is logic or understandable to use drones in different contexts.*

The manipulation of Transparency also did not provide support for hypothesis 2. But, in addition to the Transparency manipulation, the questionnaire consisted of questions to measure transparency beliefs about the municipality of Enschede. These questions together form the construct: Transparency_construct. To explore whether Transparency_construct provided support for hypothesis 2, first a mediansplit was made, resulting in a variable with two levels: low transparency beliefs versus high transparency beliefs. Then a Multivariate Anova was employed with Transparency_construct and Context as independent variables and Trust, Perceived control and Acceptance as dependent variables. A main effect of Transparency_construct was found, Wilks' Lambda = .94, $F$ (3, 112) = 23.38, $p < .05$. The more participants thought the municipality of Enschede was transparent, the more they trusted the municipality, $F$ (1, 114) = 58.30, $p < .05$, $M_{low\ transpansparency\ beliefs}$ = 4.33, $SD_{low\ transparency\ beliefs}$ = 0.54 versus $M_{high\ transparency\ beliefs}$ = 5.05, $SD_{high\ transparency\ beliefs}$ = 0.52. Also, the more participants held high transparency beliefs, the more they felt in control, $F$ (1, 114) = 16.79, $p < .05$, $M_{low\ transpansparency\ beliefs}$ = 2.64, $SD_{low\ transparency\ beliefs}$ = 1.44 versus $M_{high\ transparency\ beliefs}$ = 3.64, $SD_{high\ transparency\ beliefs}$ = 1.55. In addition, the more participants held high transparency beliefs about the municipality of Enschede, the more they accepted drones $F$ (1, 114) = 16.01, $p < .05$, $M_{low\ transpansparency\ beliefs}$ = 4.04, $SD_{low\ transparency\ beliefs}$ = 0.78 versus $M_{high\ transparency\ beliefs}$ = 4.60, $SD_{high\ transparency\ beliefs}$ = 0.80. No main effect of Context was found, Wilks' Lambda = .62, $F$ (6, 224) = 1.09, *ns.* and no interaction effect of Transparency_construct and Context was found, Wilks' Lambda = .91, $F$ (6, 224) = 1.73, *ns.* In contrast to the manipulation of Transparency, this analysis provides partial support for hypothesis 2, because it shows higher transparency beliefs are related to higher trust, perceived control and drone acceptance.

Additionally, there were reasons to believe Trust was an independent variable, because the items in the questionnaire about trust did not specifically ask about trust based on the previous virtual reality experience. Instead, participants could have answered the questions about trust based on their already existing amount of trust, because they may have experienced a lack of information about trust in the virtual reality environment. This topic will be discussed in more detail in the discussion. To test whether Trust had an effect on Perceived control and Acceptance, first a median split was made for Trust, thereafter a Multivariate Anova was employed with Context, Transparency and Trust as independent variables and Perceived control and Acceptance as dependent variables. A significant main effect was found of Trust, $F$ (2, 107) = 4.42, $p < .05$. Further analysis showed Trust had a significant effect on Acceptance, $F$ (1, 108) = 8.81, $p < .05$, but not on Perceived control, $F$ (1, 108) = 2.01, *ns.* No further significant main effects were found for Context, $F$ (4, 214) = 0.55, *ns.* and Transparency, $F$ (2, 107) = 0.05, *ns.* and no significant interaction effects were found of Trust and Context, $F$ (4, 216) = 0.84, *ns.*, Trust and Transparency, $F$ (2, 107) = 1.44, *ns.*, Context and Transparency, $F$ (4, 214) = 1.31, *ns.* and of Trust, Context and Transparency, $F$ (4, 214) = 0.30, *ns.* This analysis provides partial support for hypothesis 2, because it indicates increased Trust is related to increased Acceptance.

Further, mean scores of the nine items, measuring Acceptance, are graphically listed in figure 14. The Acceptance scale consisted of two subscales: items 1, 3, 5, 7 and 9 were measuring how useful drones are and items 2, 4, 6 and 8 were measuring how satisfied participants were with drones. The means and standard deviations of the overall scale and the subscales can be found in table 4.

