Bachelor Thesis

What's that flying above my head?

Leni Schierjott

s1612964

Peter de Vries

University of Twente

26.06.2019

Table of Content

Table of Content

Abstract

Drones are nowadays not only used in the military sector, by governments, by companies or as a toy but are more and more implemented into society as an exchange for mundane activities like delivering food. This study examines in how far trust, privacy concern and perceived control play a role in the acceptance of surveillance drones in different environments. Participants were put into different virtual reality environments and a virtual app which provided additional information about the usage of drones. Participants were confronted with a drone flying above their head either at a festival, a business area or at a park. They received a neutral message on the app above the usage of drones or an informative one. Results show that participants were more likely to accept drones as surveillance in a festival than at a business area or park and more likely to accept it at a business area than a park. Further analysis indicated that the perception of transparency has an influence on the level of trust that people have, which then has influence on the acceptance of drones as a mean of surveillance. These findings support earlier done studies as well as the importance trust between government and public has on the acceptance of surveillance drones.

Introduction

Ding, dong – your food is here; delivery done by drone. Drones are nothing new when it comes to their usage as a toy or for filming purposes. But now, some companies are using them to deliver food instead of the good old delivery boy (Business Matters, 2018). Organisations as well as companies are not only pushing the research for drones as delivery service but also for companies like Amazon as a way to send the ordered package via drone instead of using the local post office (Business Matters, 2018).

Drones (unmanned aerial vehicle, UAV) are defined as "an aircraft without a pilot that is controlled by somebody on the ground" (Cambridge University Press, 2019). There are two different types of drones. Unmanned drones, which are automatically programmed and do not need a pilot and Remotely Piloted Aviation Systems (RPAS), which are controlled by a human pilot from a nearby location (European Commission, 2014). RPAS can be used as a hobby by a private person or for example to deliver mail or as a camera in the air for surveillance/recordings. Nowadays it gets more and more popular to use drones as an instrument of filming places or moments from above, an angle normally not easy to come by. It is also widely being used for movies, videos and events. But RPAS are not only used by private people but also by the governmental organizations (Wang, Xia, Yao, & Huang, 2016).

Whereas the private use of RPAS is more for self-indulgence, governmental organisations use it as surveillance or as a help to keep an overview in a hectic or difficult situation.

Using drones as surveillance however promotes suspicion in the public (Wang, Xia, Yao, & Huang, 2016). Public might fear their privacy being in danger or in general may be overwhelmed with the situation and how to react when a drone is spotted in an unanticipated/unexpected environment (Wang, Xia, Yao, & Huang, 2016). Although the acceptance is open to changes when not confronted with a drone alone but in a group.

One of the biggest concerns when drones should be used as means of surveillance is the people's privacy. Using a drone for these purposes is something new, therefore the public does not know what exactly happens with the filmed material, how long it will be saved, who has access to it and even if the people in the video are recognizable (Vattapparamban et al., 2016). No clear rules exist about the use of drones for surveillance and about what happens to the filmed material.

The research question of this thesis is:

Does information about the usage of surveillance drones and the privacy of the people being filmed by them, in different environmental settings, have an influence on people's acceptance of the governmental use of surveillance drones?

Theoretical Framework

Oltvoort et al. (2019), which was used as a basis, tested if transparency about information regarding the drones had influence on trust and perceived control which then have an influence on the acceptance of drones.

Environment plays an important role in the usage of drones in 'civil' areas. Drones could not only be used in different environments, for example surveillance of a shopping street or getting a bird's eye view on a fire that has broken out, but also for public safety and security (Odido & Madara, 2013). Relevant environments to study are public safety (business park and event) and surveillance (park/neighbourhood area). It is imaginable that people would react differently to seeing a drone on a playground (neighbourhood area) than on a festival (event). A neighbourhood area can often be seen as a more private area where surveillance in form of cameras, Closed Circuit Television (CCTV) or a drone as such a matter is invading in the people's privacy and therefore will be more likely seen as an invader

4

than a mean to keep oneself save (Taylor, 2010), whereas events and business areas are public spaces and expected to be more crowded than a neighbourhood area. In these areas people might be easier persuaded to accept drones as a mean of surveillance because it might give them a stronger feeling of being save in public. It is easier for the people to come up with explanations as to why the drone should be there, in a public area, than in a private one (Taylor, 2010).

Transparency is an important factor in this study because it is believed that it can have an immense influence of the acceptances of drones (Bennis, Goleman, & O'Toole, 2008). Depending on how transparent the information given to the people in the different environment will be, the trust the people have in the government and their feeling of perceived control over the situation will change (Baronas & Louis, 1988). Transparency consists of three concepts; disclosure, clarity and accuracy. Clark Williams (2008) states that disclosure is the perception of receiving related and admissible information in an open manner while the transfer of the information must be on time. Accuracy means that the given information has to be the same for everybody as well as unbiased and neutral (Schnackenberg & Tomlison, 2016). Clarity stands for the comprehensibility of information received (Schnackenberg & Tomlison, 2016,) which means that the given information needs to be exact but also easily understandable.

Trust plays a major role when it comes to risk perception and the acceptance of new technology, under which drones would fall (Pavlou & Gefen, 2004). In most cases people are not concerned about new technologies in general but more about the way organisations and governments would design and use the new technology (Li, Hess, & Valachich, 2008). It therefore seems important that an existing level of trust between people and an organisation/government is already a small step in the direction of accepting new technologies.

The trustworthiness of the government or an organisation can be divided in three dimensions: integrity, competence and goodwill (Mayer, Davis, & Schoorman, 1995). Mayer, Davis and Schoorman (1995) define integrity as "the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable" (p. 719). Competence is defined as a set of characteristics, skills and competencies that enable a group (can also be an organisation) to have influence in a certain sector/division (Mayer, Davis, & Schoorman, 1995). Lastly, goodwill means the extent to which "a trustee is believed to want to do good to the trustor" (Mayer, Davis, & Schoorman, 1995, p. 717), separately from the trustee's own ego centrical motivation. If all these three dimensions of trust are established, at least on a ground basis,

between the people and the organisation/government, new technology, in this case drones as a mean of surveillance, will be easier accepted.

Transparency of information and or disclosure about situations also has an influence on **perceived control**. Depending on the accessibility and understandability of given or perceived information, people will have different levels of perceived control (Hajli & Lin, 2016). It can be described with an example of being shut in a room. When someone simply shuts you in the room without telling you why and for how long you will be in there, the perceived level of control that you will have will be low. Without getting any information it is difficult to estimate in how much control you are. You might be in control over your bodily reaction, but you have no control regarding your surroundings. However, when you are shut in with the knowledge that it is only for 10 minutes, your perceived level of control will be higher. The same goes for the usage of technology. When the user for example has information about how it works and or why it works in a certain way, the user will be more likely to accept, use or buy the new technology as opposed to when no information is given to the user at all (Mills & Krantz, 1979).

