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Emotional compass: What drives us to share GPS locations online?

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Abstract

This thesis investigates the correlation between personality traits and willingness to share GPS locations in the context of location-based services (LBS), examining the potential existence of a "data privacy paradox" in which stated privacy concerns are not consistent with actual data sharing behaviour. Using secondary data from the LISS panel, which includes a representative sample of Dutch people, logistic regression and proportional odds models were used to analyse the impact of the Big Five personality traits, which is Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism, on privacy concerns and willingness to share GPS locations.

Keywords

Big Five, personality traits, willigness to share GPS location online, privacy concerns

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1. INTRODUCTION

Nowadays, privacy-related behaviours have become a very important area of research. While location-based services (LBS) are becoming more common, the sharing of GPS data is causing people to have concerns about their privacy. In turn, companies are increasingly curious about what factors influence individuals' willingness to share private information (Jiang, et al., 2021). At the same time, with highly advanced apps that require and benefit from access to users' locations - from social media platforms to navigation tools - the decision to share GPS location has become a common dilemma for many people (Huang, et al., 2018).

The decision to share GPS information is not simply technical or privacy-related (Sun, et al., 2015). On the contrary, it is strongly linked to individual differences such as age (Steijn & Vedder, 2015), gender (Sun, et al., 2015), and education level (O'Neil, 2001). When other areas have been tested, it would be interesting to analyse the effect of the popular Big Five Model framework, which divides personality into five dimensions: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. This framework allows to test how people make various decisions, also those about sharing GPS location online (Liu & Campbell, 2017; Picazo-Vela, et al., 2010).

It is also true that, that to this date, researchers have primarily focused on examining the relationship between individual characteristics and general privacy concerns. However, those concerns do not always translate into whether Internet users will share their data online or not (Gerber, et al., 2018). The so-called "data privacy paradox" shows an interesting gap between consumers' stated privacy fears and their behaviour in real life - people in surveys and experiments state they are concerned about their privacy online and, even though, choose to share their private information online, often without much hesitation (Bandara, et al., 2020; Chen, et al., 2021). An article by Spyros Kokolakis (2017) summarised all the major articles related to the data privacy paradox. It indicates that Privacy Calculus Theory and people's familiarity with sharing information online may lie behind this phenomenon. In other words, people are so used to sharing private data that they no longer pay attention to it. In addition, individuals are often influenced by an optimism bias, which make them confident that their data will not be used in undesirable ways. With the existence of the "data privacy paradox", it is impossible to transfer the conclusions on online privacy concerns to people's willigness to share GPS location via smart devices.

There are a lot of articles focusing on factors that influence willingness to share GPS locations in the context of LBS. However, they are dominated by studies focusing on users'

trust in companies which collect data, their privacy concerns, their technology literacy and the perceived benefits of sharing their location (Gerpott & Berg, 2011; Kim, et al., 2017; Kummer, et al., 2018). Going forward, there is no research on the impact of character traits on this willigness to share GPS location. This is an obvious gap, as personality traits can predict numerous human behaviours (Ozer & Benet-Martínez, 2006), also in digital environments (Correa, et al., 2010; Stachl, et al., 2017).

As it has not yet been investigated how personality traits would affect the willingness to share one's location online within the location-based services (LBS), this paper will address a gap in current research with the question:

"To what extent do personality traits influence willingness to share GPS locations in the context of location-based services (LBS) and privacy concerns?
Can the data privacy paradox be observed among users of these services?".

The existence of the "data privacy paradox" indicate that researchers should shift their attention more towards analysing the factors that influence users' actual online behaviour. By focusing on the research question above, the study aims to contribute to understanding of the psychological factors that underlie privacy concerns and privacy-related behaviour. Moreover, this study has the opportunity to test whether the 'data privacy paradox' truly exists, as some researchers have already managed to challenge its existence (Solove, 2021).

The study results will provide valuable insights on users' privacy behaviour, making it easier for companies to design more privacy-conscious location-based services (LBS). It is worth to mention that nowadays, it is possible to create personality profiles of people based on their digital footprints (Azucar, et al., 2018; Hinds & Joinson, 2019). Understanding how personality traits affect people's willingness to share their GPS location can help managers tailor products to their target segment much better. In addition, managers could better tailor requests for data sharing, making people more comfortable with online applications. This, in turn, has a significant impact on the companies' businesses. With the location data collected, managers can tailor marketing campaigns to the specific areas and offer personalised offers to customers located in a particular location. Finally, with the results of the study, companies could create customisable privacy settings or customized privacy notifications based on personality profiles. This could potentially increase users' trust in technology applications.

In terms of social relevance, the findings of this study will offer insights for policymakers in developing more effective and informed strategies to promote digital responsibility. As already stated, it is possible to create personality profile based on users' digital footprints. Thus, the results of this study may have implications for the development of

social campaigns. If certain personality types are identified as less inclined to proactively protect their privacy, organisations can approach these individuals with campaigns warning them of the potential risks of such behaviour. On the other hand, such knowledge may imply a reduction in policymakers' expenditures on such campaigns. If certain groups are already alarmed enough about the possible negative consequences of location sharing, they may not be targeted so often and intensively. In conclusion, this study can help improve the effectiveness of current efforts to improve digital responsibility among the people.

Finally, the usage of the Big Five personality model in the context of digital behaviour will expand academic knowledge of how individual differences influence willingness or unwillingness to share data online. It is likely that this study will inspire future researchers to better explore the relationship of personality traits to other situations in which people must choose to share private information. In addition, this study provides a basis to go further and see if there are sets of characteristics that more or less strongly influence people's engagement in privacy-related activities. Finally, the thesis also provides a solid overview of existing research on the links between personality traits, privacy concerns and privacy-related behaviour.

The work is divided into three main parts. The first reviews the most relevant articles and theories that help explain the concepts described. This section also includes the formulation of hypotheses. The next section, methodology, describes the data, how it was collected, and which variables were taken to investigate the research question. The following part contains the result of the research. The conclusion of the paper summarises the results of the study and explains the limitations of the research.

2. LITERATURE REVIEW

This chapter will address the concept of location-based services (LBS), focusing on the willingness to share sensitive data online and privacy concerns in general. Key research and theories will also be presented, including the "data privacy paradox". The first part will focus on the willingness to share sensitive information online in the context of LBS, while the second part will focus on privacy concerns in general.

2.1. Location-Based Services

Location-Based Services (LBS) use users' geographic location from mobile devices to provide various offerings and also to increase the efficiency and personalization of mobile services and apps (Junglas & Watson, 2008). The history of location-based services is closely linked to the evolution of mobile technology. As devices such as smartphones and smartwatches become more advanced and omnipresent, companies can now use users' GPS location to increase human engagement through the geographical personalisation of services (Thapa, et al., 2024) and gain profits from location-based targeted advertising (Banerjee & Dholakia, 2012). Individuals can also benefit from such personalised offerings. It could be by providing geographically relevant information and services, such as navigation, local traffic updates, weather forecasts and emergency services, to more advanced ones, such as apps and games that offer rewards for location-specific activities and integration of augmented reality (AR) for better experience (Uphaus, et al., 2021). Despite the many advantages of LBS, not everyone wants to share their geolocation with mobile apps. The unwillingness to share such data may come from privacy concerns about the usage, storage and disclosure of such knowledge. For the majority of people, location details are considered highly sensitive, exposing insights into their daily routines and habits (Gadzheva, 2007).

2.1.1 Theories and models in use

To better understand individuals' willingness to share or withhold personal information online, it is crucial to know theories and models related to privacy behaviours. The Privacy Calculus Model, a theoretical framework from 1977, presumes that users engage in a cost-benefit analysis to determine if the benefits of disclosing personal data, such as personalised services, social connectivity or economic incentives, outweigh the potential risks or costs, such as loss of privacy, misuse of data or identity theft (Culnan & Armstrong, 1999; Jozani, et al., 2020). According to Acquisti and Grossklags (2005) people may tend to disclose personal data

online because they prioritize immediate rewards over long-term privacy risks. In this context, the model suggests that people's online decisions to share private data are not solely based on privacy concerns but also on a rational evaluation of the trade-offs between positive outcomes and negative consequences. In line with this theory, if a person feels that the benefits of sharing location outweigh concerns about the misuse of the data, the person will be willing to share their location with the app.

Another framework, the Technology Acceptance Model (TAM), was developed by Fred Davis in 1989 as extension of the Theory of Reasoned Action (TRA) by Ajzen and Fishbein (Oye, et al., 2014). The model proposes that people's eagerness to use technological devices is influenced by two factors: perceived ease of use and perceived usefulness. In the context of mobile devices and apps, if a person believes that sharing private data will enhance the apps' usefulness or make it easier to use, she or he will be more inclined to do it (e.g. Marangunić & Granić, 2015). Over the years, the TAM has been evolving and been broadened to include additional variables such as subjective norms, sense of self-efficacy and enjoyment of results (Rosli, et al., 2022).

Finally, the Theory of Planned Behaviour (TPB) explains that individuals' behaviour is driven by three components: their intention, which is influenced by their attitudes towards the behaviour, social influence and perceived control over the effects of their actions (Ajzen, 1985; Conner & Armitage, 1998). In the context of LBS, the decision to share a location will depend on the one's attitude towards sharing sensitive data and the perceived control over the negative consequences of such actions. The Theory of Planned Behaviour (TPB) has been shown to account for 27% of the variance in behaviour and 39% in intention to behave in a certain way (Armitage & Conner, 2001). TPB has been applied to various domains widely, including health, environmental behaviour and consumer habits (Manning, 2009).

The above theories show that despite concerns about sharing private information online, people are still willing to do so if they think they will benefit from such behaviour.

2.1.2 Big Five model

In addition to models discussed above, the behaviour itself can be explained by the Big Five model. This theory identifies five broad dimensions of human personality traits: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism (OCEAN). These dimensions provide the most widely accepted framework for understanding personality variability among individuals, providing a description of how people differ in their tendencies to think, feel and behave (McAdams & Pals, 2006). According to the article by Ozer and Benet-

Martínez (2006), personality significantly influences behaviour by predicting a wide range of individual, interpersonal and social effects. Significant links have been established within this framework between individual personality traits and their trust in technology (Bansal, et al., 2016; Junglas, et al., 2008; Junglas & Watson, 2008).

2.1.2.1 Openness

Openness describes individuals' eagerness to seek new experiences, engage in creative and artistic activities, and try new things. People with high openness are more likely to approach problems with innovative, yet riskier, decisions (DeYoung, et al., 2014). According to research by Moshe Zeidner and Gerald Matthews (2000), openness is the strongest positively correlated trait with intelligence, intellect and curiosity about the world. This is why, although such people are open to new experiences, they develop a deep awareness of risks and often reach for available knowledge (Chen, et al., 2017). This trait also shows the second strongest correlation with computer literacy, which also, like the description of people with this trait, indicates that people with openness are often more willing to explore new things and learn (Ahmed & Rasheed, 2020).

Three years ago, Sindermann et al. (2021) surveyed 1,073 German respondents using an extensive questionnaire. The researchers examined people's knowledge of online privacy and online behaviour, and asked them to complete the Big Five and an intelligence test. Then, linear models were used to understand what correlates with people's online privacy skills and online behaviour. The researchers chose to include in linear models variables such as gender, age, character traits, intelligence and educational background. The correlational analysis showed that openness was the only trait among OCEAN which was positively linked to online privacy literacy, which in turn was positively correlated with online privacy behaviour, meaning that people who were more open were less likely to share their data online. These results are in line with those of another study, which found a positive correlation between openness and privacy-friendly behaviour on social media sites, meaning people who score high in Openness were less likely to share their private information on social media platforms (Li, et al., 2019). Additionally, a 2015 study found that openness is not linked to either perceived usefulness or actual usage of new technologies (Barnett, et al., 2015). On the basis of Privacy Calculus Theory, these results could indicate that such individuals will not be willing to share their location online due to a lack of belief in the benefits of such an exchange. Same conclusions can be drawn from Technology Acceptance Model, which suggest that people will not share

their personal information when they do not believe that sharing data will, in fact, enhance usefulness of an app or service. Therefore, the first hypothesis is:

H1: *Individuals' openness is negatively correlated with willingness to share GPS location online.*

2.1.2.2 Conscientiousness

High *Conscientiousness* is associated with reliability, discipline, and a strong work ethic (Roberts, et al., 2009). Conscientious individuals are often well-organized, mindful of details, and careful about their decisions (Roberts, et al., 2009). This should imply that this characteristic will be negatively correlated with the willingness to share personal data online. However, studies do not agree on this issue.