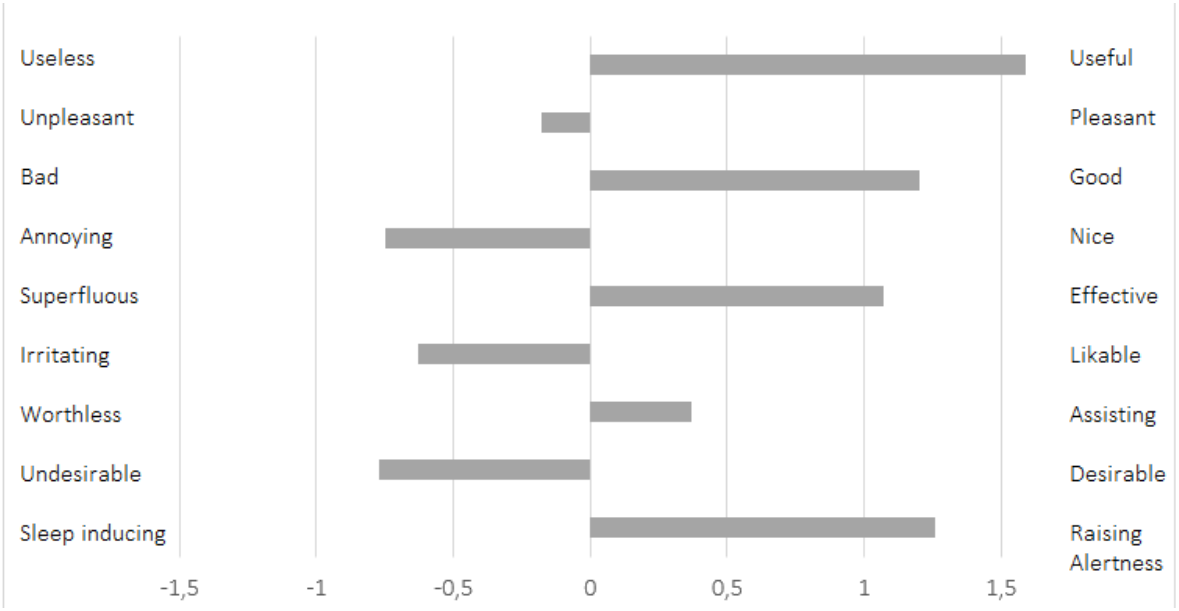


*Figure 14: Mean scores of the items of the Acceptance scale.*

*Table 4:Means and Standard deviations of the overall Acceptance scale, the Usefulness scale and the Satisfaction scale (reaching from 1 – 7, with 1 = negative, 4 = neutral and 7 = positive).*

| Scales | M | SD |
|---|---|---|
| Acceptance | 5.35 | 0.84 |
| Usefulness | 5.10 | 0.82 |
| Satisfaction | 3.42 | 1.10 |

To test whether the two subscales of the Acceptance scale would result in different outcomes, the conceptual model was also tested with the Usefulness- and Satisfaction scale, instead of with the Acceptance scale. A Multivariate Anova was employed with Context and Transparency_construct as independent variables and Trust, Perceived Control, the Usefulness scale and the Satisfaction scale as dependent variables. Again, no significant main effect was found for Context, Wilks' Lambda = .94, $F$ (8, 222) = 0.90, *ns.*, but a significant main effect was found for Transparency_Construct, Wilks' Lambda = .62, $F$ (4, 111) = 17.38, $p < .05$. No significant interaction effect was found, Wilks' Lambda = .90, $F$ (8, 222) = 1.50, *ns.* Transparency_Construct had a significant effect on all variables: Trust, $F$ (1, 114) = 58.30, $p < .05$; Perceived control, $F$ (1, 114) = 16.79, $p < .05$; Usefelness scale, $F$ (1, 114) = 9.14, $p < .05$; and Satisfaction scale, $F$ (1, 114) = 15.23, $p < .05$, meaning higher transparency beliefs are related to higher trust, perceived control, higher usefulness beliefs and greater satisfaction about the use of drones. Table 5 gives an overview of the mean scores and standard deviations of these variables.

