

Course: SKOM12  
Term: Spring 2022  
Supervisor Ilkin Mehrabov  
Examiner

# Exploring the Adoption Intentions of COVID-19 Digital Contact Tracing App in Denmark

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# Abstract

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Since the beginning of the COVID-19 pandemic, contact tracing apps have been used as a means to curb the spread of the virus worldwide. If well adopted, these apps can aid in subduing the spread of the virus. However, the introduced contact tracing app needs to be accepted and adopted by the majority of the public in order for it to be beneficial. The Danish government has made available a local contact tracing app, SmitteStop, on June 18th, 2020. The new app has been actively advertised by governmental institutions, such as the Danish Health Authority, in order to establish a base of active users. It is becoming critically important to understand factors influencing people's decision to download a contact tracing app in a setting of a pandemic. This knowledge will improve the efficiency of government communication strategies to convey the benefits of contact tracing apps. The research model has been developed based on The Theory of Planned Behaviour (TPB) to better understand the adoption of contact tracing apps. TPB was extended, and two new constructs of perceived privacy risk and trust in the government have been added to the model. In order to validate the model, an online questionnaire was applied, and a total of 372 valid responses were obtained. However, contrary to what was expected, only one of the added constructs, perceived privacy risk, directly affected intentions to use SmitteStopp app. Finally, the study discusses the findings and makes several suggestions for future research.

*Keywords:* COVID-19, Theory of Planned Behaviour, adoption of contact tracing apps, communication strategies

Word count: 18 243

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# 1.Introduction

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The COVID-19 pandemic has emerged from a new type of virus causing a highly contagious respiratory infection. On March 11<sup>th</sup>, 2020 WHO (World Health Organization) declared COVID-19 a pandemic (AJMC, 2021). The virus has successfully spread worldwide while negatively impacting economies and causing countries to slip into recession. The governments' and global public health agencies' responses have been fragmented. Some countries implemented policies to stop the spread of the virus. Others attempted to suppress and contain the spread, and finally, some attempted to build herd immunity (Elkhodr et al., 2021).

Global and national health authorities relied on mitigation measures based on testing, tracing, isolation, and quarantine (Salathe et al., 2020). Therefore, there were high expectations for contact tracing apps (CTA) to enhance conventional mitigation measures (Von Wyl et al., 2021). Contact tracing is a process that allows the prevention of onward transmission of the virus by identifying and managing people who have been exposed. New technologies allow the creation of tracing apps that trace the user's encounters with other app users, making contact tracing more efficient and less labour intensive. As people simply need to download an app onto their mobile device (Elkhodr et al., 2021). Some studies have stated that the rationale for using the CTAs is based on modelling studies that suggest that CTAs alone can stop the spread of the virus (Anglemyer et al., 2020; Ferretti et al., 2020). CTAs lead to a faster notification of contacts exposed to the infected person. As the CTAs track the encounters with other people and can identify all the encounters a person had. However, the studies also specified that for the CTAs to be effective, a considerate proportion of the population must use the app. According to some researchers, at least 60% of the population or more should adopt the app (Von Wyl et al., 2021).

While 60 % of the population might seem like an unachievable goal, some governments have successfully implemented contact tracing technology in one form or another. Countries like China and Singapore were able to reopen soon after the lockdown due to the successful implementation of contact tracing measures for public health monitoring. China achieved it by utilizing the national e-wallet application, which linked the digital footprints of a person based on the purchases completed. In Singapore, a smartphone application monitored the person's

contact tracing and location check-in/check-out systems (Ngan & Kelmenson, 2020). However, big data analytics has also granted governments and private corporations' opportunity to collect various types of data. Such as real-time location, credit card history, and geofencing technology, track the movement of the spread of the virus by tracing a person's activities (Ngan & Kelmenson, 2020). As a result, this caused some scholars to raise concerns over the risk of erosion of privacy due to the application of new technologies by public authorities (Goold, 2010; Monahan, 2006). Accordingly, the topic of privacy has become significantly popular among researchers. Conversely, the findings produced contradictory results. While in some studies, privacy decision-making was a rational process of weighing benefits and losses, in other studies, this process was irrational (Sharma et al., 2020).

Despite the growing interest in digital tracing apps, individuals are rarely asked about their views and perceptions on the matter of CTAs (Suh & Li, 2021). To date, few studies explore citizens' intention to use CTAs in a setting of an ongoing pandemic (Lin et al., 2021; O'Callaghan et al., 2021). Therefore, this master thesis aims to fill this gap in research by exploring individuals' intentions to use CTAs. The study focuses on Denmark and the Danish population's intention to adopt the SmitteStop app at the pandemic's beginning. When referring to the Danish population or locals, this paper focuses on all the residents—people from other countries currently living, working, or studying in Denmark and Danish nationals. SmitteStop is a Danish alternative to a CTA. It has been developed by the Danish Ministry of Health in partnership with the Danish Health Authority, the Danish Patient Safety Authority, the Danish Agency for Digitization and Netcompany (smitte|stop, 2021). The app became available to the Danish public on June 18th, 2020 (Post, 2020). The latest data available dates to February 2021. It states that the app has been downloaded close to 2.2 million times since its launch (Brandt, 2021). However, the stated number of 2.2 million is not indicative of the actual number of users of the app. The cited number includes cases where the app was downloaded more than once and did not indicate if the app was activated and used after the download. This signifies that the actual number may be smaller (Ostergaard & Frokjær, 2020). Therefore, with the currently available data, it is impossible to state precisely how many people in Denmark actively used the app at the beginning of the pandemic. Instead, only an approximate indication of the app use is available. Additionally, a professor at Roskilde University stated that for the app to truly make a difference, at least 3,4 million people should download and use it (Ostergaard & Frokjær, 2020). The key motivation of this study is to bring a new perspective and explore the Danish populations' intentions to adopt the SmitteStop app at the beginning of a pandemic as

a measure to curb the infection rates. This could serve as a guide in future implementations of the CTAs in a setting of an outbreak of a potential pandemic. The findings of the study will provide insight to the government and assist in formulating communication strategies and policies for future adoption of contact tracing apps in Denmark.

Additionally, as crises increasingly are becoming more critical social and political factors. They pose threats to security, health, and psychological stability. Therefore, communication is viewed as a tool for achieving goals, solving problems, influencing people, and coordinating actions. The outputs or outcomes of communication behaviours and processes focus on functional methods (Sellnow et al., 2013). Therefore, communication has become the primary means by which public health officials can influence public behaviour to mitigate the spread of infectious diseases. Accordingly, the importance of using a CTA during a crisis needs to be communicated to the population. In order to successfully communicate the message, it needs to be explained or framed in a specific way for the audience to perceive it (Sellnow et al., 2013).

Therefore, this research proposes building on existing studies and contributing to the debates on how to effectively communicate during an ongoing crisis. Through the lens of crisis communication framing theory, the study develops further knowledge of factors influencing the public intention to use CTAs. In order to accomplish that, the study adopts the Theory of Planned Behaviour (TPB), which serves as a framework for gaining knowledge about the intention to use the CTA (Ajzen, 1991). The TPB has been extensively applied within the studies of health domain (Armitage & Conner, 2001), as unlike other behavioural theories, it implies that the desired behaviour depends on both motivation (intention), as well as the ability (perceived behavioural control) (Ajzen, 1991). Nevertheless, the simplicity of the model has also received some criticism. A certain sceptical view was developed towards its sufficiency as a complete theory in predicting human behaviour (Conner & Armitage, 1998; Sparks & Shepherd, 1992). Taking into account the aforementioned criticism, this study has tested two additional constructs derived from the comprehensive literature review (Conner & Armitage, 1998). The added measures of perceived privacy risk and trust in the government have been previously empirically tested by researchers (Altmann et al., 2020; Duan & Deng, 2020; Yang et al., 2012). It was discovered that high perceived privacy risk reduced acceptance of new technology (Duan & Deng, 2020; Yang et al., 2012; Kokkoris & Kamleitner, 2020), and low trust in the government influenced the acceptance of certain CTAs (Altmann et al., 2020; Moon, 2020).