The first research in discussion surveyed a young sample of 382 undergraduate students in 2015 (Barnett, et al., 2015). The study was split into three parts, allowing for more complex and elaborate questionnaires. The researchers wanted to see how the Unified Theory of Acceptance and Use of Technology (UTAUT) and personality traits are correlated with behavioral intention to use technology and actual usage of technological devices. Data were examined using the SEM method. The study confirmed that the perceived benefits of using technology are significantly and positively correlated with the degree to which students use technology on a daily basis. In terms of character traits, only two of them had a statistically significant effect on the dependent variables. Conscientiousness, one of them, had a positive effect on intention and actual use of technology, which was in line with the literature review, which noted that highly conscientious individuals are driven to be productive, sufficient, and successful (Barnett, et al., 2015). Findings from the research, as well as Technology Acceptance Model, suggest that conscientious people may be more prone to share their personal data online. It is so because they use technology more often and this is connected to the fact that they positively assess the benefits of using it. A study conducted a year later found that conscientiousness was not statistically significant when it came to sharing sensitive health data online, indicating that highly conscientious individuals were neither averse nor prone to share personal data online (Bansal, et al., 2016). Summarising the above research results, it can be said that conscientiousness makes people more willing to share private data online, because conscientious people see many advantages of using technology. Thus, a second hypothesis was formed:

H2: *Individuals' conscientiousness is positively correlated with willingness to share GPS location online.*

2.1.2.3 Extraversion

Extraversion is a tendency to be outgoing, talkative and energetic. Extraverts usually feel comfortable in social settings and they are energised by others' companions (Judge, et al., 2002). In addition, they usually like to be the centre of attention in relationships, events and other interactions. Consequently, extroverts focus more on the relationships' well-being than their own (Argyle & Lu, 1990). Moreover, extraversion is proven to be strongly and positively correlated with optimism (Sharpe, et al., 2011), which may suggest, in the context of sharing data on the Internet, that such individuals would be less concerned about the misuse of their private data.

In 2016, a study was conducted to explore correlations between character traits and privacy concerns and trust in data collectors (Bansal, et al., 2016). The study used an experimental method, focusing on financial, purchasing and health contexts to explore the sensitivity of information disclosure. The results of the study showed that extraversion had a positive impact on trust in data collection authorities in all contexts (Bansal, et al., 2016). In addition, a more recent study suggests that extraversion is neither correlated with privacy-friendly behaviour online, meaning that extroverted people are more prone to share private data online, nor with web privacy literacy (Sindermann, et al., 2021). This trait is also the most positively correlated trait with computer literacy (Ahmed & Rasheed, 2020). As mentioned later in this section, people who are more familiar with technology may be more or less willing to share private information depending on the context. Unfortunately, there are a lot of research that draw different conclusions about the effect of computer literacy on privacy behaviour online. To assess the direction of the extraversion's effect, it is worth mentioning that in terms of overall willingness to share information, this particular trait has the most significant positive impact among OCEAN (Pei-Lee, et al., 2011). The study by Pei-Lee et al. (2011) found that extroversion is positively correlated with the usage of social platforms, where extroverts are more likely to post updates and interact with friends compared to introverts. At the same time, extroverts are more prone to creating and sharing private content online, as this is one way to be close with their friends. Many platforms now provide the opportunity for people to share their location in order to stay up to date with their followers and friends. In accordance with TAM and articles cited, extroverts may see more benefits of sharing personal data than drawbacks of doing so. Taking into account all the studies and the description of people with a high extroversion index, a third hypothesis was developed:

H3: *Individuals' extraversion is positively correlated with willingness to share GPS location online.*

2.1.2.4 Agreeableness

The next trait, *Agreeableness*, is a tendency to be cooperative and compassionate towards other people rather than suspicious and antagonistic (Graziano & Eisenberg, 1997). Others often see agreeable people as friendly, supportive and gullible (Bradley, et al., 2013). On the other hand, this characteristic also has its negative side. People displaying significant agreeableness often have problems with being assertive. This, in turn, has the effect that such people will find it difficult to refuse requests or situations they're uncomfortable with (Seibert & Kraimer, 2001).

Regarding the digital environment, the trait was proven to not correlate with both online privacy literacy and behaviour, suggesting that highly agreeable people are not aware of potential risks of sharing personal data on the Internet (Sindermann, et al., 2021). On the other hand, this trait was proven to positively impact the perception of risk associated with sharing confidential health information online by the research made in 2010 (Bansal, et al., 2010), which, in light of the theories discussed, may indicate that agreeable individuals may be more averse to share information. Hence, both articles do not present consensus about the effect of agreeableness on sharing personal information online.

Regarding different contexts, this characteristic does not always correlate with trust in the good intentions of those collecting the data. Interestingly, in the more sensitive information context, highly agreeable individuals will have more trust in entities that collect data (Bansal, et al., 2016). This could be because usually more sensitive data is collected by more trusted entities, e.g. hospitals or local governments. It is also in line with the description of the trait, which says that agreeable people are not suspicious towards others. Finally, it is worth citing the results of a study on personality traits and privacy control behaviour on social networking sites (SNS), with a focus on young users in China. Using questionnaires, the researchers surveyed more than 200 students and then conducted Pearson correlations, path analyses and regression analyses to investigate the direct and indirect effects of personality traits on privacy control behaviour. Contrary to the researchers' predictions, agreeableness was found to be negatively correlated with adjusting privacy settings, and the effect was statistically insignificant (Li, et al., 2019). This may indicate that agreeable people do not pay attention to privacy-friendly behaviour, and would not pay attention to privacy settings and potential leaks of their personal data. Since the majority of articles suggest that agreeable people will be either

more prone to share their personal data online or they will be not afraid of potential risks of such sharing, the forth hypothesis is:

H4: *Individuals' agreeableness is positively correlated with willingness to share GPS location online.*

2.1.2.5 Neuroticism

The last characteristic, Neuroticism, is described as emotional instability, anxiety, irritability and sadness. Neurotic people have a higher tendency to feel negative emotions, such as worry, fear, and anger (Uliaszek, et al., 2010). Additionally, they are more risk-averse (Oehler & Wedluch, 2018). High neuroticism is also associated with a tendency towards pessimism. People with this trait often anticipate the worst and think too much about the negative consequences of their actions (Marshall, et al., 1992).

Using a questionnaire and correlation study, Chen (2017) showed that emotional instability does not affect individuals' concerns about misusing their personal information online. Hence, neurotic people would be more prone to share their private data online, because they do not anticipate that someone could use their private data in a undesirable way. Additionally, according to Sindermann et al. (2021), neurotic people are less likely to score high on a test measuring knowledge related to privacy-friendly behaviour online, meaning that they are less knowledgeable about protecting their personal information in digital environments.

On the other hand, the 2019 study indicates that neuroticism is a strong and positive predictor of interest in privacy settings in the context of social media (Li, et al., 2019), which is in line with the description of the people who score high in Neuroticism. Such people experience almost constant anxiety in normal situations. In addition, the 2020 study confirmed that the trait is negatively correlated with computer literacy. This indicate that emotionally unstable people may be less aware of how to navigate the web correctly (Ahmed & Rasheed, 2020), and they could be less aware of benefits of sharing personal data. This statement is confirmed by a 2015 study which found out that neuroticism is negatively correlated with general perceptions of the usefulness of technological devices. In light of Technology Acceptance Model and Privacy Calculus Model, neurotic people will be less prone to share personal data because they do not believe that this action will enhance the devices' usefulness and they do not see benefits of doing so. Hence, the fifth hypothesis is:

H5: *Individuals' neuroticism is negatively correlated with willingness to share GPS location online.*

2.1.3 The moderation effect of perceived sensitivity of data

A variable that can significantly influence willigness to share GPS location online is also the perceived sensitivity of data in different contexts. Bansal et al. (2010) demonstrated that character traits are correlated with individuals' perceptions of data sensitivity, particularly in contexts like health information, which is deemed highly sensitive. A 2013 study showed that location information is considered one of the most sensitive, significantly and negatively influencing users' willingness to share their location with mobile apps (Leon, et al., 2013). In addition, researches have shown that the perceived sensitivity of personal data increases the strength of the factors influencing people's willingness to share data online such that those people are more concerned about unwanted use of data (Lidynia, et al., 2017; Yang & Wang, 2009).

In light of the Privacy Calculus Model, the perceived sensitivity of the data can act as a moderator in the relationship between personality traits and willingness to share GPS location. For example, individuals with certain personality traits may generally be less willing to share their location data, however, if they perceive their location data as highly sensitive, this willingness is likely to decrease even more. Therefore, in the study, it was decided to test whether perceived and subjective evaluations of how sensitive location data are, would strengthen or weaken the effect of character traits on the dependent variable.

The next hypotheses are as follows and also derive from the earlier description of personality traits:

H6a: *Perceived sensitivity of GPS location moderates the relationship between openness and willingness to share GPS locations online such that the negative effect is stronger when people perceive their location information as highly sensitive.*

H6b: *Perceived sensitivity of GPS location moderates the relationship between conscientiousness and willingness to share GPS locations online such that the positive effect is weaker when people perceive their location information as highly sensitive.*

H6c: *Perceived sensitivity of GPS location moderates the relationship between extraversion and willingness to share GPS locations online such that the positive effect is weaker when people perceive their location information as highly sensitive.*

H6d: *Perceived sensitivity of GPS location moderates the relationship between agreeableness and willingness to share GPS locations online such that the positive effect is weaker when people perceive their location information as highly sensitive.*

H6e: *Perceived sensitivity of GPS location moderates the relationship between neuroticism and willingness to share GPS locations online such that the negative effect is stronger when people perceive their location information as highly sensitive.*

2.1.4 Other factors that may influence the willingness to share GPS locations

However, not only personality traits and perceived sensitivity of data influence the willingness to share one's location in the context of LBS. In fact, other differences may play a major role when it comes to privacy self-restrictions.

2.1.4.1 Technology literacy

Technology literacy, as a variable that may explain why people are more or less familiar with how to protect their privacy online, has already been proposed by Sindermann et al. (2021) in his study. This variable has a potential to explain the willingness to share one's location. In the article already quoted, Bansal (2016) showed that people with more online experience will be more willing to disclose personal information in both more sensitive and less sensitive contexts. There are also studies indicating that people who have higher technology literacy experience less stress with technology adoption (Lee & Huang, 2014; Beckers & Schmidt, 2003). In the 2003 study, more than 180 people were surveyed in the first part and asked through questionnaires about their computer and digital skills and concerns about using computers and the Internet. The SEM method was then used to analyze the data. The study showed that the more experience a person had in using a computer, the less stress they felt about using technology (Beckers & Schmidt, 2003).

However using technology and technology adoption is not the same as sharing personal information online. There are a number of studies that show that the more people use technology, the more knowledgeable they are about privacy online (Bartsch & Dienlin, 2016; Park, 2013). The results of one study suggest a complex interaction between users' knowledge and privacy control behaviour. While digital skills play a key role, the extent to which individuals engage in privacy control behaviours also depends on their access to and use of the Internet and the relation is moderated by sociodemographic factors (Park, 2013). Another study found that people with greater privacy knowledge are more likely to restrict access to their social network profiles (Bartsch & Dienlin, 2016). The next article, written by SoeYoon Choi (2023), highlights that cautious privacy behaviour is significantly and positively shaped by the frequency of technology use by users and their technological proficiency. Another article,

describing a survey among students characterised by high technology literacy, also found that these individuals are not as willing to share their location online, especially with external parties (Belligoni, et al., 2023). Finally, the authors of the 2022 article argue that technological skills, which are a key factor in online privacy and security, negatively affect willingness to share private information online (Hirschprung, et al., 2022). From articles mentioned above one can assess that the relationship between technology literacy and privacy behaviour online exists but the direction of the technology literacy effect can differ based on the context and research group. Although the first article suggested that technology literacy positively correlates with online data sharing, most articles seem to draw the opposite conclusion. Hence, the seventh hypothesis is:

H7: *Technology literacy is negatively correlated with the willingness to share GPS location online.*

2.1.4.2 Demographics

The importance of demographic differences cannot be underestimated, as they play a major role when it comes to self-restrictions on privacy. In general, reluctance to share private data online increase with age (Kezer, et al., 2016; Steijn & Vedder, 2015; Steijn, et al., 2016), and adults seem to be most aware of threats that arise from sharing private information on the Internet (Van den Broeck, et al., 2015). The groups that seems to be least concerned about online privacy are adolescents and elderly, as they are the least involved in privacy-related activities (Sheehan, 2002; Steijn, et al., 2016). According to article written by Steijn et al. (2016), young people are typically more focused on the immediate social rewards of SNS usage, and because of that, they are more willing to display private information online. Those findings are confirmed by the Seounmi Youn (2009), who further suggest that adolescents see the most benefits from data sharing. This, in turn, make youngsters more willing to share personal data online, as they think that benefits of doing so outweigh potential risks. However, young adults are proven to engage in behaviours to improve their online privacy as they get older, and higher Internet proficiency positively influences the relationship between age and privacy, reinforcing this effect (Boyd & Hargittai, 2010). Taking everything into consideration, the eighth hypothesis is:

H8: *There is a quadratic relationship between age and willingness to share GPS locations online. Specifically, willingness to share initially decreases with age and then increases at older ages, indicating a U-shaped pattern in which both age and the square of age (Age^2) are significant predictors.*

Regarding gender differences, studies do not present a consensual position. Some studies indicate that women are generally more anxious about the consequences of sharing personal data (Goldfarb & Tucker, 2012; O'Neil, 2001; Youn, 2009), and other confirm this relation, indicating that men are more inclined to take a risk when posting personal and intimate information or content online (Fogel & Nehmad, 2009). However, when it comes to privacy behaviour online, men showed stronger overall information security behaviours compared to women. Additionally, females were more likely than males to believe that other parties had security measures in place and their data is protected (McGill & Thompson, 2018). A 2019 article perfectly summarises gender differences in the context of online data sharing. According to the literature review, women are more likely to post on social media, upload photos and use apps. However, despite being more active, women are also more likely to activate privacy settings and less frequently disclose personal data in their profile, the study proved (Tifferet, 2019). Hence, the ninth hypothesis is:

H9: *Women are less willing to share a GPS location online.*

The last variable that could influence privacy behaviour online significantly is education, as indicated in several articles on this subject. It is proven that individuals with a higher level of educational attainment are less willing to share their private information than those less educated (Acquisti & Gross, 2006; Ögütçüa, et al., 2016). This is related to the fact that people with higher levels of education show greater Internet proficiency (Goldin & Katz, 2018; van Deursen & van Dijk, 2011), which is positively correlated with online privacy awareness (Park, 2013). Therefore, the tenth hypothesis is:

H10: *Higher education is negatively correlated with willingness to share GPS location online.*

The table below summarises the most relevant studies cited in this chapter related to character traits.