*Table 5: Means and Standard deviations of the variables Trust, Perceived control. Usefulness scale and Satisfaction scale, divided by high and low transparency beliefs concerning the municipality of Enschede.*

| Variable | Transparency beliefs | Mean | SD |
|---|---|---|---|
| Trust | High | 5.06 | 0.06 |
| | Low | 4.33 | 0.07 |
| Perceived control | High | 3.64 | 0.19 |
| | Low | 2.49 | 0.21 |
| Usefulness scale | High | 5.31 | 0.09 |
| | Low | 4.88 | 0.10 |
| Satisfaction scale | High | 3.77 | 0.13 |
| | Low | 3.02 | 0.14 |

Further, based on the correlation table (table 1) some additional analyses have been conducted. First, A median split was made for Age (young vs. older). After, a Multivariate Anova was conducted with Age as independent variable and Trust, Perceived control and Acceptance as dependent variables. A significant main effect was observed for Age, Wilks' Lambda = .92, $F$ (3, 116) = 3.55, $p < .05$. Further analysis showed Age had a significant effect on Trust, $F$ (1, 118) = 7.45, $p < .05$, but not on Perceived Control, $F$ (1, 118) = 3.72, *ns.* and Acceptance, $F$ (1, 118) = 0.32, *ns.* This means that Age contributes to the variance of Trust: the more age increases, the lower the trust, $M_{young}$ = 4.88, $SD_{young}$ = 0.54 versus $M_{older}$ = 4.58, $SD_{older}$ = 0.69.

Second, a regression analysis was conducted with Gender as independent variable and Transparency_construct as dependent variable. A significant model was observed, $F$ (1, 118) = 5.68, $p < .05$ with an beta value of -.21, showing that males are more inclined to hold high transparency beliefs about the municipality of Enschede than women are.

Third, a regression analysis was conducted with Education as independent variable and Trust as dependent variable. Again, a significant model was observed, $F$ (1, 118) = 7.18, $p < .05$ with a beta value of -.24 , meaning that the higher completed level of education, the lower the trust in the municipality of Enschede.

Lastly, a regression analysis was conducted with Frequency of visits as independent variable and Trust as dependent variable. A significant model was observed, $F$ (1, 118) = 5.26, $p < .05$ with a beta value of -.21. This means that the more frequent people visit Enschede, the more trust they have in the municipality of Enschede.

## Conclusions and Discussions

The current study examined whether the acceptance of drones differs among contexts and whether transparent information disclosure from the Municipality of Enschede increases acceptance of their drones. 120 people who visit Enschede on a regular basis participated in a virtual reality experiment, in which they were randomly assigned to a context (an event, a business park or a park) and an information-disclosing strategy (transparent versus not transparent). Events were expected to be contexts in which drones were most accepted, followed by business parks and least in parks. Moreover, transparent information-disclosure was expected to increase acceptance of government's use of drones.

*Acceptance.* It was expected that the context in which the government uses drones would affect the public's acceptance (H1). In other words, it was expected that people would be less willing to accept a drone in a park, because this could be a place that could be experienced as a more private space and, in addition, people could be less able to come up with logic reasons for drone presence. On the other hand, it was expected that people would be more willing to accept drones at a business park and during an event, because these places could be perceived as more public spaces and people are expected to come up with more logic reasons for drone presence in these contexts. As expected, the items in the questionnaire measuring the extent to what it is logic and understandable to use drones among the three contexts, showed participants to be most willing to accept drones during events, followed by business parks and least in parks. This is in line with findings of Taylor (2010), because events are public places and parks are more private places and Taylor (2010) found people to be less willing to accept camera's in private places. The manipulation of context in virtual reality, however, did not provide support for this expectation, which means the groups who had a virtual reality experience in the three different contexts did not differ significantly in the amount of acceptance of government's drones.