Since drones as a matter of surveillance are new, there is no set of rules as to what should happen with the filmed material. **Privacy concern** is hereby very important. There are no clear lines when an area is a public space or when it is a private area (except for private property) (Taylor, 2010). People make their own distinction what they regard as a private area or a public one. Being filmed in a business area might therefore be generally accepted because it is seen as a 'public space' whereas a playground would be a 'private area' for most. Moreover, there is a thing that is called 'Privacy of location and space' regarding privacy (Custers, 2016). Privacy of location and space alludes the right a person has not to be monitored or identified when moving in public or private places. There are also no indications as to how good the environment and people are actually recognizable on these cameras. Furthermore, people and the public are more likely to accept drones as another possibility of surveillance when transparency considering the filmed material is given (Clarke, 2014). This means it needs to be possible to check on a website or an app who has access to the material, how good people can actually be recognized, how long the material will be stored and whose drone it is (Rao, Gopi, & Maione, 2016). Since CCTV (closed-circuit television) camera have shown to have a positive impact on people's evaluation of the environment in which they are used (Van Rompay et al., 2015), adding or switching the CCTV with surveillance drones should not have a change on people's attitude towards monitoring in those areas.

Privacy concern will be tested with a questionnaire to see in what way the participants general attitude regarding privacy is and if given information about the drone and therefore the people's privacy has influence on the acceptance of drones as surveillance potential (Finn, & Wright, 2016).

The Current Study

In this study participants were sent into one out of three Virtual Reality (VR) environments – a festival, business area or neighbourhood/park- and watched a drone fly over them/fly by. During the VR the participants had a virtual smart phone in their hand; transparency was hereby manipulated by providing information about the drone or not, depending on the condition the participants were assigned to. The effect environment and transparency over the collected filmed material has on trust, perceived control and privacy concerns in regard to acceptance of drones as a surveillance measurement, was measured. Based on the information provided above the conceptual model (Fig. 1) was developed. The municipality of Enschede was chosen as the governmental implementor of surveillance drones in this case.
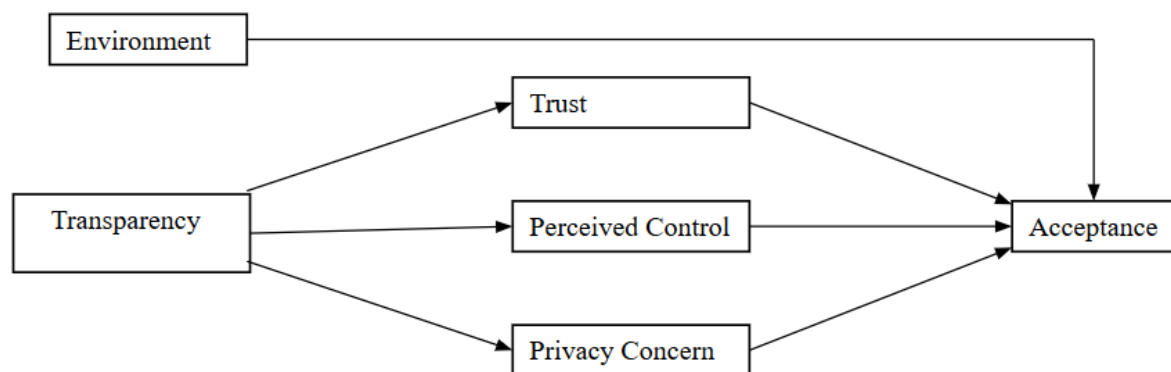

Fig. 1: Conceptual model

Methods

Participants and Design

In total, 44 people participated [19M (43.2%), 25F (56.8%), range 18 - 28 years, M_{age} = 23, SD= 2]in the study. Out of all participants are 86.4% on daily basis in Enschede, whereas 11.4% are on a weekly basis and 2.3% only a couple of times per year. 36 participants were from Germany, 6 from the Netherlands and 2 from other countries. Out of the 44 participants 16 did the VR in the park/neighbourhood, 13 in the business are and 15 at the festival. The participants were recruited through SONA, a cloud-based participant management software (*Overview*, n.d.) and convenience sampling.

This study has a 3 (Environment: festival vs neighbourhood/park vs business area) * 2 (Transparency: yes vs no) design with acceptance as the dependant variable. The participants were divided into two conditions. Each participant was randomly assigned (by throwing a dice) to a non-transparency condition or to a transparency condition. The non-transparency condition had no information about the usage of the material in regard to the privacy of the people in it whereas the transparency condition had information about it. In each condition the environments the participants will get to see are also randomly selected. The possible environments are a business area, an event and a park. The inclusion criteria for participating were: being at least 18 years old and living in or visiting Enschede on a regular (daily, weekly, at least once a year) basis.

Procedure

The participants were led into the room were the VR will take place. First, they got an introduction into the theme and a rough overview about what is going to happen in the next minutes (informed consent, VR experience, questionnaires). After this they were seated and started with the first half of the questionnaire. The first half of the complete questionnaire starts with a questionnaire (Appendix A) about their personality traits. Afterwards the participants got the VR glasses on and the virtual reality started. The whole virtual reality procedure took about 100 seconds. It began with a scene in one of the randomly assigned environments (park, event or business area). The park environment had a grey sky, a few people and a playground in it (Figure 3).

Figure 2: Neighbourhood area/park

The business area had a big parking space and a few business buildings that surround the participant (Figure 4).

Figure 3: Business area with drone

In the festival environment the people were mostly black shades or purple ones. A big tent was put next to the participants with some food and drink shacks (Figure 5).