Table 1. Summary of the cited articles

Study	Sample		Study design	Methodology	Dependent variables	Mediator/ Moderator	Key findings
	No. of respondents	Age of respondents					
Bansal, et al., 2010	367	18-31 (males), 18-44 (females)	Correlational	Survey-based approach; CFA and EFA	Perceived sensitivity of information	Trust in technology (mediator)	Neuroticism and agreeableness positively impacts the perceived sensitivity of health information in the context of sharing private data online. In turn, the perceived sensitivity of information is positively correlated with privacy concerns; Extraversion is not linked to the perceived sensitivity of sharing private information online.
Barnett, et al., 2015	382	Average age of 21.9 years	Correlational	Survey-based approach; CFA	Perceived and actual use of technology	Behavioral intention	Conscientiousness positively correlates with both perceived and actual technology use, while neuroticism negatively influences these aspects; Extraversion did not positively impact actual technology use; The link between personality traits and technology use was direct, unaffected by behavioral intentions to use the technology.
Bansal, et al., 2016	367	18-31 (males), 18-44 (females)	Experimental	Survey-based approach; CFA and EFA	Internet privacy concern; trust in the website	None	Conscientiousness does not significantly affect privacy concern or trust; Neuroticism is positively correlated with privacy concerns, while the impact on trust is insignificant; Agreeableness positively influence both privacy concern and trust; Extraversion is negatively linked to privacy concerns and positively to trust.
Li, et al., 2019	231	17-23	Correlational	Survey-based approach; SEM	Privacy control behavior on SNSs	None	Neuroticism and openness significantly influence privacy control behaviour on SNS. Neuroticism positively influenced privacy-related behaviour, as well as openness.
Ahmed & Rasheed, 2020	225	Not specified	Correlational	Survey-based approach; Pearson's correlation	Computer and digital literacy (among others)	None	Extraversion is positively linked to computer literacy, while neuroticism negatively. Extraversion was the personality trait most positively associated with digital literacy, as well as conscientiousness and openness. Neuroticism is negatively linked to digital literacy.
Sindermann, et al., 2021	1073	Average age of 38.67 years	Correlational	Survey-based approach; Quasi-Poisson regression	Privacy literacy and privacy behaviors	None	The relationship between most personality traits and privacy behaviour is insignificant; Openness positively impacts online privacy literacy, while agreeableness negatively.

Source: Own development based on articles cited

To summarise, the most recent overview of studies on the issue shows that it has not yet been tested how character traits could directly influence the willingness to share one's location with GPS (Gerber, et al., 2018). This highlights the opportunity for the upcoming research to make a contribution by exploring the relationship between character traits and the dependent variable in question. Additionally, none of the studies used perceived sensitivity of data as a moderator between character traits and privacy behaviour.

2.2 Privacy concerns

Privacy concerns refer to the concerns and issues people have about how their personal data is used, collected, stored and shared by others, particularly companies, governments or other entities. The extent to which an individual will be concerned about their data online will depend on many demographic variables, such as age, educational attainment and gender (Lee, et al., 2019). According to the article, which summarises the most important articles on the subject, other factors also contribute to these concerns, such as governmental regulations, personal knowledge, computer anxiety, information sensitivity, and the context in which the data are collected (Li, 2011).

Personality traits were also among the variables that can predict privacy concerns (Junglas, et al., 2008). In fact, the relationship between character traits and these concerns has been studied many times. That would indicate that a study on the correlation between personality and willingness to share personal data would not contribute much to the current literature. However, the existence of the “data privacy paradox” perfectly demonstrates that privacy concerns cannot be compared with data sharing in reality.

2.2.1 “Data privacy paradox”

The “data privacy paradox" shows that although people often express concerns about their privacy, they still engage in activities that violate that privacy, such as sharing personal data for small gains or on social media platforms. Kokolakis (2017) provides a complex review of the relevant literature exploring this paradox and presenting evidence of its existence. Based on the articles cited, the gap between stated privacy concerns and people's actual behaviour may be due to the expected benefits of data sharing, the desire for social interaction, cognitive biases and habitual use of technology, which makes people less careful. The existence of this paradox has been validated in the context of location-based services (Lee, et al., 2013; Zafeiropoulou, et al., 2013). On the other hand, there are some studies questioning the existence of this paradox,

although, as Kokolakis points out, their number is much smaller than those studies confirming its existence. Hence, tenth hypothesis states:

H11: *The "data privacy paradox" exists, meaning that privacy concerns are not correlated with the willingness to share GPS locations online.*

2.2.2 Personality traits and privacy concerns

As already mentioned, character traits often have a significant impact on privacy concerns and this has already been studied by several researchers. According to a study by Junglas et al. (2008), openness and conscientiousness are positively correlated with increased privacy concerns, while agreeableness is negatively correlated. Other traits, such as extraversion and neuroticism, have shown different effects in different studies. For example, Chen et al. (2017) confirm that conscientiousness, agreeableness and openness positively affect privacy concerns, while extraversion have a negative effect. The impact of neuroticism on privacy concerns was insignificant. However, two further studies have shown that neuroticism is significantly and positively correlated with privacy concerns, as well as agreeableness, and extraversion is negatively correlated with those concerns (Bansal, et al., 2016; Škrinjarić, et al., 2018). Interestingly, Korzaan and Boswell (2008) noted that only agreeableness was significant in their study, while Babajide Osatuy (2015) found that both conscientiousness and agreeableness positively influenced privacy concerns.

The diversity of these findings indicates that results may vary depending on the group studied and the cultural context. It was therefore decided that this study should, once again, explore the relationship between characteristics and privacy concerns. This approach will allow the results to be compared with a model explaining people's willingness to share their GPS location online. The table below summarises the above findings and allows hypotheses to be formulated.

Table 2. Summary of the relationship between personality traits and privacy concerns

	OCEAN				
	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Korzaan & Boswell, 2008	not tested	insignificant	insignificant	+	not tested
Junglas, et al., 2008	+	+	insignificant	-	insignificant
Osatuyi, 2015	not tested	+	insignificant	+	not tested

Bansal, et al., 2016	not tested	not tested	-	+	+
Chen, et al., 2017	+	+	-	+	insignificant
Škrinjarić, et al., 2018	insignificant	insignificant	-	insignificant	+

Source: Own development based on articles cited

Based on the above summary of articles examining the impact of character traits on privacy concerns, the following hypotheses were put forward:

H12: *Individuals' openness is positively correlated with privacy concerns.*

H13: *Individuals' conscientiousness is positively correlated with privacy concerns.*

H14: *Individuals' extraversion is negatively correlated with privacy concerns.*

H15: *Individuals' agreeableness is positively correlated with privacy concerns.*

H16: *Individuals' neuroticism is positively correlated with privacy concerns.*

2.3 Summary of the literature review

In summarising the literature review, it becomes apparent that there is a gap in the current body of research regarding the effect of character traits on individuals' willingness to share their location via GPS. Almost all articles discuss privacy behavior in general, i.e. people's behaviour regarding the protection of online privacy, which also is not the same as a real desire to share information. Privacy concerns also do not directly reflect users' reluctance to share their sensitive data online, which was described as a "data privacy paradox". Lack of studies on the direct impact of characteristics on the willingness to share GPS location online highlights the opportunity for the upcoming research to make a contribution by exploring this relationship.

The table below summarises all the hypotheses put in the paper and the variables used to test them.

Table 3. Summary of hypotheses

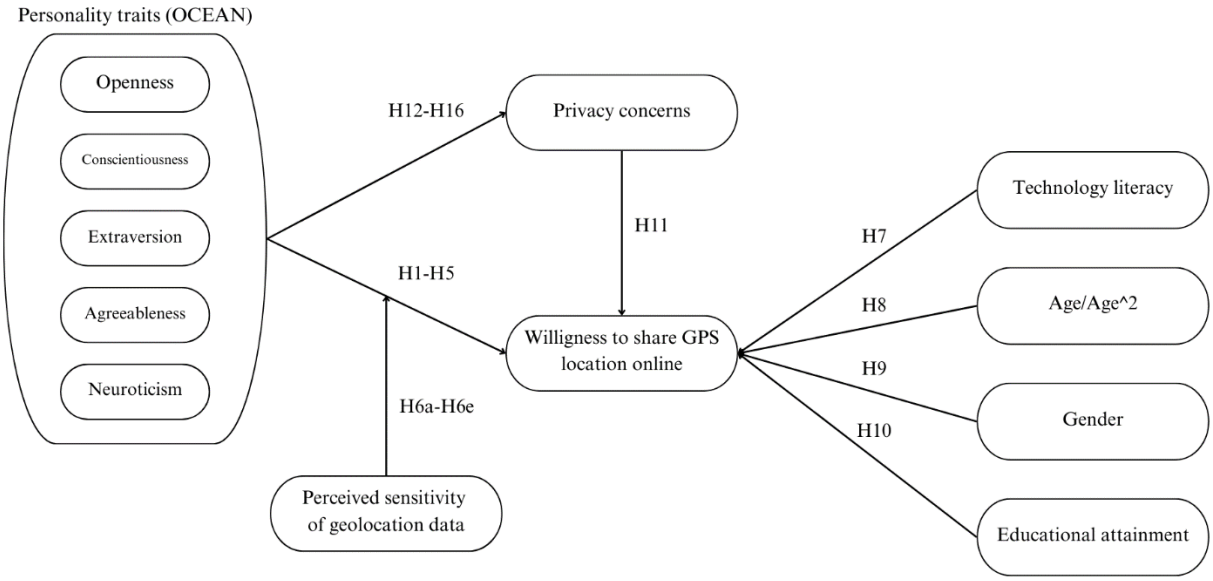
The hypothesis	**The independent variable used**
The model explaining willigness to share GPS location online	
H1: Individuals' openness is negatively correlated with willingness to share GPS location online.	Openness
H2: Individuals' conscientiousness is positively correlated with willingness to share GPS location online.	Conscientiousness

H3: Individuals' extraversion is positively correlated with willingness to share GPS location online.	Extraversion
H4: Individuals' agreeableness is positively correlated with willingness to share GPS location online.	Agreeableness
H5: Individuals' neuroticism is negatively correlated with willingness to share GPS location online.	Neuroticism
H6a-H6e: Perceived sensitivity of GPS location moderates the influence of personality traits by strengthening or weakening the effects of traits.	Perceived sensitivity of GPS location
H7: Technology literacy is negatively correlated with willingness to share GPS location online.	Technology literacy
H8: There is a quadratic relationship between age and willingness to share GPS locations online. Specifically, willingness to share initially decreases with age and then increases at older ages, indicating a U-shaped pattern in which both age and the square of age (Age^2) are significant predictors.	Age
H9: Women are less willing to share a GPS location online.	Gender
H10: Higher education is negatively correlated with willingness to share GPS location online.	Educational attainment
H11: The "data privacy paradox" exists, meaning that privacy concerns are not correlated with the willingness to share GPS locations online.	Privacy concerns
The model explaining privacy concerns	
H12: Individuals' openness is positively correlated with privacy concerns.	Openness
H13: Individuals' conscientiousness is positively correlated with privacy concerns.	Conscientiousness
H14: Individuals' extraversion is negatively correlated with privacy concerns.	Extraversion
H15: Individuals' agreeableness is positively correlated with privacy concerns.	Agreeableness
H16: Individuals' neuroticism is positively correlated with privacy concerns.	Neuroticism

Source: Own development

The conceptual model looks as follows.

Figure 1. Path diagram of the tested model



3. METHODOLOGY

This chapter aims to present a method for testing the validity of the hypotheses raised in the previous chapter. The data used in the study will also be described.

3.1 Data source

The study will be based on secondary data from the LISS panel data. The LISS panel is an online research unit located at the campus of Tilburg University that collects data on a representative population of Dutch people. The organization was found in 2007 and since then it has been managed by non-profit institute named Centerdata (LISS panel, 2024).

The LISS data archive is organized in three parts. In the first one, one can find background variables containing socio-economic and demographic information on panel members updated monthly. The second part contains the background surveys. These are surveys conducted by the LISS team every year and include 11 questionnaires on topics such as health, political views, religiosity or personality. In the third section, one will find the results of surveys carried out on the panel by external entities and parties. Each dataset contains a variable "nomem_encr" with unique IDs of the panel members, which can be used to link the datasets from all three parts (LISS panel, 2024).