Furthermore, the study tests the overall efficacy of the TPB model, by exploring the relevance of including two more constructs to the original framework. TPB can serve as a great tool to design future communication strategies in order to reinforce the adoption of healthy behaviours (Francis et al., 2004). The study's findings will contribute to the field of crisis communication by providing observations and interventions that could improve communications strategies when addressing the population. Respectively, this will grant the governmental institutions opportunity to formulate communication strategies and policies for promoting the adoption of CTAs for future epidemic control and better emergency management in Denmark. As the study builds on the TPB model and further extends it, the findings contribute to improving the predictive power of TPB. The study achieves this by applying a cross-sectional study design, studying a sample at the time of the ongoing Covid-19 pandemic. The survey data was collected through the social media tools in a time frame between 27th of April and 17th of June 2021. The data set contains 382 responses.

### 1.1. Aim And Research Questions

The study aims to explore the intentions to use the SmitteStop CTA in a diverse sample of the Danish population. Specifically, the paper focuses on identifying parameters that affect the nationwide adoption of the SmitteStop app by exploring the extent to which various constructs affect the intentions to use the app. This is realised by investigating the relationships between variables. In line with the post-positivism tradition, the theory is applied deductively as a prediction of expected findings in regards to how variables relate to each other (Leavy, 2017). Through the application of the TPB model, the study aims to test the overall efficacy of the TPB by further exploring relevance of including two more constructs to the original framework. Subsequently, hypotheses are developed and guided by existing theory and literature (Van de Ven, 2007). In terms of theory, this will further build the understanding and applicability of the model and test the extended model and how well it explains the variance. This knowledge will also contribute to a better understanding in terms of practical implications. As identifying potential reasons behind the low uptake of CTA by the Danish public.

The stated discussion leads to identify the following research question:

**RQ:** To what extent does the revised model of TPB measures the intention to use the SmitteStop CTA in Denmark?



In addition to testing the theoretical (hypotheses) and practical implications, the study aims to further contribute to a complex understanding of public attitudes towards the CTAs. As a result, the findings will improve the future implementations of CTAs in the context of a health crisis. Especially as a measure to curb the spread of the virus at the beginning of the pandemic. The study further aims to contribute new knowledge to the strategic communication field. More specifically, crisis communication by providing interventions to be applied in the framing theory to increase the uptake of the CTAs by the public during a developing crisis.

## 1.2. Relevance To Strategic Communication

The essence of strategic communication can be defined as “communicating purposefully to advance its mission” (Hallahan et al., 2007, p. 4). Therefore, this thesis embarks on exploring intentions to adopt the COVID-19 digital CTA in Denmark to learn which parameters have the most significant influence on CTA use. This insight will allow to tailor the communication to reinforce influential parameters for the governments to apply various crises management practices (Sellnow et al., 2013). In public relations, issues management is a dominant paradigm, which it includes “the identification, monitoring, and analysis of trends in key publics” (Heath & Gay, 1997, p. 6). Therefore, it argues the importance of identifying and analysing the public’s perceptions.

Increasingly, crises are important social, economic and political forces, that unlike any other phenomenon, create change in societies much quicker. As much as these forces have the potential to harm, they also bring constructive change. A crisis can reshape institutions and drastically influence widely held beliefs (Sellnow et al., 2013). It is increasingly important to gain knowledge of the public's intentions to adopt the SmitteStop app during the ongoing crisis to explore the relationships among constructs and how they affect the intention. Therefore, the investigation of the extended TPB provides knowledge about which determinants have a stronger influence on the intention to use the CTA. Based on that knowledge, according to the TPB, the interventions can be designed to influence and change health related behaviour through the framing theory of crisis communication. The framing theory is applied as a lens through which the problem is observed. The theory distinguishes two different dimensions: disciplinary (psychological and sociological) and explanatory models (applicability models vs other effects models). The research is built on an explanatory model which studies how frames

apply substantial influence on citizens attitudes, beliefs and behaviours (Tewksbury & Scheufele, 2009). In communication research framing theory is studied through two main approaches: as dependent variable (how frames are established) and independent variable (how framing effects an audience). This study is guided by the independent variable with the belief that to frame something means to select an aspect of perceived reality and highlight it in the communication method in order to promote a specific behaviour (Tewksbury & Scheufele, 2009).

Thereby, this knowledge is particularly important for communication in crisis communication in health context at times of crisis like a global pandemic, where communication strategies employed must reach the majority of the public and therefore influence public behaviour. Hence, it can serve to improve future crisis communication strategies.

### 1.3.Demarcation

The study explores the intentions to use the SmitteStop CTA through a sample of the Danish population. It is conducted during the ongoing pandemic of COVID -19 and includes all residents of Denmark despite their nationality in order to study which parameters affect the nationwide adoption of the SmitteStop app. Therefore, it does not comprehensively analyse national culture and extensive research of differences among Danish and non-Danish citizens. Instead, the study centres on the intention of using a CTA and which constructs have the strongest influence on the intention among all residents of Denmark. It further intends to contribute to a more profound understanding of public attitudes about CTAs by examining theoretical (hypotheses) and practical implications. This knowledge is particularly important for crisis communication where communication strategies employed must reach the majority of the public and influence public behaviour. Additionally, it is worth noting that while the study takes into account respondents' perception of privacy risk, the emphasis does not lie on the extensive analysis of risks of data surveillance, the efficacy of use of CTAs or the threat of surveillance. The intention of the research paper lies within studying intentions to use the CTA and the factors that influence it. In contrast, the analysis of risks of data surveillance would focus beyond the perceived privacy risks by an individual.

The research applied a cross-sectional study design with a nonprobability sampling approach to data collection. The data was collected through social media platforms like Facebook and LinkedIn. The data was collected through an online survey in a time frame from the 27th of April until the 17th of June 2021. The target population for this research are people residing in Denmark, which includes both Danes and expats. The reasoning behind including Danes and foreigners refers back to the study objectives. The study is conducted in a setting of an ongoing pandemic, during which the government encourages the use of CTAs. In order to tailor the communication strategies, the governmental institutions require to obtain knowledge about which determinants have a stronger influence on the intention to use the CTA. Furthermore, the study is focused on the intentions to use the CTAs at the start of the pandemic as a preventative measure and does not delve into the study of intentions during a prolonged crisis. As during a longer period of time, intentions to use CTAs may be influenced by other factors.

## 2. Literature Review and Theoretical Framework

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The chapter aims to provide an overview of the theoretical framework guiding this research, introduce to the concept of TPB and the new constructs of perceived privacy risk and trust in the government, and the development of the hypothesis. The theoretical framework will serve as the foundation for the research model and hypothesis formulation. Lastly, the chapter concludes with the research model.

### 2.1. Previous adoptions of the Theory of Planned Behaviour

The domain of attitude theory presents a simplified approach and comprehensive method of predicting human behaviour. One of the most prominent theorists and psychologists Ajzen and Fishbein (1980), stated that in order to prevent health-compromising behaviours and correspondingly adjust governmental policies, it is necessary to uncover the reasons behind the behaviours. Their contributions drew a clear distinction in theory between the attitude, intention to perform the behaviour and actual behaviour. As a result, the Theory of Reasoned Action (TRA) was established, which became one of the most widely applied models (Fishbein & Ajzen, 1980). However, in 1988 the TRA model was extended as some inadequacies were identified in the model by the researchers (Ajzen, 1991). The TRA model had an underlying assumption that people have complete self-control to perform actual behaviour. However, researchers observed that most behaviours are located somewhere amid the extremes of total lack of control and total control over the behaviour (Ajzen, 1991; Godin et al., 1992). Following the reasoning, to adjust the TRA model, the third determinant of perceived behavioural control was included in the model. This resulted in a new model of Theory of Planned Behaviour (TPB) (Sparks & Shepherd, 1992).