Figure 4: Festival area

To get used to the environment, participants had around 20 seconds in the beginning to look around and to get a feeling for the VR. They could look around but could not move. Their character had a phone in his hand, which only materialized after the initial 20 seconds of the beginning were over. Here the participant had time (70 seconds) to look around and read the information that is on the phone in his hand. Both groups had hands with a mobile phone in the left hand. The control group only has a welcome text(non-transparency condition) on the screen (Figure 6), whereas the experimental group has information (transparency condition) on the mobile phone screen (Figure 7). Through scrolling more and more information was revealed to participants of the experimental group (Figure 8). Around 10 seconds before the VR sequence finished the drone would appear. After the VR simulation was done, the participants had to fill in the second half of the questionnaire. This half (Appendix B) was longer and consisted out of six big topics; privacy concern, transparency, trust, perceived control and acceptance. During the last week of data recording the VR simulation with the non-transparency condition stopped working due to a technical error. All participants were then put into the simulation with the transparency condition but told to disregard their hand so that the chance of them accidentally seeing or reading the information was reduced as much as possible. While being in the simulation they were read the non-transparency condition message they would normally have had on their phone. The ethical approval was given by the ethic committee of the University of Twente.
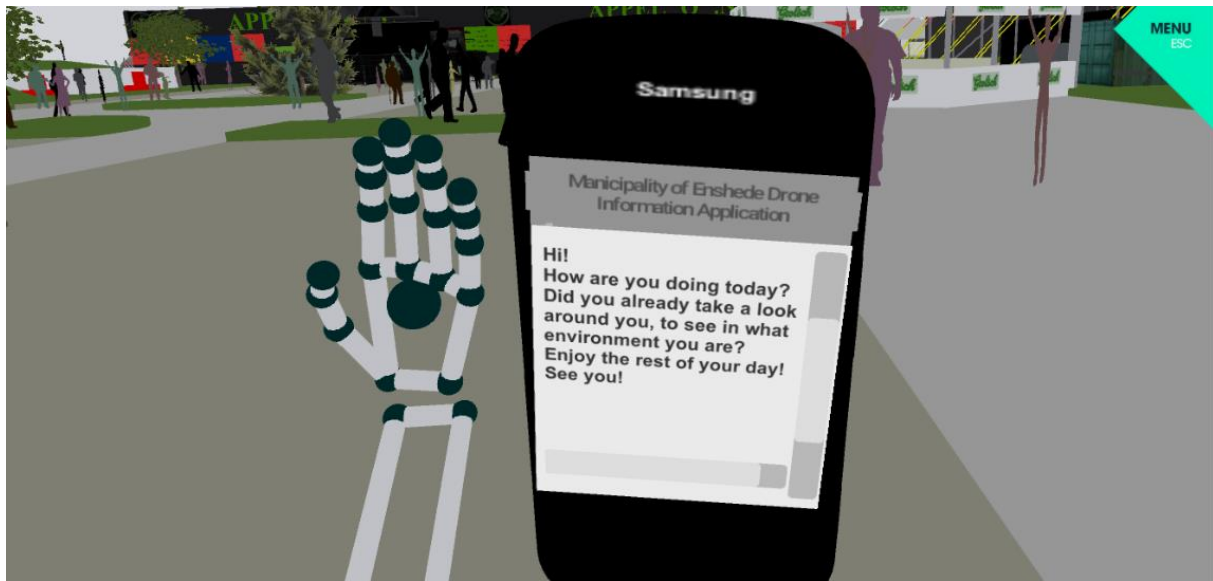
What's that flying above my head?

Figure 5: Phone for the non-transparency condition in the festival area

Figure 6: Start screen of information for the transparency condition in the neighbourhood area
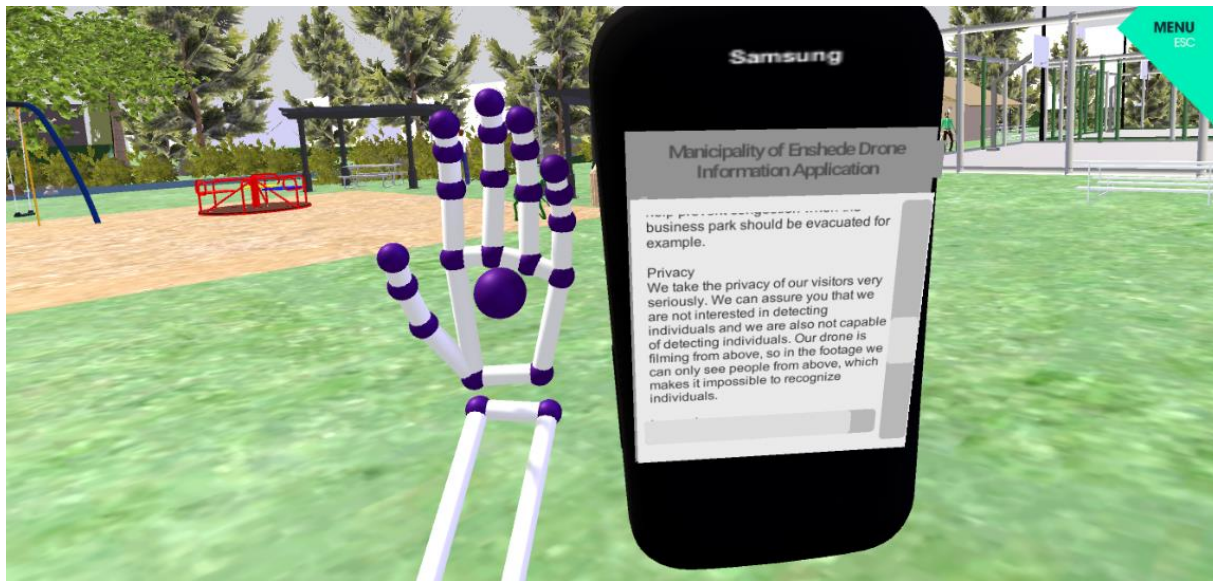
Figure 7: More information on the mobile phone screen after scrolling down in the neighbourhood area

Materials

For this study Virtual Reality (VR) will be used. The virtual reality glasses (Oculus CV1) as well as the virtual environments were given/created by the BMS Lab of the University of Twente in collaboration with the Design Lab of the University of Twente. The three different environments (park/neighbourhood, business park and event) were made in 3D, whereas the characters were created with Reallusion and built into the VR with Iclone 7 and Character Creator 2. To engulf fully in the environments Oculus CV1 was used.

Measures

The measures that existed in the questionnaire (Appendix B) were Privacy, Transparency, Trust, Perceived Control, Acceptance and Personality Trait. Furthermore, five question about demographic data were asked, as well as six statements as checks for manipulation in the different contexts. This study focuses on the five measures of Privacy, Trust, Transparency, Perceived Control and Acceptance. The measure for Personality Trait is not of importance for this study.

Perceived transparency, perceived by the participants, was measured using a 7-point Likert scale, ranging from 1=strongly disagree to 7=strongly agree. Four items were used to calculate the level of agreement of the participant with the Municipality of Enschede. An example of such an item would be "the municipality of Enschede wants to be accountable to people like me for its actions". The Cronbach's alpha (α) was .76 and Guttman's Lambda 2 (λ_2) was .77.