3.1.1 Selected databases from the LISS data archive

In order to test all the hypotheses, it was decided to use the four available databases.

The first is a database with background variables and it includes information on gender, age, number of household members, place of residence, occupation and earnings (LISS panel, 2024). Survey data examining the personality and characteristics of each respondent in the panel was then taken from the second part of the archive. This questionnaire examines concepts such as, Big Five personality, happiness, life satisfaction, value orientation, social desirability and LOT-R (LISS panel, 2024).

A further two databases were created through the work of Bella Struminska from Utrecht University and Florian Keusch from University of Mannheim and University of Maryland, who conducted two studies with private funds. The first focused on the use of smart devices and privacy concerns. The second study, on the same research group, was conducted a month later. At that time, respondents were asked if they will be willing to share their phone's GPS location via app to take part in the new research. Respondents were encouraged to do so with a monetary incentive (Struminskaya & Keusch, 2019).

The table below summarizes key information about all four databases.

Table 4. The summary of all databases in use

Title	Abstract	Date of data collection	Number of responses	Key variables for the research
Background variables	Basic information about the respondents	March 2019	9856	Age, gender, highest level of education
Personality	Survey on personality and characteristics	May 2019	5075	Questions from the Big Five Inventory 2 (personality traits)
Smart Devices (part 1)	Questionnaire on smartphone use and privacy concerns	March 2019	2864	Privacy concerns, perceived sensitivity of data, technology literacy
Smart devices (part 2)	Question about consent to data sharing	April 2019	2539	Willingness to share GPS location online

Source: Based on information found on https://www.dataarchive.lissdata.nl/

3.1.2 Justification for choosing the data set

Using secondary data, such as the LISS panel data, for this research is a good choice for several reasons. Firstly, this dataset contains information about more than 2,000 people of different ages. This is a much larger and more diverse group than the studies cited in the literature review of this thesis. With information on people from each age group, the study's conclusions will be applicable to a larger number of individuals. In addition, the LISS dataset already contains all the necessary information, including personality traits and GPS-sharing behavior, to test the hypotheses. Finally, as it will be described further, the models need a huge population for developing results.

3.2 Data analysis method

The aim of this thesis is to look at the effects of personality traits, age, gender and education on willingness to share GPS locations online, with perceived data sensitivity operating as a moderator in the first model. The second model focuses entirely on examining the impact of personality traits on privacy concerns. Control variables will be included in the second model to avoid the problem of omitted variables. The path diagram of the model tested is shown on the page 24 (see Figure 1).

To investigate the hypotheses, logistic regression and proportional odds models will be executed using secondary data from the LISS panel.

3.2.1 Logistic regression explaining willigness to share GPS location online

To investigate the relationship between personality traits, demographic factors and willingness to share GPS locations online, a logistic regression model will be estimated using Maximum Likelihood Estimation (MLE). The form of the model is as follows:

$$log\frac{P(Y_i=1)}{1-P(Y_i-1)} = \beta_0 + \alpha PERS_i + \beta(PERS_i * Mod_i) + \partial T_i + \delta X_i + \varepsilon_i \quad (1)$$

The explanatory variable in the above model is the willingness to provide GPS location online by the respondent *i*. The variable $PERS_i$ is respondent *i*'s levels of personality traits and is represented by the Big Five NEO 2 test score. The variable Mod_i is a variable reflecting respondent *i*'s perceived sensitivity of their geolocation data. The variable T_i is a variable specifying the respondent *i*'s technological skills. The vector X_i includes variables relating to respondent *i*'s demographic characteristics including age, gender, educational attainment. There is a constant B_0, which represents the log odds of the outcome being "YES" when all predictors are held at zero.

3.2.2 Proportional odds model explaining privacy concerns

The second model in this thesis aims to investigate the relationship between personality traits and privacy concerns. The model has the following form:

$$\log\frac{\mathrm{P(Y_i \leq j)}}{\mathrm{P(Y_i > j)}} = \propto_0 - (\beta_1 * \mathrm{PERS_i} + \beta_2 * \mathrm{Y_i}) \qquad (2)$$

The dependent variable is ordinal and it depicts levels of privacy concerns. $P(Y_i \leq j)$ is the cumulative probability of the respondent *i*'s response Y being in category j or lower, while $P(Y_i > j)$ is the probability of being in a higher category than j. Vector Y_i includes all control variables, including individual characteristics of the person *i*. The model includes a intercept parameter $\propto_0$. It was decided to choose proportional odds model, instead of linear regression, because it is more appropriate for analysing dependent variables that are put in order. In that

case, proportional odds model allows more accurate predictions of the relationship. Linear regression could also work but, according to J. Scott Long and Jeremy Freese, having an ordinal dependent variable, the use of linear regression, although possible, could lead to inconsistent predictions (Long & Freese, 2006).

3.3 Selection of variables

The following subsection is divided into two parts. The first part explains the choice of control variables for the proportional odds model. The second part summarises all the variables that were used in both models.

3.3.1 Selection of variables in proportional odds model explaining privacy concerns

The second model used more control variables that were not hypothesized in the literature review. Variables were selected according to the already established relationships of the variables with privacy concerns, e.g. age variable and gender (Lee, et al., 2019), or based on correlation results shown in Appendix 2. To ensure the validity of including some variables, the current literature was checked.

The first variable is the *Average_Privacy* variable. This variable is the average of the responses to questions pi19a033-pi19a045. In these survey questions, respondents were asked to "indicate to what extent they consider the following information to be private", and then asked for a variety of items. Respondents answered by ticking from 1 (not at all private) to 5 (very private). A study published in Frontiers in Psychology indicates that the perceived sensitivity of information significantly affects general privacy concerns. The study indicates that people who perceive certain information to be highly sensitive, such as financial data or place of residency, tend to show greater overall concerns about their individual privacy (Belen-Saglam, et al., 2022). The variable *Average_Privacy* captures how much every individual perceive different types of personal information as sensitive. The Cronbach's alpha coefficient for the *Average_Privacy* is at 0.9. It indicates that the individual variables forming the mean of *Average_Privacy* reliably measure the same construct.

It was also decided to include the variable *Familiarity_With_Phising* in the model, as the variable was found to be highly correlated with both the dependent variable and some of independent variables, and leaving it out could lead to the problem of an omitted variable. Furthermore, it is logical that the more familiar a person is with the capabilities of data thieves and the potential dangers of such activities, the more concerned they will be about their online

data privacy. Additionally, this was confirmed by a study from 2023, which showed that the degree of familiarity with the effects of phishing has a significant impact on privacy concerns (Nguyen, et al., 2023).

The variables *Technology_Literacy* and *Average_Worry* were also found to be significantly correlated with the dependent variable. In the case of the variable *Technology_Literacy* it was decided to include it because of the proven relationship between technology literacy and privacy concerns (Park, 2013). However, there is no consensus on the direction of the relationship. While some studies show a positive correlation showing that greater technology literacy positively influence knowledge of risks and consequently increase privacy concerns (Saritepeci, et al., 2024), others indicate that overconfidence about skills can cause people to underestimate privacy risks (Ma & Chen, 2023). The reason for including *Average_Worry* is that research indicates that greater concerns about security of sharing personal information tend to lead to a greater privacy concerns, also for research purposes (Herbert, et al., 2021). However, not all studies present consensus view on this matter. A study by Chaudhuri, Chatterjee and Vrontis (2023) found that concerns about data privacy can vary based on circumstances. Privacy concerns can be diminished when data is requested from institutions or companies that are highly trusted. In the case of the study from 2023, the information was requested by the government, which wanted to improve its regulations. Because people perceived their government to be strong and effective, they were more confident in sharing their data because they both believed in the system and felt they were helping a trusted entity (Chaudhuri, et al., 2023). As this variable was created from questions asking respondents about their concerns about the collection of confidential information by LISS, the organisation that conducted the survey, this variable serves as a valid control variable. In addition, it is worth noting that this variable is an average of multiple questions. The Cronbach's alpha coefficient for the *Average_Worry* is at 0.89 and indicates that the individual items reliably measure the same construct. Furthermore, the results indicated that none of the variables, excluded from the mean, would significantly improve this score.

For the variables *Average_Privacy*, *Average_Worry* and *Technology_Literacy* it was decided to take the average instead of the factorials for three reasons. Firstly, for all 3 variables, factor analysis showed only two factors, which were additionally difficult to distinguish on the basis of the variables in the survey. This was confirmed by the correlation analysis between the factors. For *Average_Privacy*, the correlation between two factors was 0.74. For *Average_Worry*, it was also 0.74. Finally, for *Technology_Literacy*, the correlation between the selected two factors was 0.7. Such high correlations give an indication that the factors are

measuring similar constructs. In the end, it was decided not to split these variables into two factors, not to overcomplicate the model.

All control variables were included not only to avoid the problem of an omitted variable, but also because these variables will help to explain the relationship between the variables of interest, OCEAN, by controlling for external influences. This makes it easier to draw clearer and more accurate conclusions about the relationships between the dependent and independent variables.

The table below summarizes all variables taken to develop both models.

Table 5. Summary of the variables used in both models

Variable name	Description	The values taken by variable
Openness	Personality traits from the BFI-2 test (Big Five Inventory-2; 12 questions per one trait)	Numbers taking values from 1 to 5
Conscientiousness		
Extraversion		
Agreeableness		
Neuroticism		
Age	Age calculated using the formula: year of survey - year of birth of respondent	Numbers taking values from 17 to 92
Age_Squared	Age squared	Numbers taking values from 289 to 8464
Gender_Female	Gender variable (baseline is male)	Binary variable taking the values 0 or 1
Education_Primary_School	Those who indicated in the survey that the highest degree obtained was primary education	Categorical variable taking the values 0 or 1
Education_Secondary_School	Those whose highest education received is secondary education from the categories given: HAVO, VWO, MBO	
Education_Higher_Education	Those who indicated in the survey that the highest degree obtained was higher education; the variable does not appear in the model since it is baseline	
Technology_Literacy	Variable indicating respondents' familiarity with smartphone features and frequency of use. Respondents were asked pi19a012-pi19a027 to answer YES/NO if they use a smartphone for a particular activity. The variable is the sum of YESes declared by an individual respondent	Integers taking values from 0 to 16

Perceived_Sensitivity_GPS	A variable indicating how much the respondent considers their location to be sensitive information	Integers taking values from 1 to 5
Average_Worry	A variable representing general concerns about sharing private data for research purposes	Numbers taking values from 1 to 4
Average_Privacy	A variable representing the general perception of one's data as sensitive	Numbers taking values from 1 to 5
Familiarity_With_Phising	A variable representing the general knowledge about phising	Integers taking values from 1 to 5
Moderator1	Openness* Perceived_Sensitivity_GPS	Numbers taking values from 1.7 to 25
Moderator2	Conscientiousness* Perceived_Sensitivity_GPS	
Moderator3	Extraversion* Perceived_Sensitivity_GPS	
Moderator4	Agreeableness* Perceived_Sensitivity_GPS	
Moderator5	Neuroticism* Perceived_Sensitivity_GPS	

Source: Own development

4. Results of the research

4.1 Description of the sample, and variables descriptives

The final sample of 2402 included 1087 men and 1315 women. Among the respondents, only 132 declared that the highest possible education they had received was primary education. This was followed by 1295 with secondary education and 975 with higher education. The following table completes the information on the variables used in the model.