For the hypothesized processes driving the effect of transparency on acceptance of government's drones, based on e.g. Bennis et al. (2008); Fombrun & Rindova (2000); Baronas and Louis (1988), partial support was found. The construct measuring transparency in the questionnaire

showed a significant effect on both trust, perceived control and acceptance. This means, the more participants indicated the municipality of Enschede was transparent, the more trust they had in the organization, the more control they perceived over the situation in virtual reality and the more they were willing to accept drones of the municipality. Therefore these findings are in line with hypotheses 2. On the other hand, the experimental manipulation itself (high transparency vs. low transparency in virtual reality, consisting of the presence of an information app or an neutral message) did not provide support for these findings.

*Additional findings.* The most notable finding of the study presented here is that participants think drones are useful, but they are not satisfied with the use of drones by the municipality of Enschede. A quote of one of the participants is: "*I can understand why they want to use drones and I also think it is logical, but that does not mean that I think it is good"*. According to the results, this seems to be the overall opinion. Additionally, findings show that participants were most interested in information about 'why' drones are used followed by information about 'privacy' and least in providing the organization with feedback. Not only did respondents spent most time reading the menu 'why', it was also most of the times the menu of their first choice. Especially in the context business park and park, respondents were likely to first read the menu 'why', whereas in the context event this was not that obvious, because during the virtual reality event the respondents were most interested in both Who, Why, How and Privacy. A notable finding is that in the context park people were far more interested in information about privacy than in the other two contexts (business park and event). Some other notable findings are 1) when age increases, trust decreases, 2) males are more inclined to have high transparency beliefs about the municipality of Enschede than women are, 3) higher levels of completed level of education are related with lower levels of trust, however, account must be taken of the fact that the education level of the respondents was generally rather high, and 4) the more frequent people visit Enschede, the more they trust the municipality of Enschede. These findings could be taken into account by the municipality of Enschede when implementing drones.

*Limitations and questions for future research.* Criticism on the current study may be that there is little connection between the virtual reality experience and the questionnaire. Although the items in the questionnaire confirmed the hypothesized relationships, the experimental manipulations themselves did not. Therefore, the experimental manipulations could be described as unsuccessful. An explanation is offered for these incongruent findings in the following.

In the questionnaire participants were asked to indicate their amount of trust in the municipality of Enschede and to what extent they accepted the drones of the municipality of Enschede. Although the content validity of the items was rather good, construct validity seems to be rather low, because the items should have measured the amount of trust in the municipality of Enschede, based on the previous virtual reality experience, instead of on their already existing amount of trust. Therefore trust could have been an independent variable, instead of a dependent variable. Organizational trust seems to be an construct that is rather hard to manipulate in an experiment because people seem to rely on convictions or feelings that already existed before the experiment. Some participants explicitly mentioned this during or after the experiment. A quote is: "*I just answered the questions based on my existing knowledge, otherwise I did not know how to answer them"*. Especially the participants in the control groups could have experienced a shortage of information, because they did not receive any essential information that could influence their beliefs about trustworthiness of the organization.

Another shortcoming in the questionnaire is that the questionnaire did not specifically ask for the extent to which participants accepted drones based on the previous virtual reality experience, instead it asked about acceptance of drones by the municipality of Enschede in general. As a consequence, this may have led to groups that did not differ in terms of being experimentally manipulated when answering the questions about trust and acceptance. Thus, although all

participants were subjected to the manipulation, the items in the questionnaire did not require knowledge from the manipulations and as a consequence this could have led to people not answering the question based on the virtual reality experience.