Trust had thirteen items, which also used a 7-point Likert scale ranging from 1= strongly disagree to 7= strongly agree. These thirteen items were divided into two sub-groups; trust and overall trust. Trust was then split up again into another three sub-groups; goodwill, integrity and competence. *Goodwill* was measured through three items, for example "I believe the municipality of Enschede takes the opinions of people like me into account when making decisions" and had $\alpha = .82$ and $\lambda_2 = .82$. *Integrity* had four items as measurement, for example "The municipality of Enschede treats people like me fairly and justly". The Cronbach's alpha for integrity was $\alpha = .86$, as well as a Lambda of $\lambda_2 = .86$. *Competence* was also measure through three items, such as "I feel very confident about the skills of the municipality of Enschede" with an alpha of $\alpha = .74$ and a lambda of $\lambda_2 = .74$. The last three items were used to measure the *overall trust* which resulted in a Cronbach's alpha of $\alpha = .67$ and a Guttman's Lambda of $\lambda_2 = .69$. *Trust* in total had a Cronbach's alpha of $\alpha = .92$ and a Guttman's Lambda of $\lambda_2 = .92$.

Perceived control's level by the participants was calculated with 5 items, which were based on other items of Ouwehand, De Ridder and Bensing (2006). These items had a 10-point Likert scale, ranging from 1= Not at all to 10= A great deal. An example of one of those items would be "To what extent did you feel you had control over the situation?" ($\alpha = .60$ and $\lambda_2 = .65$).

For measuring the perceived level of Acceptance, the acceptance scale by Van der Laan, Heino and Bensing (1997) was used. That is a nine item Likert Scale. Three items in the questionnaire had to be recoded. Those items were "…effective - superfluous", "…likeable - irritating" and "…desirable - undesirable" ($\alpha = .84$ and $\lambda_2 = .87$). The acceptance for each environment has also been measured.

Privacy concern was measured with a 7-point Likert scale, ranging from 1= strongly agree to 7=strongly disagree. The privacy questionnaire had 22 items, such as "I would not mind appearing on television" or "I would like to keep photos of my family on the internet" ($\alpha = .43$ and $\lambda_2 = .54$). The highest Cronbach's alpha that can be achieved through deleting an item is $\alpha = .51$. The item that needs to be deleted is "I would not mind appearing on television". It is taken into account in the following that the Cronbach's alpha is below required level.

Results

Table 1 shows the means and standard deviations of the variables used.

Table 1: Means (M), Standard Deviations (SD) of the Variables

	M	**SD**
Privacy concern	2.89	.39
Perceived control	2.93	1.09
Trust	3.49	0.91
Perceived transparency	3.60	1.13

The outcome variable drone acceptance (M= 3.92, SD= 0.88), ranged from values of 2.11 to 5.78.

To test if Transparency and Environment had a significant effect on the acceptance of drones a Multivariate Anova was conducted. In this case acceptance, perceived transparency, trust, perceived privacy and perceived control were the dependent variables and Transparency and Environment the independent variable. The results showed a non-significant effect of Transparency (F (5, 32) = .672, p = .647, ns., Wilk's Lambda = .91) and Environment (F (10, 64) = .672, p= .746, ns., Wilks' Lambda= .82). There was also a non-significant interaction effect found between Environment and Transparency (F (10, 64) = 1.417, p = .193, ns., Wilks' Lambda= .67). Since there is no significant effect of the Transparency manipulation on Perceived transparency, it was decided to do more analyses in an exploratory manner, in which Perceived transparency as the new independent variable was used.

Additional analyses

Since there is no significant effect of Transparency or Environment on Acceptance and no significant interaction between Environment and Transparency, a linear regression analysis is done. This also leads to a new model (Figure 8).
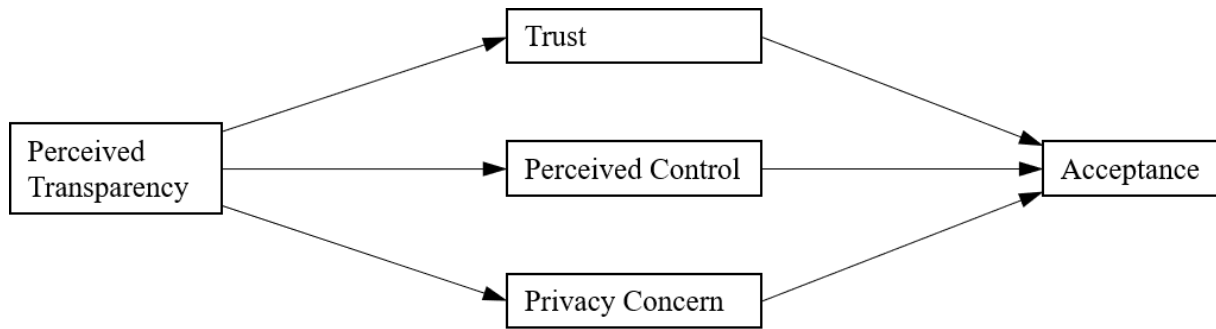
Figure 8: New conceptual model for the additional analysis

Mediation analysis

The hierarchical regression analysis has Acceptance as the dependent variable, Perceived transparency as independent variable in Block 1 and Trust, Perceived control and Privacy concern as independent variables in Block 2 was done.

The direct effect of Perceived transparency on Acceptance is insignificant ($B= 0.209$, $p= .089$). When the mediators Trust, Perceived control and Privacy concerns were added it was shown that Perceived control has no significant effect on Acceptance ($B= -0.081$, $p= .501$), whereas Trust ($B= 0.354$, $p= .020$) and Privacy concern ($B= 0.769$, $p= .017$) have a significant direct effect on Acceptance (Figure 9),.
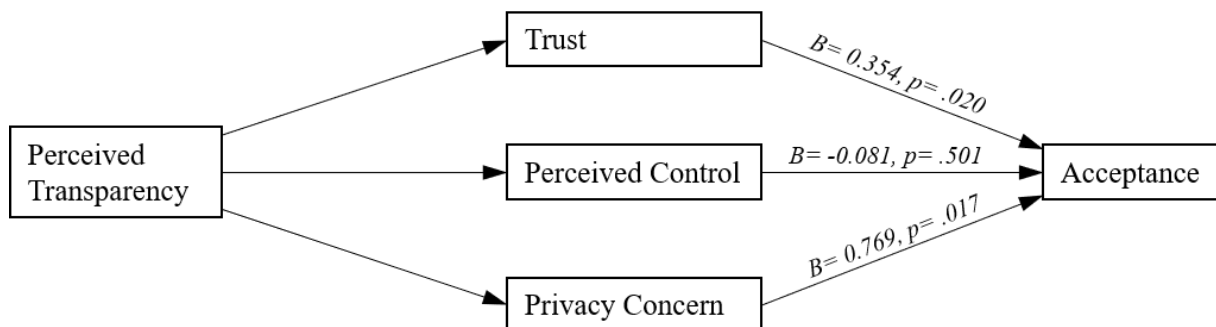