Table 6. Selected statistics of variables used in models

Variable name	Mean	Median	Standard Deviation	Minimum	Maximum
Openness	3.525	3.500	0.502	1.800	5.000
Conscientiousness	3.767	3.800	0.514	1.500	5.000
Extraversion	3.201	3.200	0.665	1.200	5.000
Agreeableness	3.871	3.900	0.506	1.800	5.000
Neuroticism	2.501	2.400	0.706	1.000	4.800
Age	52.420	55.000	17.354	17.000	92.000
Age_Squared	3049.00	3025.00	1750.230	289.000	8464.000
Technology_Literacy	11.320	12.100	3.383	0.100	16.100
Perceived_Sensitivity_GPS	3.632	3.667	0.901	1.000	5.000
Average_Worry	2.526	2.571	0.668	1.000	4.000
Average_Privacy	3.723	3.846	0.793	1.000	5.000
Familiarity_With_Phising	3.450	4.000	1.315	1.000	5.000
Moderator1	12.850	12.830	3.843	2.200	25.000
Moderator2	13.720	13.800	4.037	2.600	24.500
Moderator3	11.600	11.550	3.720	1.800	24.000
Moderator4	14.080	14.180	4.021	2.400	25.000
Moderator5	9.101	8.800	3.507	1.700	22.000

Source: Own development

4.2 Logistic regression explaining willigness to share GPS location online

4.2.1 Estimation of parameters

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Openness	0.632*** (0.093)	0.725*** (0.096)	0.751*** (0.096)	0.607*** (0.099)	0.574*** (0.100)	0.580*** (0.100)	0.536*** (0.102)	0.502*** (0.104)	0.667* (0.394)
Conscientiousness	-0.494*** (0.091)	-0.477*** (0.092)	-0.465*** (0.093)	-0.408*** (0.095)	-0.395*** (0.095)	-0.428*** (0.096)	-0.410*** (0.096)	-0.407*** (0.096)	-0.121 (0.387)
Extraversion	0.110 (0.069)	0.050 (0.071)	0.039 (0.071)	-0.036 (0.073)	-0.026 (0.073)	-0.002 (0.074)	0.006 (0.074)	0.009 (0.074)	-0.031 (0.313)
Agreeableness	-0.172* (0.090)	-0.152* (0.092)	-0.150 (0.092)	-0.109 (0.094)	-0.086 (0.095)	-0.082 (0.095)	0.003 (0.099)	0.004 (0.099)	-0.275 (0.380)
Neuroticism	0.018 (0.063)	0.043 (0.065)	0.050 (0.065)	-0.017 (0.067)	-0.058 (0.068)	-0.050 (0.068)	-0.012 (0.070)	-0.009 (0.070)	-0.522* (0.281)
Privacy_Concerns		-0.573*** (0.063)	-0.529*** (0.064)	-0.454*** (0.066)	-0.442*** (0.066)	-0.465*** (0.067)	-0.462*** (0.067)	-0.465*** (0.067)	-0.462*** (0.067)
Sensitivity_OfGPS_location			-0.148*** (0.049)	-0.148*** (0.051)	-0.150*** (0.051)	-0.155*** (0.051)	-0.144*** (0.051)	-0.145*** (0.051)	-0.371 (0.593)
Technology_Literacy				0.143*** (0.014)	0.115*** (0.016)	0.111*** (0.014)	0.110*** (0.016)	0.109*** (0.016)	0.109*** (0.016)
Age					-0.010*** (0.003)	0.047*** (0.015)	0.046*** (0.015)	0.044*** (0.015)	0.044*** (0.015)
Age_Squared						-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Gender_Female							-0.282*** (0.096)	-0.278*** (0.096)	-0.272*** (0.096)
Education_Primary_School								-0.131 (0.211)	-0.135 (0.211)

Education_Secondary_School								-0.141 (0.094)	-0.146 (0.094)
Moderator 1									-0.174 (0.403)
Moderator 2									-0.321 (0.402)
Moderator 3									0.036 (0.312)
Moderator 4									0.313 (0.410)
Moderator 5									0.493 (0.261)
Constant	-0.104 (0.526)	1.092** (0.552)	1.384** (0.588)	0.117 (0.588)	0.966 (0.650)	-0.159 (0.712)	-0.331 (0.716)	-0.090 (0.741)	1.558 (4.361)
Observations	2402	2402	2402	2402	2402	2402	2402	2402	2402
Log Likelihood	-1,624.844	-1,580.451	-1,575.941	-1,518.573	-1,513.782	-1,506.545	-1,502.200	-1,501.042	-1,498.157
Akaike Inf. Crit.	3,261.689	3,174.902	3,167.882	3,055.147	3,047.563	3,035.089	3,028.400	3,030.084	3,034.314

Significance levels: * 0.1/ ** 0.05/ *** 0.01; standard error values are given in brackets.

Source: Own development

4.2.2 Diagnostics

Initially, model (1) examined the relationship between personality traits alone with willingness to share GPS locations. Then, in models (2) to (9), further control variables were progressively added, as well as variables considered with developed hypotheses. The final version of the model, the results of which will be commented in the next chapter, is model (8). As all moderators proved to be statistically insignificant, it was decided not to interpret the results of the last model due to the excessive number of non-significant variables, which also does not positively affect the estimations of different variables. Non-significant variables can introduce error in the estimates of significant variables. This is because the model attempts to fit these additional variables, potentially distorting the estimated coefficients of the variables that actually are significant. In general, when developing models one should try to avoid including non-significant variables, as overfitting is bad for the interpretation of the study results.

Not all variables defining personality traits turned out to be significant. However, they were not removed because it is believed that a lack of significance is also a result worth discussing. In model (8), *pseudo-R2* is as high as 17%.

Analysis of the residuals, leverage and Cook's distance showed that there were outlier observations, but none of them turned out to be a variable with unrealistic or false data. In view of this, it was decided not to remove any of the variables in order to improve the parameter estimation results.

Diagnostic tests were performed to ensure that the model was constructed correctly. The Box Tidwell test showed that there was a non-linear relationship between *Age* and the *Sensitivity_ofGPS_location* variable with log-likelihoods. For the *Age* variable, *Age_Squared* was added to the model to improve linearity. In many situations in real life, the relationship between the predictor (IV) and the response (DV) is not linear. By adding a quadratic term, the model can capture the curvature in the data. This allows the model to fit the data more accurately (MacCallum & Corinne, 1995).

For the other variable, none of the transformations improved this result. The rest of the variables showed a linear relationship with the explained variable. Analysis of the VIFs (Appendix 3) showed no issues with multicollinearity. The result of the cross-validation of the logistic regression model indicates a mean prediction error of 0.220, suggesting that the model predicts the dependent variable with acceptable accuracy. To check the overall fit of the logistic regression model, a Hosmer-Lemeshow test was performed. The result of the test says that p-

value is 0.9203, suggesting that there are no significant differences between observed and predicted values. Therefore, it can be concluded that the model is a good fit. To check the ability of the model to distinguish classes, the AUC value of the ROC curve was calculated. The AUC value obtained is 0.7054, meaning that the model has a good ability to distinguish classes.

4.2.3 Interpretation of the results

Open-minded *(Openness)* people appear to show more willingness to share their GPS location (estimate = 0.502, p-value < 0.001), while diligent *(Conscientiousness)* people seem to be less eager to share their location with smart devices (estimate = -0.407, p-value < 0.001). P-values for both, *Openness* and *Conscientiousness*, suggest that variables are highly significant. In case of Openness the results are not in line with a developed hypothesis (H1). The negative effect of the Conscientiousness trait also does not support the hypothesis (H2). Other traits, such as *Extraversion* (p-value = 0.907), *Agreeableness* (p-value = 0.965) and *Neuroticism* (p-value = 0.902), do not have a statistically significant effect on the decision to share location online (H3, H4, H5). Although the direction of the effects of these variables is consistent with the assumed hypotheses, p-values clearly indicate that the effects of those three variables are not significant. Hence, those variables will not be discussed.

The seventh hypothesis was not successfully confirmed, indicating that greater familiarity with technology positively correlates with willingness to share GPS locations (estimate = 0.109, p-value < 0.001). In other words, this may indicate that people more familiar with technology are more confident with both using smart devices for benefits and protecting their data online (H7).

The coefficient for the *Age* variable is positive and statistically significant (estimate = 0.044, p-value = 0.006), suggesting that with each additional year of age the willingness to share GPS location increases. However, this growth is not constant and changes with age, as the impact of *Age_Squared* shows (estimate = -0.001, p-value < 0.005). The increase in willingness to share location with age starts to slow down and then potentially turn around as people get older. These findings do not confirm the eighth hypothesis (H8).

The positive and significant coefficient for *Gender_Female* indicates that women tend to share their GPS location less willingly compared to men (estimate = -0.278, p-value = 0.03). The result is as expected (H9).

Respondents' education appeared to have no statistically significant effect on the willingness to share GPS locations, with p-values being as high as 0.534 for

Education_Primary_School, and 0.131 for *Education_Secondary_School* (H10). This suggests that there is no difference between the three levels of education.

The eleventh hypothesis that privacy concerns will not have a statistically significant impact on the willingness to share location was not confirmed. The aim of this hypothesis was to prove the existence of a "data privacy paradox". However, the variable was found to be statistically significant and the effect was negative (estimate = -0.465, p-value < 0.001). This means that people who have more concerns about their privacy online will be less likely to share their private data on the Internet (H11). Similar conclusions can be drawn from the effect of the *Sensitivity_ofGPS_location* variable, which showed how strongly the respondent believes their location is sensitive information. In light of the results, the more a person believes their location is sensitive information, the less they will be willing to share their localisation with mobile devices (estimate = -0.145, p-value < 0.001).

Finally, the influence of moderators proved to be non-significant, since p-values for all of them are above 0.1 (H6a-H6e). The table below summarizes results of the research.

Table 7. Summary of hypotheses 1-9

Hypothesis	Comment
H1: Individuals' openness is negatively correlated with willingness to share GPS location online.	➔ Hypothesis NOT confirmed (p-value = 0.00000140127837)
H2: Individuals' conscientiousness is positively correlated with willingness to share GPS location - online.	➔ Hypothesis NOT confirmed (p-value = 0.00002208372836)
H3: Individuals' extraversion is positively correlated with willingness to share GPS location online.	➔ Hypothesis NOT confirmed (p-value = 0.906987) ➔ The effect of the trait on DV was found to be statistically insignificant
H4: Individuals' agreeableness is positively correlated with willingness to share GPS location online.	➔ Hypothesis NOT confirmed (p-value = 0.964936) ➔ The effect of the trait on DV was found to be statistically insignificant
H5: Individuals' neuroticism is negatively correlated with willingness to share GPS location online.	➔ Hypothesis NOT confirmed (p-value = 0.901684) ➔ The effect of the trait on DV was found to be statistically insignificant

H6a-H6e: Perceived sensitivity of GPS location moderates the influence of personality traits by strengthening or weakening the effects of traits	➔ Hypothesis NOT confirmed (all p-values > 0.05) ➔ The effects of moderators not significant
H7: Technology literacy is negatively correlated with willingness to share GPS location online.	➔ Hypothesis NOT confirmed (p-value = 0.00000000003118)
H8: There is a quadratic relationship between age and willingness to share GPS locations online. Specifically, willingness to share initially decreases with age and then increases at older ages, indicating a U-shaped pattern in which both age and the square of age (Age^2) are significant predictors.	➔ Hypothesis NOT confirmed (p-value = 0.005502)
H9: Women are less willing to share a GPS location online.	➔ Hypothesis confirmed (p-value = 0.003683)
H10: Higher education is negatively correlated with willingness to share GPS location online.	➔ Hypothesis NOT confirmed (p-value = 0.533683 for primary, and p-value = 0.131336 for secondary education) ➔ The effect of educational attainment not significant
H11: The "data privacy paradox" exists, meaning that privacy concerns are not correlated with the willingness to share GPS locations online.	➔ Hypothesis NOT confirmed (p-value = 0.00000000000347) ➔ The effect of privacy concerns is significant and negative

4.3 Proportional odds model explaining privacy concerns

4.3.1 Estimation of parameters

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Openness	0.328*** (0.089)	0.447*** (0.090)	0.480*** (0.092)	0.446*** (0.094)	0.470*** (0.094)	0.336** (0.096)	0.240* (0.099)	0.206* (0.099)
Conscientiousness	0.165* (0.085)	0.114 (0.086)	0.099 (0.086)	0.091 (0.086)	0.079 (0.087)	0.071 (0.087)	0.021 (0.090)	-0.006 (0.090)
Extraversion	-0.291*** (0.066)	-0.278*** (0.066)	-0.280*** (0.066)	-0.274*** (0.066)	-0.244*** (0.067)	-0.218** (0.067)	-0.172* (0.070)	-0.143* (0.070)
Agreeableness	0.113 (0.087)	0.057 (0.087)	-0.0001 (0.091)	-0.0004 (0.091)	0.006 (0.091)	0.018 (0.092)	0.148 (0.094)	0.149 (0.094)
Neuroticism	0.120* (0.061)	0.215*** (0.062)	0.189** (0.064)	0.193** (0.064)	0.189** (0.064)	0.208** (0.064)	0.169* (0.066)	0.171* (0.066)
Age		0.017*** (0.002)	0.017*** (0.002)	0.017*** (0.002)	0.010*** (0.003)	0.009** (0.003)	-0.0003 (0.003)	-0.0002 (0.003)
Gender_Female			0.189* (0.087)	0.192* (0.087)	0.173* (0.087)	0.259** (0.088)	0.009 (0.092)	-0.029 (0.092)
Education_Primary_School				-0.362* (0.184)	-0.398* (0.184)	-0.301 (0.186)	-0.131 (0.190)	-0.137 (0.190)
Education_Secondary_School				-0.088 (0.085)	-0.105 (0.085)	-0.052 (0.086)	-0.020 (0.089)	-0.012 (0.089)
Technology_Literacy					-0.064*** (0.015)	-0.084*** (0.015)	-0.015 (0.016)	-0.016 (0.016)
Familiarity_With_Phising						0.213*** (0.033)	0.193*** (0.034)	0.181*** (0.034)

Average_Worry							1.705*** (0.077)	1.594*** (0.079)
Average_Privacy								0.355*** (0.057)
Observations	2402	2402	2402	2402	2402	2402	2402	2402
Log Likelihood	-2,543.736	-2,519.027	-2,516.632	-2,514.577	-2,505.178	-2,484.196	-2,202.055	-2,182.093

Significance levels: * 0.1/ ** 0.05/ *** 0.01; standard error values are given in brackets.

Source: Own development

4.3.2 Diagnostics

At first, model (1) examined only the relationship between personality traits and privacy concerns. Next, in models (2) to (8), further control variables were gradually added. The final version of the model, the results of which will be commented, is model (8).