A third shortcoming if the current study is related to perceived control. In het questionnaire participants were also asked to indicate their perceived control over the virtual reality situation. In this case, the questionnaire did specifically ask about the virtual reality situation, but it also did not lead to significant differences between the groups. An explanation for this could be that all participants were instructed about what was going to happen (so both participants who received transparent information and participants who received a neutral message). The instruction before going into the virtual reality environment was done because user tests (performed prior to the actual research) made clear that participants needed some information about what was going to happen, otherwise they did not know what to do or where to look, especially when they had no experience with virtual reality. Therefore participants were told broadly what they could expect. This may have led to people, in both conditions (high transparency vs. low transparency), perceiving rather much control over the situations. This could be a plausible explanation for the unsuccessful manipulation while the items in the questionnaire did confirm the hypothesized process.

Future research should focus on tests real environments or in creating such a virtual reality environment that no substantive instruction is needed. This environment should be more veracious (e.g. adding more environmental sounds, letting people move in the environment, giving participants more time to get adjusted to the virtual reality experience before entering the experimental condition). Also, the manipulation in the current research was supported by the "Municipality of Enschede Drone Application" on a smartphone. This worked rather well, but in real life it is not likely that visitors of an event, business park or park download this app. Nevertheless, using this application in the current study was needed because there was no information available about the needs of the public. This application therefore was a useful tool for a needs assessment. But, now this assessment has been done, future research should focus on another, more subtle way of informing people. For instance, by automatically sending a message to people's phones who are near a drone. This is in line with ideas of Thomasen (2017). He proposes to let drones emit information to a cell phone application, to take away some of the power-imbalance between the drone operator and the individual encountering the drone (Thomasen, 2017). Findings of the current research could help to compose such an information message, because this research showed people are most interested in why drones are being used in a certain context and in information about privacy.

Another direction for future research could be to not focus on cell phones, but other subtle ways of informing people. For instance, by using different kinds of drones with recognizable colours (e.g. colours of the police, firefighters, ambulance). This could lead to people recognizing the organization using the drone. These ideas have common ground with some preliminary ideas for regulating drones by and Froomkin and Colangelo (2015). Froomkin and Colangelo (2015) promote ideas for self-defence against drones, for instance they suggest drones could be equipped with coloured lights or other markers to inform citizens about the capabilities of the drone, for instance whether or not it is filming.

Furthermore, in their research, PytlikZillig, Duncan, Elbaum and Detweiler (2018) have shown that it is important to be responsive to the values of specific target audiences while communicating to different publics about drone usage. Knowing this, and knowing that participants in the current research were most interested in why drones are being used suggests future research should focus on what values specific target audiences hold in the Netherlands. For instance by interviewing inhabitants of different areas in the Netherlands, of different age groups, with different religions et cetera.

*Practical implications and conclusion.* An important implication for the Municipality of Enschede is that they should take into account the context in which they implement the drone: drones

in more private places, like parks, are less accepted than in more public contexts, like events. Further, when using drones in more private places, such as a park, the implementer should focus most on providing the public with information about privacy and about why the drone is being used in that particular context. On the other hand, when drones are being implemented in more public contexts, such as during an event, the implementer should focus most on communicating to the public who is responsible for the drone presence. Further, the implementer should focus on telling the public why the drone is being used, how it is being used and give the public information about privacy considerations. Additionally, citizens with higher transparency beliefs about the municipality of Enschede are more willing to accept drones because they have more trust in the municipality and because they perceive to have more control. However, it is yet unclear how higher transparency beliefs can be reached in the context of using drones, although the data shows participants are most interested in why drones are used and in information about privacy. This area therefore needs more attention. Another important implication is not to use drones unless necessary, because this study made clear that participants are rather optimistic about the usefulness of drones, but in general, not satisfied. In sum, the public of smart city Enschede is ready for-, but not satisfied with the use of safety and security drones.

## Appendix A: Literature

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## Appendix B: Information which participants could find in the Municipality of Enschede Drone Application

### 1. Event

### Who

The municipality of Enschede is using drones to improve the wellbeing of its citizens.
Our 'drone-team' consists of 10 benevolent people, appointed by the Mayor of Enschede.