Figure 9: Conceptual model with results of the first regression analysis

Since there is a significant direct effect with Trust and Privacy concern, two more regression analysis were done, with Perceived transparency as independent variable and one with Trust as dependent variable and one with Privacy concern as dependent variable. The analysis with Trust and Perceived transparency (Figure 10) shows a significant effect ($B= 0.269$, $p= .026$). The Sobel tests show that the path via Trust and Perceived transparency is not significant ($z=$

1.78, p = .08). This result suggests that the effect of Perceived transparency on Acceptance is not mediated by Trust. The regression analysis between Privacy concern and Perceived transparency (Figure 10) shows no significant effect (*B*= 0.026, *p*= .632).
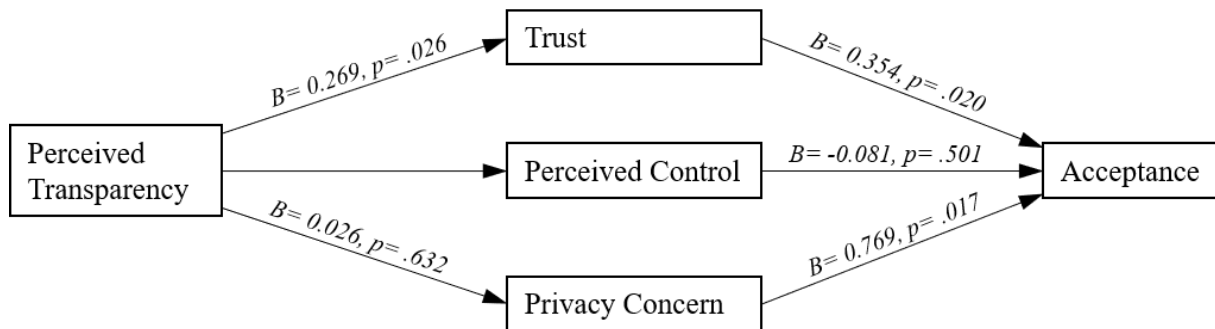

Figure 10: Conceptual model with all results

Effects of environment on acceptance

To compare the acceptance of drone usage among the three environments, a repeated measures Anova analysis was conducted. The analysis showed that the three environments differed significantly from each other, $F_{(2,42)} = 35.99$, $p < .001$, Wilk's Lambda = .37. A follow up pairwise comparison showed that drones were significantly the most accepted during events/festivals compared to business areas and in the park. Then in business areas compared to in the park and the least accepted in parks/neighbourhood areas. The acceptance for the environments on their own, regarding their mean and standard deviation is shown in Table 2.

Table 2: Means (M) and standard deviation (SD) of each environment

	M	**SD**
Event/Festival	4.87	1.42
Business Area	3.80	1.55
Park/Neighbourhood	3.13	1.37

Conclusion/Discussion

The aim of this study was to examine whether the usage of concrete information of filmed material by surveillance drones has an influence on the acceptance of surveillance drones. It was also tested if the environment in which the surveillance drones are used has an influence on the acceptance of them.

It was shown that manipulation of environment and transparency combined had no influence on the acceptance. Additional analyses have shown that the environment in which the people are in has a small effect on the peoples' acceptance of surveillance drones. People are more likely to accept surveillance drones during events or festivals than in a business area or a park/neighbourhood and more accepted in business are compared to parks/neighbourhoods, whereas the perceived transparency has a significant effect on the acceptance of drones. People who perceived the VR situation to be transparent were generally more open towards the usage of surveillance drones than people who did not perceive it as a transparent situation. The difference between Transparency and perceived transparency hereby is that Transparency stand for the condition the participants were in; non-transparency condition and transparency condition. Perceived transparency is how the participants perceived the situation in general. Even in the non-transparency condition, participants may have perceived the situation they were in as transparent. Furthermore, it was found that perceived transparency has an effect on trust and trust has an effect on acceptance but there was no overall effect between perceived transparency, trust and acceptance. These findings match with the findings of Oltvoort et al. (2019), except that Oltvoort et al. (2019) found a mediation between perceived transparency, trust and acceptance of drones. The smaller effect of perceived transparency in this study could be significant if more people would have participated in the study. The low number of participants could also explain why perceived transparency, trust and acceptance have an effect on each other when separated but not when the direct relation is tested by means of the Sobel test.

Results also show that privacy concern also has a direct effect on Acceptance. Although privacy concern has a Cronbach's alpha below the required level, it was also expected to have a negative effect. Since surveillance drones are an endangerment to people's privacy (Finn, & Wright, 2016), the acceptance of them would have been expected to be negative in total. The low alpha might also explain why there seems to be a direct effect on Acceptance but no effect between perceived transparency and privacy concern.

Perceived control has neither effect on perceived transparency nor on Acceptance, which could be due to an age range of participants that already has some general knowledge about drones but not their usage in the surveillance sector. Additionally, as Mills and Krantz (1979) said, given more information, a more transparent situation, people are more likely to accept new technology is in contrast to accepting drones in general or accepting them as a mean of surveillance. Openness to new technology might be given with transparency resulting

in a high level of perceived control over different situations. But accepting the new technology in otherwise a sector that is normally associated with a high level of perceived control (neighbourhood, home) on its own, is something different.

The findings regarding the acceptance of surveillance drones depending on the environment people are in, can be linked to the literature of Taylor (2010) in which it is stated that people tend to feel less safe when they are filmed in private areas, such as neighbourhoods, than public places, such as business areas. As the results show, the participants felt the most open towards surveillance drones in the event/festival area. This could be due to most people recognising an event as a public space and not a private area. The tendency to feel less safe being filmed in private areas might result in an enhanced need for privacy, which could be achieved by giving more privacy information that should be accessible 24 hours every day of the week.

Limitations and questions for future research

A limitation of the study was that the VR was not authentic enough. The VR for the environment 'event' showed other people only as black or purple silhouettes, whereas they were clearly seen as people in the other two environments. The same goes for some smaller aspects in the backgrounds. This was stated by participants as well as by the researchers that tested the VR. Kuliga et al. (2015) states that Virtual Reality has strong potential as an empirical tool in research. However, a few participants said that they "cannot get a feeling for the environment, because they know that it would look completely different in real life".