To ensure that the model was built properly, the results of the diagnostic tests were analysed. The results of the Brant test indicate that the overall model has problems with meeting the assumption of proportionality of chances (p-value = 0). From checking the individual variables, only Openness, Agreeableness and Neuroticism fail to meet this assumption. Despite this result, it was decided to interpret the model. The running of the partial proportional model showed that all three characteristics affect the transition to the next categories in the same direction. The effects differed only in strength. Correlation analysis between the variables did not indicate a multicollinearity problem. In model (9), *pseudo-R2* is as high as 14.91%. In a 10-fold cross-validation procedure, the model achieved a classification accuracy of 58.99%.

4.3.3. Interpretation of the results

From the analysis, it can be concluded that a person's openness has a positive impact on the level of privacy concern with estimate being as high as 0.206. The effect is significant with p-value equals 0.037 (H12). Neuroticism also has a positive and significant effect (estimate = 0.171, p-value = 0.010), indicating that the more neurotic a person is, the more concerned they will be about their privacy online (H16). These are results that support the hypotheses put forward in this work. Extroversion, on the other hand, has a negative effect on the level of concern (estimate = -0.143), suggesting that more extroverted people may be less concerned about their privacy online. P-value for Extraversion is equal to 0.041, indicating that the variable is significant. This is also consistent with the hypothesis (H14). The effects of Agreeableness (p-value = 0.113) and Conscientiousness (p-value = 0.949) on DV were found to be statistically insignificant (H13, H15).

When it comes to demographic factors, it turns out that none of them have significant effects on dependent variables. The P-value for the *Age* variable is 0.940, for *Gender_Female* it is 0.757, for *Education_Primary_School* it is 0.470 and for *Education_Secondary_*School it is 0.891.

The technology literacy proved to be ultimately irrelevant with p-value equals to 0.299, although on the other hand, a positive and strong effect of knowledge of phishing on privacy concerns can be observed (estimate = 0.181, p-value < 0.001). This result is in line with the

intuition that the more aware a person is of the dangers of online data theft, the more concerned they will be about their privacy.

A positive and significant effect of the *Average_Worry* (estimate = 1.594, p-value < 0.001) and *Average_Privacy* (estimate = 0.355, p-value < 0.001) variables on privacy concerns can also be observed. Therefore, it can be concluded that the more a person is generally worried that someone could use their data in a bad way for scientific purposes, the more they will be generally worried about their privacy in general. In the case of *Average_Privacy*, the more often a person declared that they considered a certain type of data to be sensitive, the more worried they would be about their privacy in general. Both results are as predicted. The table below presents the outcome of the second model.

Table 8. Summary of hypotheses 10-14

Hypothesis	Comment
H12: Individuals' openness is positively correlated with privacy concerns.	➔ Hypothesis confirmed (p-value = 0.0371)
H13: Individuals' conscientiousness is positively correlated with privacy concerns.	➔ Hypothesis NOT confirmed (p-value = 0.9488) ➔ The effect of the trait on DV was found to be statistically insignificant
H14: Individuals' extraversion is negatively correlated with privacy concerns.	➔ Hypothesis confirmed (p-value = 0.0411)
H15: Individuals' agreeableness is positively correlated with privacy concerns.	➔ Hypothesis NOT confirmed (p-value = 0.1129) ➔ The effect of the trait on DV was found to be statistically insignificant
H16: Individuals' neuroticism is positively correlated with privacy concerns.	➔ Hypothesis confirmed (p-value = 0.0101)

5. Conclusions

The results of the study showed, contrary to expectation and theory, that personality traits collectively have less influence on behaviour than on beliefs. In the case of willingness to share a GPS location, only Openness and Conscientiousness will influence this behaviour. In contrast, for privacy concerns, slightly different traits will influence this variable, namely Openness, Extraversion, and Neuroticism. Interestingly, the results suggest that Openness positively correlates with both willigness to share GPS location online and privacy concerns, which is not intuitive. For the rest of the variables, it was not possible to show that a particular characteristic, while influencing privacy concerns, simultaneously generates willingness or unwillingness to share data on the Internet. Conscientiousness, for example, was found to have no significant effect on concerns, while having significant and negative correlation with willigness to share GPS location online. Extraversion and Neuroticism, on the other hand, were found to have a significant impact only on privacy concerns, and these are traits with no effect on willigness to share GPS location online.

The above studies, conducted on the same research group, show that the impact of traits on online behaviour and concerns about sharing data online are different. Therefore, the results of studies on what people think cannot be generalised to the results of studies on the impact of features on their actual behaviour. This may be a common mistake that arises specifically in research on privacy concerns and cautious online behaviour. Furthermore, it is worth noting that it is more important how we actually behave, rather than how we think and feel when asked about our opinions and beliefs. Even high privacy concerns do not guarantee that people will behave reasonably online. Therefore, we need more research on how different variables affect people's actual behaviour concerned sharing private data online.

As for the “data privacy paradox”, it turned out that such a paradox does not exist. At the beginning of the study, it was expected that privacy concerns would not affect people's willingness to share their GPS location online. However, it turned out that concerns do have a significant and strong effect on online behaviour. This effect is negative, meaning that people who are more worried about their online privacy will be less likely to share their data, and this is an unexpected result, since majority of articles proved the existence of the paradox. This is an outcome which adds to the current research on “data privacy paradox”.

About the effects expected, it was able to confirm that users' perceived data sensitivity will negatively influence their willingness to share data online and positively influence privacy concerns. In the light of this, companies and policymakers should engage more resources and

work when asking people for more sensitive data. This may also be useful for researchers who need to obtain sensitive data from respondents for research purposes. In general, all these actors have the tools to convince people that their data will be used appropriately. Also, all these entities should take care of their reputation as entities that do not use people's data in a wrong way.

The impact of technological familiarity only affects actual behaviour and not people's beliefs. Thus, people with greater knowledge and familiarity with technology will be more likely to share their GPS location, which may be due to awareness of the benefits of doing so and knowledge about protecting their data online.

Finally, it has become apparent that the demographics of people can make a difference to both behaviour and privacy concerns. However, these effects will be different. In the case of gender, women, who are having more privacy concerns on average, will be also less likely to share their data online. Those collecting data should have this in mind. In general, women are said to be more neurotic and forward thinking. This may cause them to have more concerns. Men are less difficult to convince to share data, so the entities mentioned should not make more effort to convince them in order to obtain essential information. People's age also matters. In general, people's willingness to share data will increase with age, but this will not be a linear relationship. Older people will be less willing to share data, which may be due to less technological competence and privacy concerns. Since younger people are also harder to convince to share data, these people should be more strongly targeted by companies. Efforts could be made to persuade such people by raising awareness of the benefits of location sharing and the reassurance that data will be safe. Surprisingly, education was found to be irrelevant to both behaviour and beliefs.

Taking into account all the results and the fact that the priority of this study was to test the impact of personality traits on the willingness to share locations, general conclusions for stakeholders will be presented. Companies, policy makers and researchers should take an interest in people who are conscientious. This trait is often correlated with diligence, strong work-ethic and being hard working, indicating that such people will be less likely to share their data with. All entities should keep this in mind when designing data sharing requests. With digital footprints, it is possible to tell which individuals are characterised by greater conscientiousnessf. Entities can target such individuals by placing more emphasis on the benefits of data sharing and on data security awareness. Companies and decision-makers should be also concerned about individuals with high privacy concerns because those concerns negatively impact the sharing of GPS locations. Entities should also bear in mind that the more

sensitive the data, the less inclined people will be to share it. It is worth keeping this in mind when designing notifications requesting data. In general, stakeholders will also find it more difficult to collect GPS location data from women than from men. Fortunately, almost all companies and decision-makers have data on the gender of their audiences, so it is not difficult to match requests for GPS location sharing. Further research would be needed to assess what negatively affects the willingness to share location online among women. Finally, companies, policymakers and researchers should bear in mind that the willingness to share data increases with age. It would be worth investing more in resources to convince younger groups of the benefits of data sharing and the overall security of data storage. In contrast, in light of the survey, it is apparent that older people may be less willing to share data online. This is a positive outcome, as old people should be wary of giving out their data given the fraudsters who target them.

The analysis carried out in this work has some limitations. First of all, this concerns the problem related to declared data. These are related to the potential measurement error of key variables in the model, which is typical of survey data. For example, declaring in a survey that a person would share their GPS location is not equal to the actual action a person would take in reality. Such problems with declared variables can occur in other variables, e.g. a person may lie about their education. In addition, the measurement of non-cognitive skills was based on the subjective assessment of the respondent. The results of such tests can be biased by factors such as self-perception, current mood of a respondent, or the context in which the test is conducted. Finally, a lot also depends on the unit that requested the data. Trust in such a unit can be crucial in obtaining parameters. On the other hand, a well-known research entity such as LISS should be trusted, which shows that despite trust, people will not always be willing to share their location online and the results show what can influence this.

This dissertation offers a deep exploration of how personality traits influence people's sharing of GPS locations. In addition, a study of how non-cognitive skills relate to privacy concerns was conducted on the same research group, offering comprehensive findings that can be easily compared. It provided an opportunity to delve deeper into how individual factors affect how people feel and their actual behaviour. In the future, it would be worth exploring impact of traits on the willingness to share data in different contexts, as do demographic factors, since hypotheses put forward in this thesis were not successfully confirmed. The study also found that the relationship between technology literacy and online behaviour was an interesting question. A review of previous research showed that there is disagreement about how technology literacy will affect the willingness to share private information online. This topic

could be explored further. Finally, further research could examine how personality traits influence privacy concerns and sharing behaviours in specific contexts, such as social media, health applications, or financial services, to understand context-specific dynamics.

In conclusion, despite some limitations of the analysis, the research questions presented in the introduction were answered and thus the aim of the study was met.

APPENDIX

1. The 50 most correlated variables with willigness to share GPS location online.

- Questions from pi19a012-pi19a027: *Do you use your smartphone for the following activities?* Yes/No
- Questions from pi19a033-pi19a045: *Please indicate how private do you feel the information is about the following;* from 1 (not at all private) to 5 (extremely private).
- Questions from pi19a046-pi19a053: *Smartphones can collect a variety of data that provide researchers with information of the everyday life of the users. Below you will see a number of activities that you could do with your smartphone. How concerned would you be about the security of providing information in the following ways for research?* From 1 (not at all concerned) to 4 (very concerned).

Table 9. Variables correlated the most with willingness to share GPS location

Variable name	Correlation value	Survey question
pi19a047	0.2675377	*How concerned would you be about the security of providing information in the following ways for research?* Download a survey app to complete an online questionnaire
pi19a046	0.2538502	*How concerned would you be about the security of providing information in the following ways for research?* Complete an online questionnaire on your smartphone
pi19a049	0.2396378	*How concerned would you be about the security of providing information in the following ways for research?* Answer a couple of questions sent via text messaging
pi19a048	0.2362612	*How concerned would you be about the security of providing information in the following ways for research?* Download an app which collects data about how you use your smartphone
age_squared	0.2264209	The variable was calculated based on variable “age”
pi19a052	0.2259978	*How concerned would you be about the security of providing information in the following ways for research?* Share the GPS position of your smartphone (for example to measure time spent in urban vs. green spaces)
pi19a022	0.2242533	*Do you use your smartphone for the following activities?* Using GPS/location-aware apps (for example Google Maps, Foursquare, Yelp)
leeftijd	0.2197114	Age of the household member
gebjaar	-0.2192323	Year of birth
age	0.2192323	Age (calculated)
lftdcat	0.2070649	Age in categories
lftdhhh	0.2045000	Age of the household head
pi19a050	0.2043077	*How concerned would you be about the security of providing information in the following ways for research?* Use the camera of your smartphone to take photos or scan barcodes (for example photos of receipts, barcodes of purchased products)
pi19a053	0.1989342	*How concerned would you be about the security of providing information in the following ways for research?* Connect your smartphone via Bluetooth to

		other electronic devices (for example wearables such as Fitbit to measure physical activity)
pi19a011	-0.1972361	*How would you describe your skills as a smartphone user?* From 1 (beginner) to 5 (advanced)
pi19a023	0.1947308	*Do you use your smartphone for the following activities?* Connecting to other electronic devices via Bluetooth (for example smartwatches, fitness bracelets, step counter)
pi19a019	0.1940632	*Do you use your smartphone for the following activities?* Making purchases (for example buying books or clothes, booking train tickets, ordering food)
pi19a032	0.1869942	*In general, how concerned are you about your personal privacy?* From 1 (not at all concerned) to 4 (very concerned)
pi19a026	0.1851827	*Do you use your smartphone for the following activities?* Streaming videos or music
pi19a051	0.1826238	*How concerned would you be about the security of providing information in the following ways for research?* Download a survey app to complete an online questionnaire
pi19a007	-0.1647959	*How familiar are you with the following computer and Internet-related items?* Phishing
pi19a021	0.1631097	*Do you use your smartphone for the following activities?* Streaming videos or music
pi19a008	-0.1597876	*How familiar are you with the following computer and Internet-related items?* Cache
pi19a020	0.1580779	*Do you use your smartphone for the following activities?* Online banking (for example checking account balance, transferring money)
pi19a018	0.1575187	*Do you use your smartphone for the following activities?* Posting content to social media websites/apps (for example posting text, images, videos on Facebook, Twitter, Instagram)
pi19a037	0.1561032	*Please indicate how private do you feel the information is about the following. My social media profile data (for example, Facebook)*
pi19a005	-0.1519123	*How familiar are you with the following computer and Internet-related items?* PDF
pi19a017	0.1420967	*Do you use your smartphone for the following activities?* Looking at content on social media websites/apps (for example looking at text, images, videos on Facebook, Twitter, Instagram)
pi19a025	0.1390960	*Do you use your smartphone for the following activities?* Playing games
belbezig	0.1336670	Primary occupation
oplzon	-0.1315747	Highest level of education irrespective of diploma
pi19a064	0.1311477	*Did you think the questionnaire was too personal?*
pi19a054	0.1283180	*How concerned would you be about the security of providing information in the following ways for research?* Download a survey app to complete an online questionnaire
pi19a027	0.1272454	*Do you use your smartphone for the following activities?* Other
pi19a004	-0.1211283	*How familiar are you with the following computer and Internet-related items?* Advanced search
Openness	-0.1193564	Trait calculated based on Big Five NEO 2 test
pi19a060	-0.1192803	*Finally; what did you think of this questionnaire?* Did you enjoy answering the questions?
cp19k027	-0.1160818	*How accurately do the statements below describe you (as a person)? I...* leave my belongings around.
cp19k027_reversed	0.1160818	cp19k027 reversed