### Why

Drones are used to make festivals a pleasant and safe place for everyone. They assist our staff, enabling them to monitor crowd dynamics. We make use of security drones to let this event run smoothly and keep everything safe for everyone.

### How

Our drone is able to recognize risky situations and risky behaviors. When this happens, our security staff will receive a warning. Also, drones could help prevent congestion when the terrain should be evacuated for example.

### Privacy

We take the privacy of our visitors very seriously. We can assure you that we are not interested in detecting individuals and we are also not capable of detecting individuals. Our drone is filming from above, so in the footage we can only see people from above, which makes it impossible to recognize individuals.

### Images/map

Here you can see what kind of footage we collect with our drone:

And here you can see the route our drone travels:

### Feedback

Here you can ask questions or give us feedback. We will respond as soon as possible.

## 2. Park

### Who

The municipality of Enschede is using drones to improve the wellbeing of its citizens.
Our ‘drone-team’ consists of 10 benevolent people, appointed by the Mayor of Enschede.

### Why

Drones are used to make this park a pleasant and safe place for everyone. They assist our staff, enabling them to monitor crowd dynamics. We make use of security drones to let the park be a safe and nice place for everyone.

### How

Our drone is able to recognize risky situations and risky behaviors. When this happens, our security staff will receive a warning. Also, drones could help prevent congestion when the park should be evacuated for example.

### Privacy

We take the privacy of our visitors very seriously. We can assure you that we are not interested in detecting individuals and we are also not capable of detecting individuals. Our drone is filming from above, so in the footage we can only see people from above, which makes it impossible to recognize individuals.

### Images/map

Here you can see what kind of footage we collect with our drone:

And here you can see the route our drone travels:

### Feedback

Here you can ask questions or give us feedback. We will respond as soon as possible.

Drone Acceptance?

### 3. Business park

#### Who

The municipality of Enschede is using drones to improve the wellbeing of its citizens.
Our ‘drone-team’ consists of 10 benevolent people, appointed by the Mayor of Enschede.

#### Why

Drones are used to make this business park a pleasant and safe place for everyone. They assist our staff, enabling them to monitor crowd dynamics. We make use of security drones to let the business park be a safe and nice place for everyone.

#### How

Our drone is able to recognize risky situations and risky behaviors. When this happens, our security staff will receive a warning. Also, drones could help prevent congestion when the business park should be evacuated for example.

#### Privacy

We take the privacy of our visitors very seriously. We can assure you that we are not interested in detecting individuals and we are also not capable of detecting individuals. Our drone is filming from above, so in the footage we can only see people from above, which makes it impossible to recognize individuals.

#### Images/map

Here you can see what kind of footage we collect with our drone:

And here you can see the route our drone travels:

#### Feedback

Here you can ask questions or give us feedback. We will respond as soon as possible.

## Appendix C: Neutral message for the control group

### Control group

Hi!
How are you doing today? Did you already take a look around you, to see in what environment you are? Enjoy the rest of your day!
See you!