Thereafter, the TPB model has gained popularity among researchers and has been practiced in various domains (Fishbein & Ajzen, 2011). It has been applied with great success in prediction of voting intentions (Fishbein et al., 1980; Montgomery, 1989), intention to have

children (Jaccard & Davidson, 1972), use of green energy and products (Dean et al., 2008; Nuttavuthisit & Thøgersen, 2017; Shalender & Sharma, 2021) and currently there is a rise of studies related to health behaviour change (Sharma et al., 2020; Tomczyk et al., 2021; Von Wyl et al., 2021). Various studies also indicate a link between psychological processes and changes in behaviour related to adaptive health behaviours during a pandemic (Bish & Michie, 2010; Tomczyk et al., 2021; West et al., 2020). Most importantly, TPB is a prominent theory within health communication research (De Bruijn, 2010; Godin et al., 1992; Rhodes et al., 2006; Sharma et al., 2020).

Another aspect to take into consideration is the TPB's sufficiency assumption. Generally speaking, TPB permits sufficiently accurate prediction of intentions and behaviour. As it allows to predict behaviour from behavioural intentions and perceived behavioural control. In turn, behavioural intentions can be predicted from attitude, subjective norms and perceived behavioural control towards the behaviour (Ajzen, 1991). Nevertheless, Conner and Armitage (1998) stated that the constructs in TPB might not sufficiently explain people's intentions and behaviour. It has been commonly argued that extension of the theory by one or more predictors will increase the amount of explained variance in the behavioural intentions or behaviour. In earlier treatments of TRA, the choice of including additional predictors was left open (Conner & Armitage, 1998).

Additionally, Ajzen and Fishbein (1980) have also recognized the importance of external variables like demographics. However, they argue that the importance of external variables is bound to fluctuate basis the situational contexts, unlike TPB constructs. Overall, Ajzen (1991, p. 199) welcomed the inclusion of new constructs "if it can be shown that they capture a significant proportion of the variance in intention or behaviour after the theory's current variables have been taken into account". Yet, Conner and Armitage (1998) advise adopting a sceptical perspective when integrating new variables into the framework, as it would undermine the main benefit of the model, being its attribute of simplicity. Following this belief, various researchers have been extending the TPB model, Kor and Mullan (2011) as well as Norman and Cooper (2011) studied the role of past behaviour, the latter in addition inspected habit construct and perceived autonomy support. For the sake of parsimony, the addition of new constructs should be considered after careful deliberation (Ajzen, 2011).

As with most major theories, TPB has received criticism from some researchers (Conner & Armitage, 1998). It is claimed that the theory is causal due to the perceived cause and effect

relationship among constructs of attitude and intention. However, the direction of causality is not apparent, as empirical tests applied correlational designs have only revealed that the change in one variable led to change in another (Conner & Armitage, 1998). Ajzen and Fishbein (1980, p. 98) have admitted that “since correlations are simply measures of association and do not imply directionality, we could also predict a person’s attitude from his intention”. Therefore, as pointed out by Conner and Armitage (1998) and Liska (1984), this prevents the implicit causal assumptions of the theory from being tested. Nevertheless, TPB remains a popular framework for researchers seeking to explore aspects of social behaviour (Fishbein & Ajzen, 2011).

## 2.2. An extended model of the Theory of Planned Behaviour

### 2.2.1. Attitude

The general assumption is that a person’s behaviour towards something (ex. action) is determined by his attitude towards it (Ajzen & Fishbein, 1980). However, Ajzen and Fishbein (1980) have identified two conceptualizations of attitude, attitude towards behaviour and attitude towards object. An attitude towards a behaviour is a person's positive or negative evaluation of performing the specified behaviour, and a person's attitude towards an object, which is a positive or negative evaluation of that object (Ajzen & Fishbein, 1980). This suggests that an attitude towards an object, like the CTA, could differ from the same individual’s attitude towards using that object. Therefore, Ajzen (1991) has concluded that the construct of attitude in the TPB model is solely related to attitude towards behaviour. Thus, the further reference to the construct of attitude will implicitly mean attitude towards a behaviour.

Furthermore, the construct of attitude taps into the overall evaluation of the behaviour. It consists of two interactive parts: behavioural beliefs and attitude towards the behaviour (Francis et al., 2004). Multiple studies show that attitude has a positive effect on the intention to perform a specific behaviour (Raygor, 2016; Shalender & Sharma, 2021; Sharma et al., 2020). The construct of attitude is considered central to the model. Therefore, if attitude does not predict intention, the theory will be rejected (Ajzen, 1991).

Various reviews of the TPB model recognize the construct of attitude as the best predictor of intention (Norman & Conner, 2005). Kahn (2007) has found that attitude serves as an essential predictor of customers' adoption behaviour. Ozaki and Sevastyanova (2011) found that attitude significantly affected the adoption of new technology in their study. On the other hand, Hidrue et al. (2011) discovered that individuals with a positive attitude were ready to pay extra for the product. Egbue and Long (2012) found that individuals with a positive attitude are more inclined to become early adopters of new technology. Sharma et al. (2020) presented empirical results that confirmed a positive influence of attitude on CTAs. Furthermore, Coombs et al. (2010) found that 23% of the variance in intention to be explained by attitude was the highest percentage compared to other constructs. In line with these findings, it is hypothesized that:

H1. Attitude has a positive and significant effect on individuals' intention to use the contact tracing app SmitteStop

### 2.2.2. Subjective Norms

Subjective norms construct refers to social pressures that make the individual perform certain behaviour (Hadadgar et al., 2016). Therefore, it is focused on a personal perspective of social pressure to perform the intended action. It is worth noting that Ajzen and Fishbein (1980) concept of subjective norms is far more limited than the sociological definition of 'norms'. Usually, 'norms' refer to implicit rules that guide us in society and advise us of 'right' and 'wrong' (Webster, 1975). However, in the TPB model, the subjective norms refers to the individual's perception of what is expected of him from his significant others (Ajzen & Fishbein, 1980). The perception does not necessarily reflect reality, but the derived conclusion constitutes an individual's subjective norms (Ajzen & Fishbein, 1980). Support for the importance of subjective norms in the TPB has been somewhat weak (Ajzen, 1991). Subjective norms have been frequently shown to be the weakest predictor (Bagozzi, 1992; Conner & Armitage, 1998). However, the contradictive findings stress the importance of this construct, since it deals with the decision-making aspect of the human nature (Holst & Iversen, 2011). This construct is made out of two components: normative beliefs, how an individual thinks other people would like him to behave and the corresponding positive or negative judgements about belief (Francis et al., 2004).

In line with the contradictory nature of the subjective norms construct, several studies have found that social norms have a considerable influence on behavioural intention (Sharma et al., 2020). Dai and Palvi (2009), during the study on mobile commerce adoption in USA and China, confirmed the influence the subjective norms have on people's intention. Correspondingly, another study of online information privacy concerns conducted by Li (2012) has also suggested that subjective norms influence individuals' behavioural intention to disclose their personal information. Other studies have found that subjective norms influenced individuals purchasing decisions (Caperello & Kurani, 2012; Lane & Potter, 2007; Lieven et al., 2011; Moons & De Pelsmacker, 2012), as well as among faculty staff and students, social pressure was identified as important criteria for the decision-making process (Egbue & Long, 2012). Furthermore, through a rapid systematic review of available research papers, Megnin-Viggars et al. (2020) identified facilitators to engage with CTAs during a pandemic, and collective responsibility was one of the facilitators. Study participants' intentions were influenced by collective responsibility to help reduce the spread of the virus. Which, as a result, created social pressure to adopt a CTA (Megnin-Viggars et al., 2020). Kokkoris and Kamleitner (2020), in their study, were able to contribute to the literature on collective responsibility, as well as privacy literature, where they demonstrated that out of concern for other people, individuals were more inclined to endanger their privacy. This indicates that a more prominent social pressure obligates individuals to behave in a particular manner.