Source: Own development based on questionnaires from Liss Archive

2. The 50 most correlated variables with privacy concerns.

Table 10. Variables correlated the most with privacy concerns

Variable name	Correlation value	Survey question
pi19a052	0.4254387	*How concerned would you be about the security of providing information in the following ways for research?* Share the GPS position of your smartphone (for example to measure time spent in urban vs. green spaces)
pi19a048	0.3974669	*How concerned would you be about the security of providing information in the following ways for research?* Download an app which collects data about how you use your smartphone
pi19a053	0.3949185	*How concerned would you be about the security of providing information in the following ways for research?* Connect your smartphone via Bluetooth to other electronic devices (for example wearables such as Fitbit to measure physical activity)
pi19a051	0.3806726	*How concerned would you be about the security of providing information in the following ways for research?* Download a survey app to complete an online questionnaire
pi19a049	0.3755271	*How concerned would you be about the security of providing information in the following ways for research?* Answer a couple of questions sent via text messaging
pi19a047	0.3715356	*How concerned would you be about the security of providing information in the following ways for research?* Download a survey app to complete an online questionnaire
pi19a046	0.3686031	*How concerned would you be about the security of providing information in the following ways for research?* Complete an online questionnaire on your smartphone
pi19a050	0.3539844	*How concerned would you be about the security of providing information in the following ways for research?* Use the camera of your smartphone to take photos or scan barcodes (for example photos of receipts, barcodes of purchased products)
pi19a042	0.2529478	*Please indicate how private do you feel the information is about the following. My date of birth*
pi19a035	0.2265060	*Please indicate how private do you feel the information is about the following*. My physical activity data (for example, how much I walk)
pi19a039	0.2088943	*Please indicate how private do you feel the information is about the following.* Pictures of myself (selfies)
pi19a034	0.2070853	*Please indicate how private do you feel the information is about the following*. My daily mobility behavior
pi19a033	0.2049205	*Please indicate how private do you feel the information is about the following.* My current geographic location
pi19a037	0.1969785	*Please indicate how private do you feel the information is about the following.* My social media profile data (for example, Facebook)
pj19a002	0.1869942	
pi19a040	0.1866245	*Please indicate how private do you feel the information is about the following.* Video of my surroundings
pi19a038	0.1819188	*Please indicate how private do you feel the information is about the following.* Pictures of my house
pi19a041	0.1760396	*Please indicate how private do you feel the information is about the following.* My health records
pi19a045	0.1721471	*Please indicate how private do you feel the information is about the following.* My e-mail address
pi19a043	0.1687733	*Please indicate how private do you feel the information is about the following.* My home address
pi19a018	0.1594118	*Do you use your smartphone for the following activities?* Posting content to social media websites/apps (for example posting text,

		images, videos on Facebook, Twitter, Instagram)
pi19a044	0.1379012	*Please indicate how private do you feel the information is about the following.* My phone number
lftdcat	0.1356161	Age in categories
pi19a019	0.1310290	*Do you use your smartphone for the following activities?* Making purchases (for example buying books or clothes, booking train tickets, ordering food)
leeftijd	0.1258253	Age of the household member
gebjaar	-0.1255559	Year of birth
age	0.1255559	*Age (calculated)*
pi19a017	0.1248854	*Do you use your smartphone for the following activities?* Looking at content on social media websites/apps (for example looking at text, images, videos on Facebook, Twitter, Instagram)
cp19k019	-0.1205836	*Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? Please indicate a score of 0 to 10.*
pi19a009	0.11919581	*How familiar are you with the following computer and Internet-related items?* Phising
cp19k033	0.11901627	*How accurately do the statements below describe you (as a person)? I...* pay attention to details.
pi19a064	0.11008978	*Did you think the questionnaire was too personal?*
age_squared	0.10872041	The variable was calculated based on variable "age"
positie	-0,10063094	Primary occupation
pi19a020	0.09866722	*Do you use your smartphone for the following activities?* Online banking (for example checking account balance, transferring money)
cp19k020	-0.09792425	*How accurately do the statements below describe you (as a person)? I...* am the life of the party
pi19a026	0.09448089	*Do you use your smartphone for the following activities?* Streaming videos or music
pi19a002	-0,09209356	*Do you think that new technology, such as smartphones, makes life easier or makes life more complicated?* From 1 (makes life a lot more complicated) to 4 (makes life a lot easier)
cp19k014	-0,09065699	*Below are five statements with which you may agree or disagree. Please indicate for each item whether you disagree or agree. Please be open and honest in your responding.* In most ways my life is close to my ideal

Source: Own development based on questionnaires from Liss Archive

3. VIFs in logistic regression explaining willigness to share GPS location online

Table 11. VIFs in logistic regression (model 1)

Variable	VIF value
Openness	1.171608
Conscientiousness	1.118448
Extraversion	1.117797
Agreeableness	1.139256
Neuroticism	1.124679
Privacy_Concerns	1.048262
Sensitivity_ofGPS_location	1.042098
Age	6.178139

Age_Squared	6.142344
Gender	1.088583
Education	1.153736
Technology_Literacy	1.208378

Source: Own development

BIBLIOGRAPHY

Acquisti, A. & Grossklags, J., 2005. Privacy and rationality in individual decision making. *IEEE security & privacy,* 3(1), pp. 26-33.

Acquisti, A. & Gross, R., 2006. *Imagined communities: Awareness, information sharing, and privacy on the Facebook." International workshop on privacy enhancing technologies.* Berlin, Springer Berlin Heidelberg.

Ahmed, S. & Rasheed, T., 2020. Relationship between personality traits and digital literacy skills: a study of university librarians. *Digital Library Perspectives,* 36(2), pp. 191-206.

Ajzen, I., 1985. *From intentions to actions: A theory of planned behavior.* Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 11-39.

Argyle, M. & Lu, L., 1990. The happiness of extraverts. *Personality and individual differences,* 11(10), pp. 1011-1017.

Armitage, C. J. & Conner, M., 2001. Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British journal of social psychology,* 40(4), pp. 471-499.

Azucar, D., Marengo, D. & Settanni, M., 2018. Predicting the Big 5 personality traits from digital footprints on social media: A meta-analysis. *Personality and Individual Differences,* Volume 124, pp. 150-159.

Bandara, R., Fernando, M. & Akter, S., 2020. Explicating the privacy paradox: A qualitative inquiry of online shopping consumers. *Journal of Retailing and Consumer Services,* Volume 52.

Banerjee, S. S. & Dholakia, R. R., 2012. Location-based mobile advertisements and gender targeting. *Journal of Research in Interactive Marketing,* 6(3), pp. 198-214.

Bansal, G., Zahedi, F. ". & Gefen, D., 2010. The impact of personal dispositions on information sensitivity, privacy concern and trust in disclosing health information online. *Decision support system,* 49(2), pp. 138-150.

Bansal, G., Zahedi, F. M. & Gefen, D., 2016. Do context and personality matter? Trust and privacy concerns in disclosing private information online. *Information & Management,* 53(1), pp. 1-21.

Barnett, T., Pearson, A. W. P. R. & Kellermanns, F. W., 2015. Five-factor model personality traits as predictors of perceived and actual usage of technology. *European Journal of Information Systems,* Volume 24, p. 374–390.

Bartsch, M. & Dienlin, T., 2016. Control your Facebook: An analysis of online privacy literacy. *Computers in Human Behavior,* Volume 56, pp. 147-154.

Beckers, J. J. & Schmidt, H. G., 2003. Computer experience and computer anxiety. *Computers in Human Behavior,* 19(6), pp. 785-797.

Belen-Saglam, R., Nurse, J. R. C. & Hodges, D., 2022. An Investigation Into the Sensitivity of Personal Information and Implications for Disclosure: A UK Perspective. *Frontiers in Computer Science,* 4(908245).

Belligoni, S., Stevens, K. A., Hasan, S. & Yu, H., 2023. Privacy and security concerns with passively collected location data for digital contact tracing among U.S. college students. *Plos one,* 18(11).

Bergström, A., 2015. Online privacy concerns: A broad approach to understanding the concerns of different groups for different uses. *Computers in Human Behavior,* Volume 53, pp. 419-426.

Blank, G., Bolsover, G. & Dubois, E., 2014. A new privacy paradox: Young people and privacy on social network sites. *Prepared for the Annual Meeting of the American Sociological Association,* Volume 17.

Boyd, D. & Hargittai, E., 2010. Facebook privacy settings: Who cares?. *First Monday,* 15(8).

Bradley, B. H., Baur, J. E., Banford, C. G. & Postlethwaite, B. E., 2013. Team Players and Collective Performance: How Agreeableness Affects Team Performance Over Time. *Small Group Research,* 44(6), pp. 680-711.

Chaudhuri, R., Chatterjee, S. & Vrontis, D., 2023. Antecedents of privacy concerns and online information disclosure: moderating role of government regulation. *EuroMed Journal of Business,* 18(3), pp. 467-486.

Chen, J. V., Su, B.-c. & Quyet, H. M., 2017. Users' intention to disclose location on locationbased social network sites (LBSNS) in mobile environment: privacy calculus and Big Five. *International Journal of Mobile Communications,* 15(3), pp. 329-353.

Chen, L., Huang, Y., Ouyang, S. & Xiong, W., 2021. The data privacy paradox and digital demand. *National Bureau of Economic Research,* pp. 44-45.

Choi, S., 2023. Privacy Literacy on Social Media: Its Predictors and Outcomes. *International Journal of Human–Computer Interaction,* 39(1), pp. 217-232.

Christov-Moore, L. et al., 2014. Empathy: Gender effects in brain and behavior. *Neuroscience & biobehavioral reviews,* Volume 46, pp. 604-627.

Conner, M. & Armitage, C. J., 1998. Extending the theory of planned behavior: A review and avenues for further research. *Journal of applied social psychology,* 28(15), pp. 1429-1464.

Correa, T., Hinsley, A. W. & De Zuniga, H. G., 2010. Who interacts on the Web?: The intersection of users' personality and social media use. *Computers in human behavior,* 26(2), pp. 247-253.

Culnan, M. J. & Armstrong, P. K., 1999. Information privacy concerns, procedural fairness, and impersonal trust: An empirical investigation. *Organization science,* 10(1), pp. 104-115.

DeYoung, C. G., Quilty, L. C., Peterson, J. B. & Gray, J. R., 2014. Openness to Experience, Intellect, and Cognitive Ability. *Journal of Personality Assessment,* 96(1), pp. 46-52.

Fogel, J. & Nehmad, E., 2009. Internet social network communities: Risk raking, trust, and privacy concerns. *Computers in Human Behavior,* 25(1), pp. 153-160.

Gadzheva, M., 2007. Privacy concerns pertaining to location-based. *Int. J. Intercultural Information Management,* 1(1), pp. 49-57.

Gerber, N., Gerber, P. & Volkamer, M., 2018. Explaining the privacy paradox: A systematic review of literature investigating privacy attitude and behavior. *Computers & security,* Volume 77, pp. 226-261.

Gerpott, T. J. & Berg, S., 2011. Determinants of the willingness to use mobile location-based services: An empirical analysis of residential mobile phone customers. *Business & Information Systems Engineering,* Volume 3, pp. 279-287.

Goldfarb, A. & Tucker, C., 2012. Shifts in privacy concerns. *American Economic Review,* 102(3), pp. 349-353.

Goldin, C. & Katz, L. F., 2018. The race between education and technology. *Inequality in the 21st Century,* pp. 49-54.

Graziano, W. G. & Eisenberg, N., 1997. Agreeableness: A dimension of personality. *Handbook of personality psychology,* pp. 795-824.

Herbert, C. et al., 2021. Are you willing to self-disclose for science? Effects of privacy awareness and trust in privacy on self-disclosure of personal and health data in online scientific studies—an experimental study. *Frontiers in big Data 4,* Volume 763196.

Hinds, J. & Joinson, A., 2019. Human and computer personality prediction from digital footprints. *Current Directions in Psychological Science,* 28(2), pp. 204-211.

Hirschprung, R. S., Tayro, S. & Reznik, E., 2022. Optimising technological literacy acquirement to protect privacy and security. *Behaviour & Information Technology,* 41(5), pp. 922-233.