Another point of criticism would be that the questionnaires do not specifically ask about the extent in which the participants would accept surveillance drones. There is no clear question in it that explicitly asks, "Would you accept surveillance drones at every open area you go to?". It is only asked about the level of acceptance of the usage of drones by the municipality of Enschede in general. There is also no open box in the questionnaire in which the participants may express their concerns or limitations as to how far they would accept surveillance drones, or under which circumstances their limit of accepting surveillance drones is reached.

An additional shortcoming was the age of the participants, most participators where in their twenties. But exactly these people use technology daily and are faster in adapting to new technology. From personal experience and also from talking to the participants, it can be said that it seems 'normal' to see a drone at a festival or in a business area. It might not be directly

associated with a surveillance drone but maybe instead with he thought that another visitor of the area brought it with them. Since most of them know at least what the drones are, there is no questioning as to why it is there, but it is simply accepted or ignored. Whereas, older people tend to have more problems with adapting and accepting new technology. Furthermore, the age range should be broader in future studies. Teenagers are nowadays more likely to accept, implement and understand new technologies than older people. The study has shown that their acceptance of surveillance drones depends on the trust they have, this might be completely different with older people. Future research could also go in the direction of more realistic VR environments. Be it people moving around, more details, better graphic in general or simply by adding sounds that would be expected in the environment.

Further research in the direction of using groups could be done. People tend to react differently in groups and since peer pressure can influence one's behaviour having a group of people react or non-react to the drone might also have an influence on the acceptance of surveillance drones. Another possibility would be to go into more detail regarding the environments. What exactly counts as a public are and from when is it a private area? Private areas could be neighbourhoods, playgrounds, smaller parks and public areas could be inner cities, big and popular parks and neighbourhoods with a tendency to violence. When there can be no clear distinguishing between these areas, it might be a compromise to limit the amount of numbers a surveillance drone flies Is there the possibility of installing an App, which sends a notification as soon as there is a drone in your area? Are there possible compromises both sides (people and government) could take to accept surveillance drones?

Following the problem with what counts as a private or a public space it also needs to be more defined what counts as private and what not from the view of the citizens. Having a drone fly over my garden while my kids play in it might be considered less private then having a drone fly over you while sunbathing topless. As mentioned earlier, it needs to be clearly stated what is visible on the filmed material and in what quality can it be seen (Vattapparamban et al., 2016).

Another point is the low number of participants (44). Compared to the study by Oltvoort et al. (2019) who had 120 participants, the results founded here could all be deemed insignificant due to the small number of particpants.

In conclusion it can be said that the implementation of surveillance drones depends a great deal on the trust that exists between people and municipality, as well as the given transparency regarding not only the drones but also the privacy concerns of the people.

Findings of this study may provide a small overview what needs to be taken into account and that information regarding the drones needs to be shared to actually implement surveillance drones into society.

References

Baronas, A. M. K., & Louis, M. R. (1988). Restoring a sense of control during implementation: how user involvement leads to system acceptance. *Mis Quarterly*, 111-124.

Bennis, W., Goleman, D., & O'Toole, J. (2008). *Transparency: How leaders create a culture of candor*. John Wiley & Sons.

Business Matters – UKs leading business magazine (2018). 7 Common ways drones are of benefit to our daily life. Retrieved from: https://www.bmmagazine.co.uk/business/7-common-ways-drones-are-of-benefit-to-our-daily-life/

Cambridge Dictionary (2019). Definition 'drone'. Retrieved from: https://dictionary.cambridge.org/dictionary/english/drone

Cavoukian, A. (2012). *Privacy and drones: Unmanned aerial vehicles* (pp. 1-30). Ontario: Information and Privacy Commissioner of Ontario, Canada.

Clark Williams, C. (2008). Toward a taxonomy of corporate reporting strategies. *The Journal of Business Communication (1973)*, *45*(3), 232-264.

Clarke, R. (2014). The regulation of civilian drones' impacts on behavioural privacy. *Computer Law & Security Review*, *30*(3), 286-305.

Custers, B. (2016). *Future of Drone Use*. Springer (2016)

European Commission Memo (2014). Remotely Piloted Aviation Systems (RPAS) – Frequently Asked Questions. Retrieved from: https://www.easa.europa.eu/sites/default/files/dfu/Q&A_Commission_Drones.pdf

Finn, R. L., & Wright, D. (2016). Privacy, data protection and ethics for civil drone practice: A survey of industry, regulators and civil society organisations. *Computer Law & Security Review*, *32*(4), 577-586.

Hajli, N., & Lin, X. (2016). Exploring the security of information sharing on social networking sites: The role of perceived control of information. *Journal of Business Ethics*, *133*(1), 111-123.

Kuliga, S. F., Thrash, T., Dalton, R. C., & Hölscher, C. (2015). Virtual reality as an empirical research tool—Exploring user experience in a real building and a corresponding virtual model. *Computers, Environment and Urban Systems*, *54*, 363-375.

Li, X., Hess, T. J., & Valacich, J. S. (2008). Why do we trust new technology? A study of initial trust formation with organizational information systems. *The Journal of Strategic Information Systems*, *17*(1), 39-71.

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of management review*, *20*(3), 709-734.

Mills, R. T., & Krantz, D. S. (1979). Information, choice, and reactions to stress: A field experiment in a blood bank with laboratory analogue. *Journal of Personality and Social Psychology*, *37*(4), 608.

Odido, D., & Madara, D. (2013). Emerging technologies: use of Unmanned Aerial Systems in the realisation of Vision 2030 Goals in the Counties. *International Journal of Applied*, *3*(8).

Oltvoort, A., de Vries, P., van Rompay, T., & Rosen, D. (2019, April). "I Am the Eye in the Sky–Can You Read My Mind?" How to Address Public Concerns Towards Drone Use. In *International Conference on Persuasive Technology* (pp. 103-114). Springer, Cham.

Pavlou, P. A., & Gefen, D. (2004). Building effective online marketplaces with institution-based trust. *Information systems research*, *15*(1), 37-59.

Rao, B., Gopi, A. G., & Maione, R. (2016). The societal impact of commercial drones. *Technology in Society*, *45*, 83-90.

Schnackenberg, A. K., & Tomlinson, E. C. (2016). Organizational transparency: A new perspective on managing trust in organization-stakeholder relationships. *Journal of Management*, *42*(7), 1784-1810.