However, it is worth noting that in some studies, it has been observed that, as soon as the social pressure decreases, most individuals will return to their original behaviour. Hence, this factor might not have a long-lasting effect on the behaviour (Roche et al., 2010; Wang et al., 2016). Though other researchers believe that if an individual is already inclined to behave a certain way, then due to the social pressure, he/she is more likely to follow that behaviour (Lai et al., 2015; Shalender & Yadav, 2018; Shalender & Sharma, 2021). Taking into account that COVID -19 is a global pandemic and the CTAs are applied as a crisis management tool in an attempt to curb the ongoing spread of the virus, the following is hypothesised:

H2. Subjective Norms have a positive and significant effect on individuals' intention to use the contact tracing app SmitteStop.

### 2.2.3. Perceived Behavioural Control



In order to explain behaviours, which fall outside of an individual's control, the Perceived Behavioural Control (PBC) construct was developed. PBC refers to a person's perception of the ease or difficulty of performing a specific behaviour. It focuses on two aspects: how much control a person has over the behaviour and the confidence person has in the ability to perform the behaviour (Francis et al., 2004). In social cognition models designed to predict health behaviours, this variable received a great deal of attention. Albert Bandura's work on self-efficacy has had a significant influence on the notion of perceived behavioural control. Bandura emphasized that self-efficacy is one's belief in his capability to perform the action, and it is not a context-free global disposition (Lange et al., 2012). Most of the knowledge about the PBC originates from Bandura's systematic research program. The research confirmed that people's behaviour is influenced by their confidence in being able to perform a specific behaviour (Ajzen, 1991).

PBC is believed to influence both intention and behaviour. The justification for including PBC was that it would allow the prediction of behaviours that were not completely under volitional control. Thus, while the TRA could sufficiently predict relatively uncomplicated behaviours (i.e. under volitional control), it was insufficient to predict behaviour in situations where there was a constrain on the action. PBC provides information on the potential constraints and explains why intentions do not necessarily predict the behaviour (Armitage & Conner, 2001). Ajzen (1991, p. 188) stated: "The relative importance of attitude, subjective norm, and perceived behavioural control in the prediction of intention is expected to vary across behaviours and situations". This implies that in cases with powerful subjective norms and strong attitudes, PBC may be less accurate in predicting intentions. Generally, individuals are more likely to carry out more achievable behaviours (Armitage & Conner, 2001).

In recent studies, researchers have shed light on relationships between attitude, subjective norm and PBC, where the latter is seen as a moderator of attitude in subjective norm (Bosnjak et al., 2020). Barbera and Ajzen (2020) have observed that attitudes prediction of intention is strengthened with greater PBC, while simultaneously weakening the importance of subjective norms in predicting the behavioural intention. Furthermore, Burgess et al. (2013) and (Carley et al., 2013) have discovered that individual's prior experience with the studied behaviour results in a stronger feeling of control which positively affects the intention. Therefore, greater perceived behavioural control results in a greater intention to perform the behaviour (Egbue & Long, 2012; Ozaki & Sevastyanova, 2011; Shalender & Yadav, 2018).

H3. Perceived behavioural control has a positive and significant effect on the intention to use the SmitteStop contact tracing app

#### 2.2.4. Behavioural Intention

Ajzen (1991) stated that behavioural intention may predict any behaviour that entails planning. Therefore, the fundamental idea of TPB is that behaviour is guided by intentions (Lange et al., 2012). This suggests that there is a strong relation between intentions and behaviour, which may be affected by the degree of control over behaviour performance. Therefore, the TPB model can be implemented with predictability and adequacy without measuring actual behaviour (Ajzen & Fishbein, 1980; Armitage & Conner, 2001; Francis et al., 2004). However, this does not necessarily imply that intention and behaviour are perfectly correlated. In some instances, a measure of the behaviour is also required. Nevertheless, the implication is that even if there is a lack of the measure of actual behaviour, the TPB model can be applied with utmost predictability and adequacy (Ajzen & Fishbein, 1980; Conner & Armitage, 1998; Francis et al., 2004). Thus, the construct of intention is central to the TPB, as it captures motivational factors included in the other three predictor constructs (Ajzen, 1991).

Additionally, PBC moderates the relationship between intention and behaviour so that intentions will predict behaviour more accurately when the PBC is high rather than low (Lange et al., 2012). The significance of behavioural intentions and PBC in predicting a specific behaviour is expected to differ across different behaviours. In cases when a person has full control over the performance of the behaviour, intentions alone should be able to predict the behaviour. Therefore, the inclusion of PBC should provide volitional control over declining behaviour. Both behavioural intention and PBC can provide a significant contribution in predicting behaviour. However, in any given application, one construct might be more important than the other, in some cases, only one of the two predictors may be needed (Ajzen, 1991).

#### 2.2.5. Perceived Privacy Risk

Perceived privacy refers to a person's perceptions in which external parties have limited access to his personal information (Dinev et al., 2013). By the majority of the researcher's

privacy is treated as a state, either implicitly or explicitly (Dinev et al., 2013). For example, both Westin (1967) and Altman (1975) refer to the state of limited access and state of control. Westin (1967) further defined privacy as individual's right to choose what information about oneself should be shared with others and under which conditions. On the other hand, privacy risk is the negative mental state that influences the perceived privacy (Chang et al., 2015). Thus, further reference to the construct of perceived privacy risk refers to Dinev and Hart (2006) definition as a degree to which an individual believes that potential loss will result in the release of personal information. Therefore, individuals will not disclose personal information if they believe it will not be well protected (Duan & Deng, 2020).

In today's online environment, privacy concerns are constantly raised among both the researchers and the general public. For instance, in a study of determinants of mobile payment usage, Lee (2019) has argued that a major barrier to the acceptance of products and services related to technologies is user's privacy concerns. Furthermore, since mobile devices are portable and personal, it enables vendors to collect private data to an even greater extent. These characteristics raise the user's awareness of the possibility of violating privacy and personal information (Lee, 2019). Several studies have reported consumers' perceived privacy risk to reduce the acceptance and use of mobile technology (Yang et al., 2012; Lee, 2019). Other studies have further incorporated the privacy calculus theory into the technology adoption frameworks in an attempt to gain a better understanding of the individual's intention to adopt the technology in the context of information sharing. For example, in order to investigate the adoption of the radio frequency identification technology, Muller-Seitz et al. (2009) integrated the security concerns construct into the technology acceptance model (TAM). Kowatsch and Maass (2012) integrated privacy calculus theory into TAM framework to investigate the adaption of internet of Things – based services. Wang et al. (2015) and Chopdar et al. (2018) introduced privacy risk into the UTAUT2 framework, and Lee (2019) added privacy risk to UTAUT framework. The above-mentioned studies have demonstrated the need to adopt privacy concern construct into frameworks of technology adoption to understand the intention to adopt the technology by an individual. The acceptance and adoption of contact tracing apps involve an evaluation of perceived risks of sharing personal data by an individual. Therefore, there is a need for a comprehensive framework to better understand the users' privacy concerns (Duan & Deng, 2020).