Huang, H. et al., 2018. Location based services: ongoing evolution and research agenda. *Journal of Location Based Services,* 12(2), pp. 63-93.

Jiang, H. et al., 2021. Location Privacy-preserving Mechanisms in Location-based Services: A Comprehensive Survey. *ACM Computing Surveys,* 54(1), p. 1–36.

Jozani, M., Ayaburi, E., Ko, M. & Choo, K.-K. R., 2020. Privacy concerns and benefits of engagement with social media-enabled apps: A privacy calculus perspective. *Computers in Human Behavior,* 107(106260).

Judge, T. A., Heller, D. & Mount, M. K., 2002. Five-factor model of personality and job satisfaction: A meta-analysis. *Journal of Applied Psychology,* 87(3), p. 530–541.

Junglas, I. A., Johnson, N. A. & Spitzmüller, C., 2008. Personality traits and concern for privacy: an empirical study in the context of location-based services. *European Journal of Information Systems,* Volume 17, p. 387–402.

Junglas, I. A. & Watson, R. T., 2008. Location-based services. *Communications of the ACM,* 51(3), pp. 65-69.

Kezer, M., Sevi, B., Cemalcilar, Z. & Baruh, L., 2016. Age differences in privacy attitudes, literacy and privacy management on Facebook. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace,* 10(1).

Kim, J., Yoon, S. & Zemke, D. M. V., 2017. Factors affecting customers' intention to use of location-based services (LBS) in the lodging industry. *ournal of Hospitality and Tourism Technology,* 8(3), pp. 337-356.

Kokolakis, S., 2017. Privacy attitudes and privacy behavior: A review of current research on the privacy paradox phenomenon. *Computers & Security,* Volume 64, pp. 122-134.

Korzaan, M. L. & Boswell, K. T., 2008. The influence of personality traits and information privacy concerns on behavioral intentions. *Journal of Computer Information Systems,* 48(4), pp. 15-24.

Kummer, T. F., Ryschka, S. & Bick, M., 2018. Why do we share where we are? The influence of situational factors on the conditional value of check-in services. *Decision Support Systems,* Volume 115, pp. 1-12.

Lee, C.-L. & Huang, M.-K., 2014. The influence of computer literacy and computer anxiety on computer self-efficacy: the moderating effect of gender. *Cyberpsychology, Behavior, and Social Networking,* 17(3), pp. 172-180.

Lee, H., Park, H. & Kim, J., 2013. Why do people share their context information on Social Network Services? A qualitative study and an experimental study on users' behavior of balancing perceived benefit and risk. *International Journal of Human-Computer Studies,* 71(9), pp. 862-877.

Lee, H., Wong, S. F. & Chang, Y., 2019. Information privacy concerns and demographic characteristics: Data from a Korean media panel survey. *Government Information Quarterly,* 36(2), pp. 294-303.

Leon, P. G. et al., 2013. What matters to users? Factors that affect users' willingness to share information with online advertisers. *Proceedings of the ninth symposium on usable privacy and security,* pp. 1-12.

Lewis, K., Kaufman, J. & Christakis, N., 2008. The taste for privacy: An analysis of college student privacy settings in an online social network. *Journal of computer-mediated communication,* 14(1), pp. 79-100.

Lidynia, C., Brauner, P. & Ziefle, M., 2017. A step in the right direction–understanding privacy concerns and perceived sensitivity of fitness trackers. *Advances in Human Factors in Wearable Technologies and Game Design: Proceedings of the AHFE 2017 International Conference on Advances in Human Factors and Wearable Technologies,* pp. 17-21.

LISS panel, 2024. *About the archive.* [Online] Available at: https://www.lissdata.nl/how-it-works-archive [Accessed 29 March 2024].

LISS panel, 2024. *About us.* [Online] Available at: https://www.lissdata.nl/about-us [Accessed 29 March 2024].

LISS panel, 2024. *Background Variables.* [Online] Available at: https://www.dataarchive.lissdata.nl/study-units/view/322 [Accessed 29 March 2024].

LISS panel, 2024. *Personality.* [Online] Available at: https://www.dataarchive.lissdata.nl/study-units/view/14 [Accessed 29 March 2024].

Liu, D. & Campbell, W. K., 2017. The Big Five personality traits, Big Two metatraits and social media: A meta-analysis. *Journal of Research in Personality,* Volume 70, pp. 229-240.

Li, Y., 2011. Empirical studies on online information privacy concerns: Literature review and an integrative framework. *Communications of the Association for Information Systems,* 28(1).

Li, Y., Huang, Z., Wu, Y. J. & Wang, Z., 2019. Exploring how personality affects privacy control behavior on social networking sites. *Frontiers in Psychology,* 10(468452).

Long, S. J. & Freese, J., 2006. Regression models for categorical dependent variables using Stata. *Stata press,* Volume 7.

MacCallum, R. C. & Corinne, M. M., 1995. Distinguishing between moderator and quadratic effects in multiple regression.. *Psychological Bulletin,* 118(3).

Manning, M., 2009. The effects of subjective norms on behaviour in the theory of planned behaviour: A meta-analysis. *British journal of social psychology,* 48(4), pp. 649-705.

Marangunić, N. & Granić, A., 2015. Technology acceptance model: a literature review from 1986 to 2013. *Universal access in the information society,* Volume 14, pp. 81-95.

Marshall, G. N. et al., 1992. Distinguishing optimism from pessimism: Relations to fundamental dimensions of mood and personality. *Journal of personality and social psychology,* 62(6), p. 1067.

Ma, S. & Chen, C., 2023. Are digital natives overconfident in their privacy literacy? Discrepancy between self-assessed and actual privacy literacy, and their impacts on privacy protection behavior. *Frontiers in Psychology,* Volume 14.

McAdams, D. P. & Pals, J. L., 2006. A new Big Five: fundamental principles for an integrative science of personality. *American psychologist,* 61(3), p. 204.

McGill, T. & Thompson, N., 2018. *Gender differences in information security perceptions and behaviour.* s.l., 29th Australasian Conference on Information Systems.

Mehregan, M. R., Hosseinzadeh, M. & Emadi, M. M., 2019. The mediating role of affect in the relationship between the big five factor personality and risk aversion: a structural model. *International journal of applied behavioral sciences,* 5(2), pp. 28-36.

Nguyen, T., Yeates, G., Ly, T. & Albalawi, U., 2023. A Study on Exploring the Level of Awareness of Privacy Concerns and Risks. *Applied Sciences,* 13(24).

O'Neil, D., 2001. Analysis of Internet users' level of online privacy concerns. *Social Science Computer Review,* 19(1), pp. 17-31.

Oehler, A. & Wedluch, F., 2018. The relationship of extraversion and neuroticism with risk attitude, risk perception, and return expectations. *Journal of Neuroscience, Psychology, and Economics,* 11(2), pp. 63-92.

Ögütçüa, G., Testik, Ö. M. & Chouseinoglou, O., 2016. Analysis of personal information security. *Computers & Security,* Volume 56, pp. 83-93.

Osatuyi, B., 2015. Personality traits and information privacy concern on social media platforms. *Journal of Computer Information Systems,* 55(4), pp. 11-19.

Oye, N. D., Iahad, N. A. & Rahim, N. A., 2014. The history of UTAUT model and its impact on ICT acceptance and usage by academicians. *Education and Information Technologies,* Volume 19, pp. 251-270.

Ozer, D. J. & Benet-Martínez, V., 2006. Personality and the prediction of consequential outcomes. *Annual Review Psychology,* Volume 57, pp. 401-421.

Park, Y. J., 2013. Digital literacy and privacy behavior online. *Communication research,* 40(2), pp. 215-236.

Park, Y. J., 2013. Digital Literacy and Privacy Behavior Online. *Communication research,* 40(2), pp. 215-236.

Pei-Lee, T., Chen, C. Y., Chin, W. C. & Siew, Y. Y., 2011. Malaysian Journal of Library & Information Science. *Do the big five personality factors affect knowledge sharing behaviour? a study of malaysian univeristies,* 16(1), pp. 47-62.

Picazo-Vela, S., Chou, S. Y., Melcher, A. J. & Pearson, J. M., 2010. Why provide an online review? An extended theory of planned behavior and the role of Big-Five personality traits. *Computers in Human Behavior,* 26(4), pp. 685-696.

Roberts, B. W. et al., 2009. Handbook of individual differences in social behavior. *2009,* p. 369–381.

Rosli, M. S. et al., 2022. A systematic review of the technology acceptance model for the sustainability of higher education during the COVID-19 pandemic and identified research gaps. *Sustainability,* 14(18).

Saritepeci, M., Durak, H. Y., Özüdoğru, G. & Uslu, N. A., 2024. Saritepeci, M., Durak, H. Y., ÖzThe role of digital literacy and digital data security awareness in online privacy concerns. *Online Information Review.*

Seibert, S. E. & Kraimer, M. L., 2001. The Five-Factor Model of Personality and Career Success. *Journal of Vocational Behavior,* 58(1), pp. 1-21.

Sharpe, P. J., Martin, N. M. R. & Roth, K. A., 2011. Optimism and the Big Five factors of personality: Beyond neuroticism and extraversion. *Personality and individual differences,* 51(8), pp. 946-951.

Sheehan, K. B., 2002. Toward a Typology of Internet Users and Online. *The Information Society: An International Journal,* 18(1), pp. 21-32.

Sindermann, C. et al., 2021. Online Privacy Literacy and Online Privacy Behavior – The Role of Crystallized Intelligence and Personality. *International Journal of Human–Computer Interaction,* 37(15), pp. 1455-1466.

Škrinjarić, B., Budak, J. & Žokalj, M., 2018. The effect of personality traits on online privacy concern. *Ekonomski pregled,* 69(2), pp. 106-130.

Solove, D. J., 2021. The Myth of the Privacy Paradox. *George Washington Law Review,* 89(1), pp. 1-52.

Stachl, C. et al., 2017. Personality Traits Predict Smartphone Usage. *European Journal of Personality,* 31(6), pp. 701-722.

Steijn, W. M., Schouten, A. P. & Vedder, A. H., 2016. Why concern regarding privacy differs: The influence of age and (non-)participation on Facebook. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace,* 10(1), p. Article 3.

Steijn, W. M. & Vedder, A. H., 2015. Privacy concerns, dead or misunderstood? The perceptions of privacy amongst the young and old. *Information Polity,* 20(4), pp. 299-311.

Struminskaya, B. & Keusch, F., 2019. *Smart devices.* [Online] Available at: https://www.dataarchive.lissdata.nl/study-units/view/873 [Accessed 29 March 2024].

Struminskaya, B. & Keusch, F., 2019. *Smart Devices > Part 1,* s.l.: CentERdata.

Struminskaya, B. & Keusch, F., 2019. *Smart Devices > Part 2,* s.l.: CentERdata.

Sun, Y., Wang, N., Shen, X.-L. & Zhang, J. X., 2015. Location information disclosure in location-based social network services: Privacy calculus, benefit structure, and gender differences. *Computers in Human Behavior,* Volume 52, pp. 278-292.

Thapa, S., Guzmán, F. & Paswan, A., 2024. We are just 10 feet away! How does location-based advertising affect consumer-brand engagement?. *Journal of Business Research,* 172(114425).

Tifferet, S., 2019. Gender differences in privacy tendencies on social network sites: A meta-analysis. *Computers in Human Behaviour,* Volume 93, pp. 1-12.

Uliaszek, A. A. et al., 2010. The role of neuroticism and extraversion in the stress–anxiety and stress–depression relationships. *Anxiety, Stress, & Coping,* 23(4), pp. 363-381.

Uphaus, P. et al., 2021. Location-based services – the market: success factors and emerging trends from an exploratory approach. *Journal of Location Based Services,* 15(1), pp. 1-26.

Van den Broeck, E., Poels, K. & Walrave, M., 2015. Older and Wiser? Facebook Use, Privacy Concern, and Privacy Protection in the Life Stages of Emerging, Young, and Middle Adulthood. *Social Media+ Society,* 1(2).

van Deursen, A. & van Dijk, J., 2011. Internet skills and the digital divide. *New Media Society & Society,* 13(6), pp. 893-911.

Xu, H. & Gupta, S., 2009. The effects of privacy concerns and personal innovativeness on potential and experienced customers' adoption of location-based services. *Electronic Markets,* Volume 19, pp. 137-149.

Yang, S. & Wang, K., 2009. The influence of information sensitivity compensation on privacy concern and behavioral intention. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems,* 40(1), pp. 38-51.

Youn, S., 2009. Determinants of online privacy concern and its influence on privacy protection behaviors among young adolescents. *Journal of Consumer affairs,* 43(3), pp. 389-418.

Yun, H., Han, D. & Lee, C. C., 2013. Understanding the use of location-based service applications: do privacy concerns matter?. *Journal of Electronic Commerce Research,* 14(3), p. 215.

Zafeiropoulou, A. M., Millard, D. E., Webber, C. & O'Hara, K., 2013. Unpicking the privacy paradox: can structuration theory help to explain location-based privacy decisions?. *Proceedings of the 5th Annual ACM Web Science Conference,* pp. 463-472.

Zeidner, M. & Matthews, G., 2000. Intelligence and personality. *Handbook of intelligence,* pp. 581-610.

List of tables