Taylor, E.: I spy with my little eye: the use of CCTV in schools and the impact on privacy. The Sociological Review 58, 381-405 (2010)

Van Rompay, T.J.L., De Vries, P.W., Damink, M.T.: "For your safety": effects of camera surveillance on safety impressions, situation construal and attributed intent. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), vol. 9072, pp. 141-146 (2015)

Vattapparamban, E., Güvenç, İ., Yurekli, A. İ., Akkaya, K., & Uluağaç, S. (2016, September). Drones for smart cities: Issues in cybersecurity, privacy, and public safety. In *2016 International Wireless Communications and Mobile Computing Conference (IWCMC)* (pp. 216-221). IEEE.

Wang, Y., Xia, H., Yao, Y., & Huang, Y. (2016). Flying eyes and hidden controllers: A qualitative study of people's privacy perceptions of civilian drones in the US. *Proceedings on Privacy Enhancing Technologies*, *2016*(3), 172-190.

Appendix A

Questionnaire Part 1 (before the VR)

Q27 **"There are many situations in which I would prefer only one choice rather than having to make a decision." (Scale from strongly agree to strongly disagree)**

Q26 **"I prefer to avoid situations where someone else has to tell me what it is I should be doing." (Scale from strongly agree to strongly disagree)**

Q25 **"When driving, I try to avoid putting myself in a situation where I could be hurt by someone else's mistake." (Scale from strongly agree to strongly disagree)**

Q24 **"I wish I could push many of life's daily decisions off on someone else." (Scale from strongly agree to strongly disagree)**

Q23 **"When it comes to orders, I would rather give them than receive them." (Scale from strongly agree to strongly disagree)**

Q22 **"When I see a problem I prefer to do something about it rather than sit by and let it continue." (Scale from strongly agree to strongly disagree)**

Q21 **"I like to get a good idea of what a job is all about before I begin." (Scale from strongly agree to strongly disagree)**

Q20 **"I'd rather run my own business and make my own mistakes than listen to someone else's orders." (Scale from strongly agree to strongly disagree)**

Q19 **"I consider myself to be generally more capable of handling situations than others are." (Scale from strongly agree to strongly disagree)**

Q18 "I would rather someone else took over the leadership role when I'm involved in a group project." (Scale from strongly agree to strongly disagree)

Q17 "I enjoy having control over my own destiny." (Scale from strongly agree to strongly disagree)

Q16 "I enjoy making my own decisions." (Scale from strongly agree to strongly disagree)

Q15 "Others usually know what is best for me." (Scale from strongly agree to strongly disagree)

Q14 "I am careful to check everything on an automobile before I leave for a long trip." (Scale from strongly agree to strongly disagree)

Q13 "I enjoy being able to influence the actions of others." (Scale from strongly agree to strongly disagree)

Q12 "I would prefer to be a leader rather than a follower." (Scale from strongly agree to strongly disagree)

Q11 "I try to avoid situations where someone else tells me what to do." (Scale from strongly agree to strongly disagree)

Q10 "I enjoy political participation because I want to have as much of a say in running government as possible." (Scale from strongly agree to strongly disagree)

Q9 "I prefer a job where I have a lot of control over what I do and when I do it." (Scale from strongly agree to strongly disagree)

Q8 "I prefer situations, in which I can anticipate the course of events over situations where I cannot." (Scale from strongly agree to strongly disagree)

Q7 "I do not like ambiguous situations." (Scale from strongly agree to strongly disagree)

Q6 "I would not take risks when an outcome cannot be predicted." (Scale from strongly agree to strongly disagree)

Q5 "I feel stressed when I cannot predict consequences." (Scale from strongly agree to strongly disagree)

Q4 "I tend to get anxious easily when I do not know an outcome." (Scale from strongly agree to strongly disagree)

Q3 "I prefer specific instructions to broad guidelines." (Scale from strongly agree to strongly disagree)

Q2 "I prefer structured situations to unstructured situations." (Scale from strongly agree to strongly disagree)

Q28 "I like to wait and see if someone else is going to solve a problem so that I do not have to be bothered by it." (Scale from strongly agree to strongly disagree)

Appendix B

Questionnaire Part 2 (after the VR)

Q30 Transparency (Scale from strongly agree to strongly disagree)

The municipality of Enschede want 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 want people like me to know what it is doing and why it is doing it

Q31 Goodwill (Scale from strongly agree to strongly disagree)

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 wellbeing of people like me, not just itself

Q33 Integrity (Scale from strongly agree to strongly disagree)

The municipality of Enschede treats people like me fairly and justly

The municipality of Enschede can be relied on to keep its promises

Sound principles seem to guide the behaviour of the municipality of Enschede

The municipality of Enschede does not mislead people like me

Q34 Competence (Scale from strongly agree to strongly disagree)

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

What's that flying above my head?

The municipality of Enschede is known to be successful at the things it tried to do

Q35 **Overall Trust (Scale from strongly agree to strongly disagree)**

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

Q36 **Privacy (Scale from strongly agree to strongly disagree)**

I would like to keep photos of my family on the internet

I'd object to my photograph appearing in a public place without my permission

I would put my photo on my personal web page

No organization or person should disseminate personal information about me without my knowledge

I would not mind appearing on television

Video cameras should be used in public places to improve public safety and security

Red light (intersection) cameras should be used.

Speeding cameras should be used

I like to close my curtains at home at night

I worry about the possibility that my conversations will be overheard

I am comfortable in allowing others to check my credit

It usually bothers me when companies ask me for personal information.

When companies ask me for personal information, I sometimes think twice about providing it.

It bothers me to give personal information to so many companies.

I'm concerned that companies are collecting too much personal information about me.

Companies should take more steps to make sure that unauthorized people cannot access personal information

Computer databases that contain personal information should be protected from unauthorized access—no matter how much it costs.

Companies should not use personal information for any purpose unless it has been authorized by the individuals who provided the information.

Companies should never sell the personal information in their computer databases to other companies.

The use of drones as surveillance reduces crime

The use of drones as surveillance is an invasion of privacy

The use of CCTV is an invasion of privacy

Q37 The next questions reflect the extent 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. (Scale from not at all to a great deal)

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

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

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?

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

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?

Q38 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 judgments of the drone of the municipality of Enschede are ... (Scale from 1 to 7)

Useful – Useless

Pleasant – Unpleasant

Bad – Good

Nice – Annoying

Effective – Superfluous

Irritating – Likeable

Assisting – Worthless

Undesirable – Desirable

Raising alertness – Sleep-inducing

Q50 Please indicate the VR environment you were situated in:

Business park

Park (Playground)

Event (Festival)

Q39 In the following please indicate your agreement with some statements concerning the use of drones during **events**. **(Scale from strongly agree to strongly disagree)**

It is logic that the Municipality of Enschede uses drones during events

I understand why the Municipality of Enschede uses drones during events

Q40 In the following please indicate your agreement with some statements concerning the use of drones during **parks. (Scale from strongly agree to strongly disagree)**

It is logic that the Municipality of Enschede uses drones at parks

I understand why the Municipality of Enschede uses drones at parks

Q41 In the following please indicate your agreement with some statements concerning the use of drones during **business parks. (Scale from strongly agree to strongly disagree)**

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

What is your age?