In recent studies, the individuals perceived privacy risk is reported to reduce the acceptance and use of the new technology (Duan & Deng, 2020; Yang et al., 2012; Kokkoris

& Kamleitner, 2020; Lee, 2019; Li et al., 2020; Thompson et al., 2020). Furthermore, Von Wyl et al. (2021) have discovered that one of the reasons for the non-use of CTAs in Switzerland was privacy concerns. Sharma et al. (2020), through their study of the adoption of digital CTAs in Fiji, confirmed that respondents' high privacy concerns were negatively related to the adoption of the app. Aligned with these findings, the following hypothesis is proposed:

H4. Perceived privacy risks have a negative and significant effect on the intention to use the SmitteStop contact tracing app.

### 2.2.6. Trust in the Government

Belanger and Carter (2008, p. 167) have defined the individual's trust in the government as "perceptions regarding the integrity and ability of the agency providing the service". Citizens' trust in a governmental agency's capability to deliver online services is critical for a countrywide acceptance of the CTA programmes. Before citizens endorse the new governmental CTAs, they must trust government agencies to possess sufficient technical resources to secure these systems. Citizens' trust will be enhanced through honest, non-fraudulent interactions with the service providers. On the other hand, false and unfulfilled promises will diminish the trust in the governmental agencies' ability to provide the service (Belanger & Carter, 2008). Within advanced democracies like the United Kingdom or the United States of America, trust in the government is becoming an issue of significance (Hardin, 2013; Intawan & Nicholson, 2018). It can be negatively influenced by a number of various reasons, like the manner and the extent to which the government chooses to manage the data. It is worth noting that trust transfer theory claims that individuals' trust in one area can influence initial trust in another domain that has certain links to the initial domain (Stewart, 2003). This further implies that high trust in the government can positively influence the initial trust of the new CTAs developed by the governments for tracking the spread of the virus. For example, in their study, Lu et al. (2011) found that overall, customers' trust in internet payments positively influenced their trust in mobile payment services.

When people believe that the government is acting in their best interest, then they also trust the governmental institutions to offer services appropriately. As a result this trust will also transfer to a COVID-19 tracing app (Belanger & Carter, 2008). Several recent studies have further observed that trust in the government influences the acceptance of certain CTAs

(Altmann et al., 2020; Moon, 2020; Von Wyl et al., 2021). While negative attitudes toward COVID-19 tracing app lacked individual's trust in the government (Moon, 2020; Oldeweme et al., 2021). Von Wyl et al. (2021), in the study of drivers for acceptance of COVID-19 CTAs, have discovered that low trust in the government was also associated with high privacy concerns and reasons for app non-use. Therefore, the degree to which the public trusts the government to manage their private data has a significant influence on the public's acceptance of government surveillance (Thompson et al., 2020). It is also worth noting that some studies have found that trust strongly influences attitude and affects behavioural intention through the construct of attitude (Amaro & Duarte, 2016; Ibrahim et al., 2020). However, as majorities of studies have indicated the direct influence the construct of trust has towards the intention, the following is hypothesised:

H5. Trust in the government has a positive and significant effect on the intention to use the SmitteStop contact tracing app.

### 2.3. Behavioural Interventions Based on the Theory of Planned Behaviour

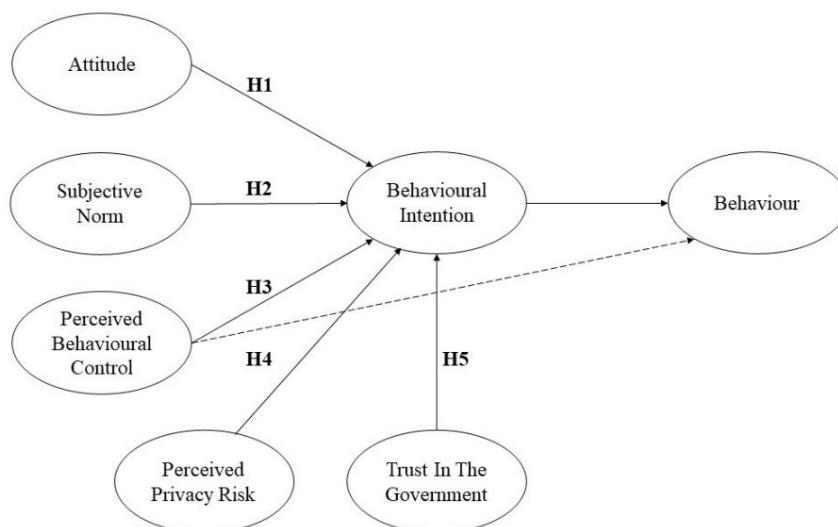
Interventions are designed with the intent to change the behaviour. They can be directed at one or more TPB determinants. According to Ajzen (2006) changes in the factors should result in changes in behavioural intentions. The method for the intervention must be developed once the beliefs for the intervention have been identified. This is achieved through the investigator's experience and creativity (Ajzen, 2006). TPB provides general guidelines for the interventions but does not specify which one is most effective. The methods considered could include persuasive communications like flyers, social media, face-to-face discussions or any other model (Ajzen, 2006).

When identifying the target for interventions, Ajzen (2006) suggests first to inspect mean levels of predictor variables, in case means are already fairly high, it is unlikely that any interventions will influence the behaviour. Following, the inspection of relative weights of predictor variables should indicate for a possible variable to target for intervention. The general guidance is that with a greater relative weight of a specific factor, the higher the possibility that changing it will influence the intentions (Ajzen, 2006).

## 2.4. Research Model

The paper proposes a revised version of the TPB model (see Figure 1) with the addition of two more constructs of trust in the government and perceived privacy risk. Previous research has indicated the predictive power of these constructs in studies of behavioural intention to use a CTAs (Duan & Deng, 2020; Yang et al., 2012; Thompson et al., 2020; Von Wyl et al., 2021). Although generally, TPB permits sufficiently accurate prediction of intentions and behaviour, several researchers claim that it is beneficial to extend the model (Conner & Armitage, 1998). As the extended model should increase the amount of explained variance in the behavioural intentions, the decision was made to add two new constructs. Even though TPB is a dominant theoretical model, it is still important to test the predictive power of the extended model and how well the added constructs improve the prediction of the intention.

**Figure 1**



In the first construct of the model, it is hypothesised that there will be positive significant relation between attitude and behavioural intention. This implies that the higher the construct of attitude, the bigger the intention to perform a specific behaviour. However, if the construct of attitude does not predict intention, the theory will be rejected, as this construct is central to the model (Ajzen, 1991). The second hypothesis predicts that subjective norms will have a positive significant effect on behavioural intention. The third hypothesis predicts that PBC has a positive effect on behavioural intention. It also acts as a moderator of attitude in the

subjective norms, where attitudes prediction of intention is strengthened with greater PBC while simultaneously weakening the importance of subjective norms. The fourth hypothesis predicts that perceived privacy risk has a negative effect on behavioural intention. This entails that a higher perceived privacy risk will negatively influence the intention to perform the behaviour. Finally, the fifth hypothesis states that construct of the trust in the government will positively affect behavioural intention.

# 3. Methodology and Research Design

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The following chapter discusses the methods applied in the thesis. The section consists of the research paradigm and research design, survey design, measurements, sample selection and data collection, considering biases, the context of the pandemic and finally, ethical considerations. The quantitative research employed an online data collection method which consisted of online surveys. Due to the dynamic nature of the topic, as well as the nature of the behaviour, which is expected to change across different situations (Ajzen, 1991), this study employs cross-sectional study design. Thus, the findings represent a ‘snapshot’ of the present state, taking into account the social and health setting in Denmark, during the data collection period between 27th of April and 17th of 2021 (Saunders et al., 2007). This implies that the findings might change after the external environment changes. For instance, the pandemic ends, and there won’t be any need for the SmitteStop contact tracing app. Therefore, the findings hold a cross-sectional value only, but provide insight into public behavioural intentions in a crisis setting. As a result, this can serve to improve future implementations of CTAs in the context of a health crisis.