## Appendix D: Timeline with stimuli

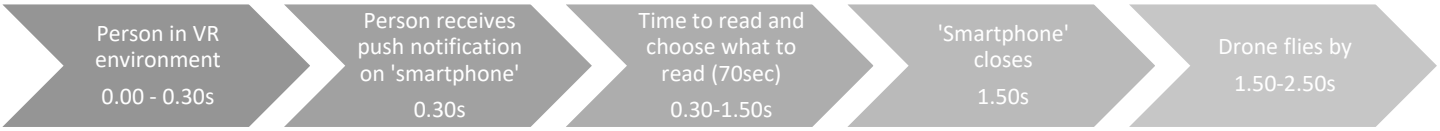


*Figure 14: Timeline for group with information application.*

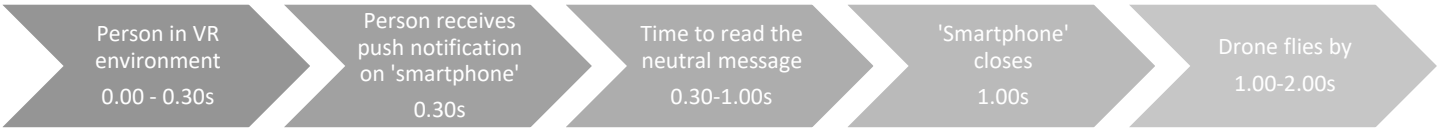


*Figure 15: Timelie for group with neutral message.*

**Appendix E: Questionnaire**

Thank you for participating in this research. This study is about the use of drones by the municipality of Enschede. We anticipate that participation costs about 20 minutes. All of your responses will be anonymous (you don't have to give your name, we won't ask for information that could lead back to you and no individual responses will be published). Participation in this study is completely voluntary. You are free to quit participation at any time for any reason without penalty or loss of compensation. Take as long as you would like when making decisions, there are no right or wrong answers, we are interested in your opinion. In this study we will make use of Virtual Reality (VR), this means that you, as a participant, will be placed in a VR environment. It is recommended to not use VR if you are tired, dizzy, feel woozy (light in the head), nauseous, ill, under influence of alcohol or drugs, or if you suffer from balance disorders. If you suffer from a severe medical condition, consult your doctor first, before you use VR.

If you have any questions regarding your rights as a research participant, or other questions, feel free to contact me (Anne Oltvoort) through my e-mail: a.b.a.oltvoort@student.utwente.nl

Do you agree with these conditions?

- Yes
- No

Now it's time for your VR experience. The researcher (Anne Oltvoort) will help you.

I hope you had a nice VR experience. Now the actual questionnaire will start.

In the VR environment a drone of the municipality of Enschede flew by. I would like to know how you think about the municipality of Enschede and how it communicates with its citizens. In the following please indicate your agreement with some statements about Transparency, Goodwill, Integrity and Competence of the municipality of Enschede and your Overall Trust in the municipality of Enschede.

Transparency

| | Stronly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| The municipality of Enschede wants to understand how its decisions affect people like me. | | | | | | | |
| The municipality of Enschede provides information that is useful to people like me for making informed decisions. | | | | | | | |
| The municipality of Enschede wants to be accountable to | | | | | | | |

| | |
|---|---|
| people like me for its actions. | |
| The municipality of Enschede wants people like me to know what it is doing and why it is doing it. | |

## Goodwill

| | Stronly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| Whenever the municipality of Enschede makes a decision I know it will be concerned about people like me. | | | | | | | |
| I believe the municipality of Enschede takes the opinions of people like me into account when making decisions. | | | | | | | |
| The municipality of Enschede is interested in the well-being of people like me, not just itself. | | | | | | | |

## Integrity

| | Stronly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| The municipality of Enschede treats people like me fairly and justly. | | | | | | | |
| The municipality of Enschede can be relied on to keep its promises. | | | | | | | |

Drone Acceptance?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sound principles seem to guide the behavior of the municipality of Enschede. | | | | | | | |
| The municipality of Enschede does not mislead people like me. | | | | | | | |

Competence

| | Stronly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| I feel very confident about the skills of the municipality of Enschede. | | | | | | | |
| The municipality of Enschede has the ability to accomplish what it says it will do. | | | | | | | |
| The municipality of Enschede is known to be successful at the things it tries to do. | | | | | | | |

Overall Trust

| | Stronly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| I'm willing to let the municipality of Enschede make decisions for people like me. | | | | | | | |
| I think it is important to watch the municipality of Enschede closely so that it does not take advantage of people like me. | | | | | | | |

| |
|---|
| I trust the municipality of Enschede to take care of people like me. |

The next questions reflect the extend to what you felt you had control over the situation. 'The situation' refers to the situation in VR in which the drone flew by. Please indicate on a scale from 0-10 to what extent you perceived control over that situation.