Q43 What is your gender?

Male

Female

Q44 What is your highest completed level of education?

Primary School (Lagere School; Grundschule)

Secondary School (e.g. VMBO; MAVO; Realschule)

Higher secondary education (e.g. MBO; Berufsfachschule)

Intermediate vocational education (e.g. HBO; Fachochschule)

Higher vocational education

Bachelor's degree

Master's degree

Doctoral degree

Other _____

What's that flying above my head?

Q45 What is your place of residence?

_____

Q46 How often do you visit Enschede?

On a daily basis

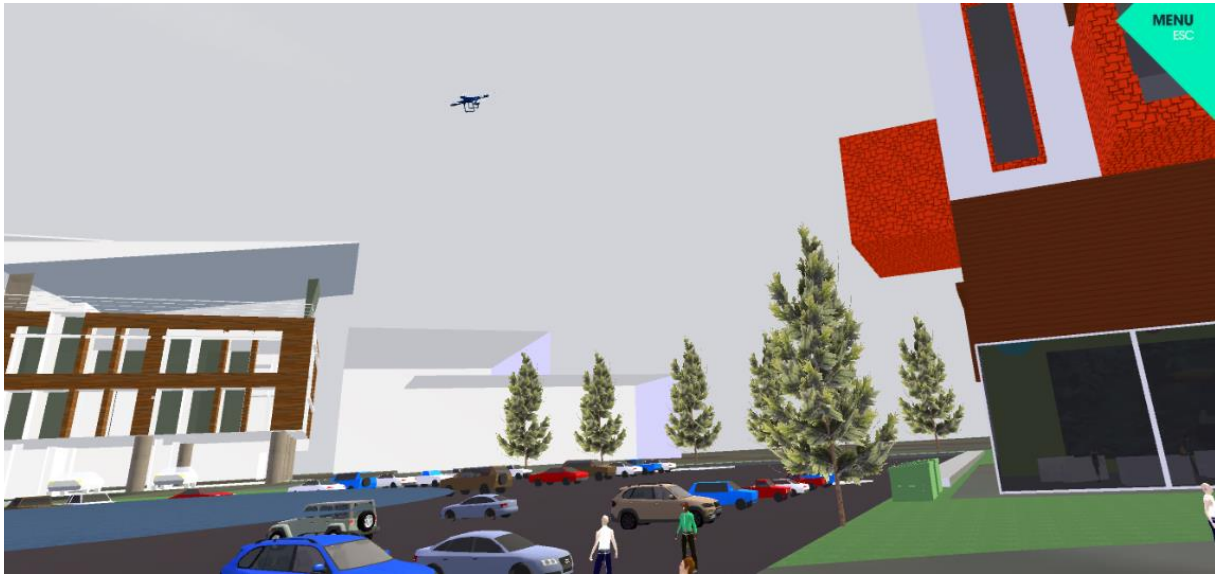On a weekly basis

On a monthly basis

A couple of times per year

Once per year or less

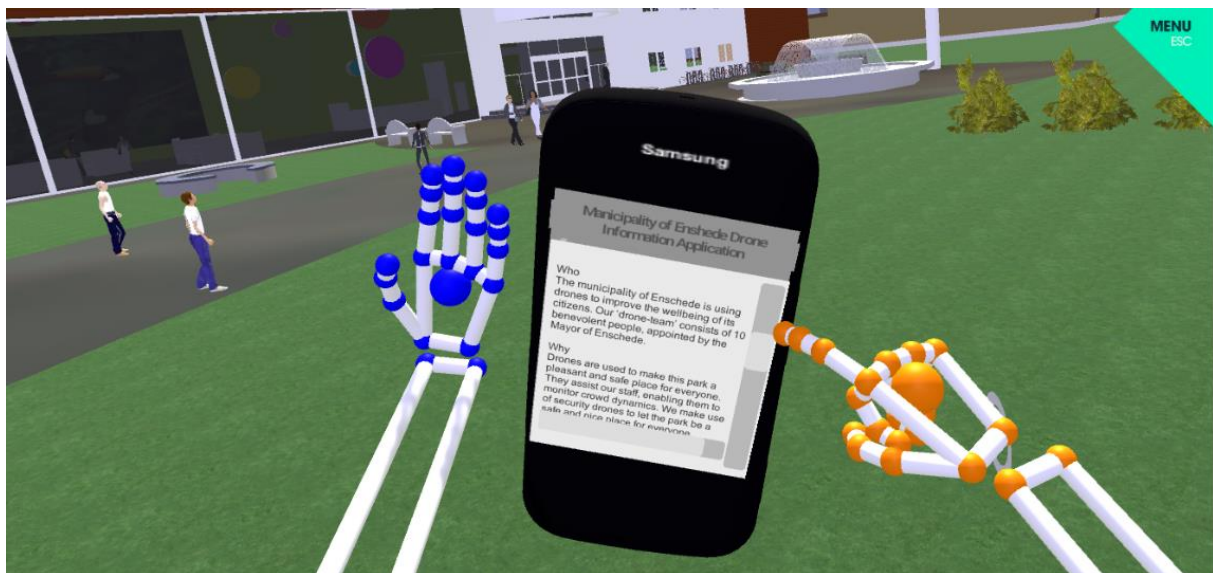# Appendix C

Pictures of the VR

What's that flying above my head?

Appendix D

Informed Consent

You are invited to participate in our research study titled
'Being filmed by a drone violates your privacy...right?'.

The purpose of this study is to investigate which factors might influence drone acceptance in general and will take approximately 30 minutes.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to ask questions whenever they emerge.

The risks associated with the study might be minor physical discomfort (headache) if being exposed to the VR for too long. This is hopefully not going to be the case in this study.

The data of this study is used as findings for a bachelor thesis topic. Your personal information is going to be handled confidentially and will not be shared with anyone beyond the study team.

By agreeing with this informed consent you agree that your anonymized information is going to be shared with researchers for future studies. This information is not going to include any information that could identify you directly.

Do you agree to participate under the conditions mentioned above?

Yes, I consent with participation in accordance with the information above.