## 3.1. Research Paradigm and Research Design

Quantitative research has always been driven by positivism, a philosophy that originated in the natural sciences. This school assumes that reality exists independent of the study process and can objectively be measured using the scientific method. However, modern research is guided by a refined version of this philosophy (Leavy, 2017). Contrary to positivism, post-positivism does not make absolute claims about the phenomena. It is based on probability testing and building evidence to reject or support hypotheses but not conclusively prove them. Although researcher objectivity and neutrality remain central to this philosophy, it recognizes researchers as knowing subjects that apply heuristic devices to steer their research (Haig, 2013). Furthermore, Weber (1978) made a distinction between “behaviour” and “action”, where “behaviour” was explained purely from a physiological point of view, but “actions” were meaningful. However, according to Weber (1978), meaning cannot be observed, it requires interpretive understanding. This means that observation alone cannot discern the behaviour and



social action. Interpretation involves gaining an understanding of the meaning behind a particular action and researchers values intrude on the study. Thus sociology required a fundamentally different methodology, which prompted the development of objectivity fundamentally different from positivist philosophy (Azevedo, 2017). Hence, post-positivists strive to depict reality as accurately as possible rather than uncovering the ultimate truth (Muijs, 2004). This has been accomplished through statistics and experiments, and the quantitative approach has become a traditional example of how “reality” can be uncovered (Azevedo, 2017).

Therefore, this study adopts the post-positivism paradigm, as it is widely applied in behavioural and social studies and strives to depict reality while considering researchers’ objectivity and neutrality. The theory within this tradition is applied deductively as a prediction of expected findings in regards to how variables relate to each other (Leavy, 2017). The study aims to explore the intentions to use the SmitteStop contact tracing app in a diverse sample of the Danish population. In line with the post-positivism tradition, a quantitative approach was adopted, and statistics were applied to represent reality. The study sets out to test the hypotheses and establish the associations between independent and dependent variables. As per research tradition, hypotheses are developed and guided by existing theory and literature (Van de Ven, 2007). Therefore, the study has incorporated new constructs to the TPB model based on an extensive literature review. Trust in the government and perceived privacy risk were proposed to be included in the model to understand the population's perceptions in a setting of a pandemic and investigate how well new constructs can predict behavioural intention.

While the TPB suggests a causal process, the independent variables (attitude, subjective norm, PBC) are said to determine the dependent variable (behavioural intention) (Ajzen, 1991). Conner and Armitage (1998) specified that the tests of TPB apply correlational designs instead. Therefore, the research method does not measure causality. However, it does allow researchers to determine whether the variables are independent or interdependent and the strength of the correlations between the predictor and outcome variables (Pallant, 2011; Tabachnick & Fidell, 2013). Furthermore, as correlational designs are considered sub-sets of descriptive research, this method is employed to analyse the data (Cooper et al., 2006). The study aimed not only to conduct descriptive statistics it also applied multiple regression analysis. Regression analysis is usually applied to study the dependent and independent variables' relationship. This allows to determine the strength of the relationship, as well as assess the importance of the relationship. The regression analysis discovers relationships among the TPB model constructs and tests how well the extended model explains the variance. As stated by Pallant (2011), multiple regression

analysis allows for testing whenever adding a new variable to the model contributes to the model's predictive ability. This was more in line with an exploratory approach, as the study aimed to explore how well the extended model of TPB was able to predict the behavioural intention (Pallant, 2011; Tabachnick & Fidell, 2013). In line with the post-positivism research tradition, quantitative methods are applied in order to depict and represent reality.

## 3.2. Survey Design

The present research applied a cross-sectional study design, studying a sample during the ongoing Covid-19 pandemic. The questionnaire is applied as a primary data collection tool, where, on a single occasion, respondents were asked to complete a battery of instruments. The survey consists of different sections, where first demographics data is collected. Further, filter questions are employed to identify whether the respondent is part of the target group residing in Denmark. And final questions are related to the extended TPB model. The six constructs studied in this thesis were measured by a multi-item Likert scale, applying pre-validated instruments from previous research. All individual scale items from the survey can be found in Appendix 2.

It was decided that an online survey was the most efficient data collection method during an ongoing pandemic. As any in-person data collection method posed at that time a threat to the health of the researcher and the participants of the study. Hence, the survey was developed through the online resource of Google Forms and was shared with the participants through a sharable link. The survey was conducted through the social media platforms Facebook and LinkedIn. The survey included scales to measure demographics, like gender, age and nationality. Additionally, a filter question was added to identify if the participant was part of the target group. As the research paper only focuses on Danish residents, and online data collection allows participants from abroad to submit their responses. The items used to assess the TPB constructs were mostly incorporated from existing scales designed and empirically evaluated by other academics (Ajzen, 1991; Francis et al., 2004). The same approach was used for the two additional constructs of trust in the government and perceived privacy risk (Altmann et al., 2020; Belanger & Carter, 2008; Chopdar et al., 2018; Lee, 2019).

### 3.2.1. Measurements Used in the Study

The six constructs studied in this research are all measured on a multi-item Likert scale (7-point Likert scale), applying pre-validated instruments from previous studies. In order to measure the TPB model, guidelines have been followed from the Ajzen (1991) and Francis et al. (2004) manual for constructing questionnaires, as well as some constructs have been adopted and slightly modified from previous studies (Belanger & Carter, 2008; Sharma et al., 2020) in order to fit the current research. For the two new constructs, the items for perceived privacy risk were adopted and modified from Lee (2019) and Chopdar et al. (2018) studies, and trust in the government measures were adopted and modified from Belanger and Carter (2008) and Altmann et al. (2020) studies.

The TPB framework, as previously indicated, provides two levels of examination, namely an indirect and direct assessment of specific constructs, depending on the study's nature (Francis et al., 2004). For the purpose of the current research, the direct measures of the construct were chosen as these measures fit the purpose of the study to explore the extended model's ability to predict behavioural intention. As Ajzen and Fishbein (1980) have stated, for the studies seeking to conduct analysis to only predict intentional behaviour, it may not be practical to focus on indirect measures. As indirect measures also increase the length of the scale considerably. However, it is worth noting that only a direct assessment of all the scales leaves the researcher with very little information about why a person views a certain result positively or negatively (Fishbein et al., 1980). Considering the purpose of the study, the use of direct assessment measures exclusively does not significantly influence the findings. Since the aim is to explore how well the extended model of TPB can predict the behavioural intention, rather than the reasons behind positive or negative view behind certain variables.

Following, five constructs contained three items, and the sixth construct (PBC) was comprised of four items. The PBC construct contained one more item to better capture the individual's confidence and ability to perform the behaviour. However, overall Francis et al. (2004) proposes the use of three items based on empirical studies by numerous researchers (Bagozzi, 1992; Sheppard et al., 1988; Warshaw & Davis, 1985). The survey items for each construct have been worded in a seemingly similar manner. The purpose behind this was that when analysed together, they should indicate not just behavioural intention but also desire and self-prediction, which are all aspects of total intention conceptualization (Francis et al., 2004). Most of the items in the survey have been worded positively, and one item in PBC was worded negatively. Adding negatively worded items minimised the risk of 'response set' (Francis et

al., 2004). There might be a tendency among some of the respondents to answer the questions in the same way disregarding the content (Francis et al., 2004).

**Attitude:** The respondent's attitude towards the CTA is measured using a seven-point Likert scale (with scale responses ranging from "strongly disagree" to "strongly agree"). The questionnaire includes a direct measure of attitude by measuring behavioural beliefs and outcome evaluations. The attitude measures were adopted and adjusted from previous studies (Fincham, 2005; Francis et al., 2004; Shalender & Sharma, 2021) and made into three statements. Allowing the respondent to answer how strongly they agree or disagree with the statement. The items included questions like "Installing contact tracing app SmitteStop on my mobile phone is the right thing to do".