To what extent did you feel you had control over the situation?

| Not at all | | | | | | | | | A great deal |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

To what extent did you feel you could predict the situation?

| Not at all | | | | | | | | | A great deal |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

To what extent did you feel you had a choice in the situation?
In other words: did you feel that you could chose to come, or to not come into contact with the drone of the municipality of Enschede?

| Not at all | | | | | | | | | A great deal |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

To what extent did you feel responsible for the situation, caused by the municipality of Enschede?

| Not at all | | | | | | | | | A great deal |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

Did you feel like you were able to influence the situation?
In other words: did you feel that you had a say in the use of a drone by the municipality of Enschede?

| Not at all | | | | | | | | | A great deal |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

I would like to know how you think and feel about the use of drones by the municipality of Enschede, in other words: to what extent do you accept the use of drones by the municipality of Enschede?
In the following items, please tick a box on every line.

My judgements of the drone of the municipality of Enschede are...

| | | |
|---|---|---|
| Useful | ○ ○ ○ ○ ○ ○ ○ | Useless |
| Pleasant | ○ ○ ○ ○ ○ ○ ○ | Unpleasant |
| Bad | ○ ○ ○ ○ ○ ○ ○ | Good |
| Nice | ○ ○ ○ ○ ○ ○ ○ | Annoying |
| Effective | ○ ○ ○ ○ ○ ○ ○ | Superfluous |
| Irritating | ○ ○ ○ ○ ○ ○ ○ | Likable |
| Assisting | ○ ○ ○ ○ ○ ○ ○ | Worthless |
| Undesirable | ○ ○ ○ ○ ○ ○ ○ | Desirable |
| Raising alertness | ○ ○ ○ ○ ○ ○ ○ | Sleep-inducing |

In the following please indicate your agreement with some statements concerning the use of drones during **events**.

| | Strongly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| It is logic that the Municipality of Enschede uses drones during events. | | | | | | | |
| I understand why the Municipality of Enschede uses drones during events. | | | | | | | |

In the following please indicate your agreement with some statements concerning the use of drones at **parks**.

| | Strongly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| It is logic that the municipality of Enschede uses drones at parks. | | | | | | | |
| I understand why the Municipality of | | | | | | | |

| |
|---|
| Enschede uses drones at parks. |

In the following please indicate your agreement with some statements concerning the use of drones at **business parks**.

| | Strongly disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|---|
| It is logic that the Municipality of Enschede uses drones at business parks. | | | | | | | |
| I understand why the Municipality of Enschede uses drones at business parks. | | | | | | | |

We're almost done! I'd like to ask you a number of questions about yourself in order to be able to give a general description my research participants.

What is your age?

__

What is your gender?

- Male
- Female

What is your highest completed level of education?

- Primary School (Lagere School; Grundschule)
- Secundary education (e.g. VMBO; MAVO; Realschule)
- Higher secundary Education (e.g. HAVO; VWO; Abitur)
- Intermediate vocational education (e.g. MBO; Berufsfachshule)
- Higher vocational education (e.g. HBO; Fachhochschule)
- Bachelor's degree
- Master's degree
- Doctoral degree
- Other: _____

What is your place of residence?

_____

How often do you visit Enschede?

- On a daily basis
- On a weekly basis
- On a monthly basis
- A couple of times per year
- Once per year or less

Thank you for participating in this study! The entire goal of this study was to find out whether respondents of this study accept the use of drones by the municipality of Enschede, and whether transparency influences this. In order to do that, all participants were randomly assigned to one of three locations: some of you were attending a festival in VR, others were in a park in VR and the rest was at a Business park in VR. Further, half of the participants received the 'Municipality of Enschede Drone App', in which participants could look for information about who were responsible for the use of the drone, why drones were being used, how the data was collected and processed, privacy, they could look at pictures and a map and they could give feedback. The other half of the participants (control group) received a neutral message.

We hypothesized that disclosing honest information before a new technology (drone) was implemented and enhancing feelings of perceived control would lead to greater acceptance.

If you have further questions about this study, again, feel free to contact me through e-mail: a.b.a.oltvoort@student.utwente.nl