**Subjective norms:** Likewise, the construct was measured using a seven-point Likert scale. Direct measurement of subjective norms involved the questions referring to the opinions of important people in others' life (Francis et al., 2004). The construct was measured by applying three items in the survey: "The people who are important to me (family, friends) think I should use a contact tracing app SmitteStop" were included in the survey.

**Perceived Behavioural Control (PBC):** For the PBC construct, the survey includes four items that reflect a person's confidence in performing a specific behaviour. The response format for all four items includes a seven-point Likert scale (ranging from "strongly disagree" to "strongly agree"). The items included questions such as "I can easily download and use the app". This method assesses a person's beliefs and self-efficacy about the controllability of the specific behaviour (Francis et al., 2004).

**Behavioural Intention:** The response format for all four items includes a seven-point Likert scale (ranging from "strongly disagree" to "strongly agree"). The phrasing of the questions rests on intent to use a CTA, for example, "I would be willing to use the SmitteStop app".

**Perceived Privacy Risk:** The perceived Privacy Risk toward the use of the SmitteStop app is assessed using Lee (2019) and Chopdar et al. (2018) three-item scale measure on a seven-point Likert scale (ranging from "strongly disagree" to "strongly agree"). The phrasing of the items was slightly changed to fit the current study, for example, "By using SmitteStop app, my location and personal information are at risk of being tracked and monitored".

**Trust in the Government:** The Trust in the Government construct measurement is based on Belanger and Carter (2008) and Altmann et al. (2020) studies. It includes the three-item scale

measure using the seven-point Likert scale (ranging from “strongly disagree” to “strongly agree”). The phrasing of the items focussed on trust in the government to perform actions on behalf of the population: “I trust the Danish Government to carry out the implementation of SmitteStop app faithfully”.

**Table 1**

Summary of Measurements

<b>Construct</b>	<b>No. of Items</b>	<b>Source(s)</b>
Attitude	3	Ajzen (1991) and Francis et al. (2004)
Subjective norms	3	Ajzen (1991) and Francis et al. (2004)
PBC	4	Ajzen (1991) and Francis et al. (2004)
Behavioural Intention	3	Ajzen (1991) and Francis et al. (2004)
Trust in the Government	3	Belanger and Carter (2008) and Altmann et al. (2020)
Perceived Privacy Risk	3	Chopdar et al. (2018) and Lee (2019)

### 3.3. Sample Selection and Data Collection

Conducting research in social sciences poses its own challenges. Unlike physical sciences, human attitudes and motives are subject to constant change and predicting that behaviour is challenging (Farrokhi & Mahmoudi-Hamidabad, 2012). An important point, in this case, is what Maxwell (1992) referred to as descriptive validity. Which implies that describing the study's conditions removes many misinterpretations from research results (Farrokhi & Mahmoudi-Hamidabad, 2012). Following this belief, sample selection and data collection methods are presented.

The research aims to investigate the extended TPB model's predictive ability and generate new knowledge about the Danish population's acceptance of the CTAs. The target population for this research is Danish residents, including both Danes and expats. The reasoning behind including not only Danes, but also foreigners is related to the study aim. During a pandemic, the use of CTAs is encouraged among all residents. The communication strategies would need

to address different groups of people residing in Denmark. However, as the target population is over 5 million people, 5 873 420 as per statistical reports for 2022 Q1 (Statistics, n.d.), it poses a challenge of selecting a representative sample in a period available for this research. It was important to choose the most efficient sampling method available. Thus, this study applies a nonprobability sampling technique. This is a less complex approach to data collection that still provides a good understanding of how variables relate to in a diverse population. However, this approach may pose a greater level of sampling error which cannot be easily calculated for a nonprobability sample (Boyle & Schmierbach, 2019). The researchers usually prefer the probability sampling technique, as it is unaffected by the researchers' conscious or unconscious biases when identifying respondents. The data collection was conducted through electronic means, which limits the data collection methods available to the research. Therefore, a convenience sample was applied, a nonprobability sample where individuals are selected basis their availability (Boyle & Schmierbach, 2019). The convenience sampling method has advantages in cost and ease of reaching the target population. The approach is based on the notion that the researcher collects data from participants to whom he or she has access (Sheppard, 2020). Considering all the advantages and disadvantages of each method and the restrictions because of the pandemic, the decision was made to apply the nonprobability, convenience sampling method.

The survey was distributed online through the social network between 27th of April and 17th of June 2021. Virtually anyone in Denmark or outside of Denmark was able to respond. Thus, the filter question required respondents to state their residency and nationality. This allowed to control the collected data and remove the respondents outside of Denmark. The total number of collected responses was 382. However, after controlling the respondent's place of residence, parts of the data were excluded. Ultimately, the data set included 372 respondents in the sample. As Cohen (1992) stated, for TPB studies, a sufficient sample size is required to achieve a moderate effect size using the multiple regression approach. As generalisability is at stake with smaller samples. In order to determine the minimum viable sample size, Pallant (2011) offers the following formula. The formula considers the number of independent variables used in the model:  $N > 50 + 8m$  ( $m$  stands for the number of independent variables). Hence, the minimum sample required for the current study is 90 cases. The current sample size of 372 satisfies that requirement. The survey was developed using an online resource of Google Forms which was shared with the participants using a sharable link through social media platforms like Facebook and LinkedIn. Facebook is one of the most popular social networks

worldwide. Hence it was used as a leading data collection platform together with LinkedIn. According to the recent data, 77,7% of the population in Denmark use Facebook and 47,9% LinkedIn (NapoleonCat, n.d). It was decided to post this on private social media channels, as well as various groups on Facebook, in order to ensure that respondents came from around Denmark and not only from the capital. Hence, the link to the survey was shared in various social groups in different cities in Denmark, see the Appendix 4 for the full list. The data was collected between 27th of April and 17th of June 2021.

### 3.4. Considering Biases

Several biases must be considered when conducting a quantitative study, as sample method, data collection, and measurements possess limitations. Firstly, the application of the convenience sample poses a certain risk to the generalisability of the population. While the convenience sample presents a more straightforward approach to collecting data, it certainly has its limitations. Convenience sampling is one of the most common types of sampling, playing a prominent role in the field of organizational studies as well as social research (Bryman, 2016). When applying the convenience sampling method, there is a risk of self-selection bias, administrative decision bias, presence of outliers and other influences. The presence of outliers can affect the sample statistics and reduce the precision of population estimations (Farrokhi & Mahmoudi-Hamidabad, 2012). Best and Kahn (2006) consider outliers a significant problem, as they can falsely cause high or low correlations. However, after conducting further literature inspection, it is revealed that many researchers rarely reveal checking for outliers (Osborne & Overbay, 2004). Osborne et al. (2001) have conducted an empirical study and discovered that only in 8% of all the studied cases, authors have reported checking for the presence of outliers. In order to address this issue in the analysis section, the data has been constantly inspected for outliers, and no major issues were identified. Furthermore, when survey respondents are allowed to choose themselves whether to participate in the survey or not, it may result in self-selection bias. As respondents who chose to participate in the survey may not represent the target population well, leading to biased data. Unfortunately, almost all survey samples are self-selected to some extent, either due to refusal-related nonresponse or negligible bias (Lavrakas, 2008). Despite that, numerous researchers consider the convenience sample approach to be a sufficient method, and have been extensively using

it in social science research (Farrokhi & Mahmoudi-Hamidabad, 2012; Nuttavuthisit & Thøgersen, 2017). The survey sample was based on a specific selection mechanism to mitigate the self-response bias. The survey was shared in various social groups based on a city to ensure the location-based variety of respondents in Denmark. Additionally, the demographic variables of age, gender and nationality demonstrate varied participants from different age groups, close to equal gender representation and nationalities.

It is also worth noting that unlike in physical sciences, social sciences and especially in communication studies, we are not working with consistent states or static materials. Instead, dealing with attitudes and motives of people, which are in constant change, as a result making a prediction of the behaviour becomes extremely hard (Farrokhi & Mahmoudi-Hamidabad, 2012). Therefore, staying true to the post-positivism paradigm, this thesis strives to depict reality as accurately as possible, but at the same time taking into account the ever-changing motives and attitudes of people and researchers' objectivity and neutrality. Staying true to Maxwell's (1992) statement, one of the means of addressing the biases present in the research is accurately reporting the circumstances in which it was carried out.

The collected data needs to be inspected for Common method bias (CMB). Podsakoff and Todor (1985, p. 65) stated that "Invariably, when self-reported measures obtained from the same sample are utilised in research, concern over same-source bias or general method variance arise". Therefore, CMB may occur when data is collected through self-reported questionnaires, and both dependent and independent variables are obtained from the same person. In order to check for CMB, Harman's single-factor test is often applied (Ahmad et al., 2019). Hence, Harman's single-factor test has also been used in this study. The test revealed no significant issue with CMB as the total variance for a single factor was 41 % which did not exceed 50 %, implying there is no issue of CMB.

All instruments applied in this study are based on published validated scales and have been previously used in similar research (Hasan et al., 2019; Shalender & Sharma, 2021). Therefore, it is considered that all the instruments bear good reliability and validity. This also entails that content validity, construct validity and criterion validity are ensured. The scale reliability was also assessed through internal consistency by Cronbach's coefficient alpha (see Table 2). Pallant (2011) recommends a minimum .7 of Cronbach alpha value. However, it is worth noting that the value is dependent on the number of items included in the scale. In cases with scales less than 10 items, the Cronbach alpha value may be smaller (Pallant, 2011). For the PBC scale, the decision was made to remove one of the items to improve the scale's reliability.



**Table 2**

Reliability Statistics

	<b>Cronbach's Alpha</b>	<b>N of Items</b>
Attitude	.921	3
Subjective Norms	.766	3
PBC	.711	3
Privacy Risk	.922	3
Trust in the Government	.892	3
Behavioural Intention	.910	3

### 3.5. Context of the Pandemic Situation

The study was conducted amid an ongoing COVID-19 pandemic, 11 months since the release of the SmitteStop app. At that point in time, the app had been downloaded 2.2 million times (Brandt, 2021). However, no official statistics were available as to how many of the Danish population actively used the app. The 2.2 million downloads is not an accurate representation of app users, as this number also includes cases of multiple downloads (when a person downloaded, deleted and downloaded the app once more) and cases when the app was downloaded but not used.

In hindsight, the time period of data collection fell on 27th of April and 17th of June 2021, as Denmark was preparing to go through a phased-out reopening since the last lockdown. At that time, Denmark had already seen an increase in around a thousand new daily cases. These numbers were closer to the ones in January 2021. Nevertheless, the government stated that the rise of cases was an expected phenomenon and that phased reopening would gradually continue (Local, 2021). The importance of data collection during the ongoing pandemic ensures that the collected data represents the public's opinion during the crisis, as the perception of threat and need to use CTA's is subjective. This means that collecting data in another time period may result in a different outcome. However, since this thesis aims to test the extended TPB model and to learn of the public's perception during an ongoing crisis, it is considered the right time for conducting this research.

### 3.6. Ethical Considerations

Throughout the research, ethical standards have been upheld. Standard practices for the protection of privacy and confidentiality of participants were ensured through a number of measures. All the participants were introduced to the research topic. They were provided informed consent at the beginning of the survey (see Appendix 2). The informed consent ensured participants' confidentiality. Furthermore, participants could discontinue their participation at any given time. The data collected until that point would be removed and not applied in the analysis. No identifiable information was collected or used in the survey. Participants were required to answer all the survey items, as all the questions in the survey were mandatory. However, as mentioned before, they could discontinue at any time, and the data would be deleted. The decision to make all the questions mandatory, was made to avoid missing data in the analysis. It ensured that participants did not omit questions by mistake. As this would pose a risk to the results being misreported (Pallant, 2011).

As survey practitioners are obliged to disclose the methods and findings to the public on the basis of ethics, the methods, data collection and findings are disclosed in this thesis. This allows for adequate peer review and validation of the findings. Reporting of methods ensures professional evaluation and avoids any misleading conclusions (Lavrakas, 2008).

## 4. Analysis

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The following section covers the quantitative analysis of the collected data. The data from the survey was coded and exported to the Statistical Package for the Social Sciences (SPSS) for further data analysis. The analysis chapter consists of descriptive statistics, multiple regression analysis, model evaluation, and hypothesis testing. The descriptive statistics investigated the data for any possible errors, and variables were checked for any violation of underlying assumptions to the statistical techniques selected (Pallant, 2011). Following the multiple regression analysis was performed to explore the relationship between dependent and independent variables (Pallant, 2011). The assumptions for multiple regression have been checked (multicollinearity, outliers, normality, linearity, homoscedasticity). Furthermore, statistical regression was applied as a model-building rather than a model testing procedure. Further, the analysis sets out to test the hypotheses and establish the associations between independent and dependent variables.

### 4.1. Data Analysis and Descriptive Statistics

The collected data was formatted and coded (see codebook in Appendix 1) in excel before being imported into SPSS. This was performed to ensure variable names included only ordinary letters, numbers and underscores, ensuring variables were in a single row across the top of the spreadsheet, and ensuring that it was converted into a format that SPSS could understand (Pallant, 2011). After controlling the respondent's place of residence, parts of the data were excluded. From 382 cases, 10 were deleted, as respondents did not reside in Denmark. Therefore, the final data set imported into SPSS contained 372 cases. In the SPSS, the data was screened and cleaned from any errors. First, SPSS FREQUENCIES were performed to observe if variable scores were not out of range. The screening also revealed no cases of missing data. Descriptive statistics were performed before any inferential statistics were computed.

Of the 372 valid responses, 54.6 % were female, 43.3 % male and 2.2 % preferred not to disclose their gender. Nationality has close to equal representation between Danes (51.6 %)

and other nationalities residing in Denmark (48,4 %). The age groups represented in the sample have been divided into the 6 categories, respondents younger than 20 (0.5 %), those aged between 20-30 (55.9 %), 31-40 (24.5 %), 41-50 (4.6 %), 51-60 (4.6) and respondents older than 60 (3.2 %). The largest age group represented in the sample are the respondents aged 20-30, which was expected as this is the age group which most actively uses technology in their daily lives.

**Table 3**

Sample details. Demographic data.

<b>Characteristic</b>	<b>Frequency (N=372)</b>	<b>Percentage</b>
<b>Gender</b>		
Female	203	54.6
Male	161	43.3
Prefer not to say	8	2.2
<b>Age</b>		
<20	2	0.5
20-30	208	55.9
31-40	91	24.5
41-50	42	11.3
51-60	17	4.6
60<	12	3.2
<b>Nationality</b>		
Danish	192	51.6
Other	180	48.4

Furthermore, the negatively worded items were reversed, in this case, item PerceivedBehControl3 (PBC Q3) was reversed, and new item was created: NewPerBehCon3. The data sets were inspected for outliers, and boxplots revealed one of the items with univariate outliers, PBC Q3 (see Table 4). Since many statistical techniques are sensitive to outliers, the most common approach to outliers includes deleting extreme outliers or changing the value to less extreme (Pallant, 2011). However, no technique is perfect, and each poses its disadvantage. The presence of outliers in the data set may lead to distortions in statistical estimates and inflated error rates. That being said, not all outliers are illegitimate, and not all invalid scores

can be identified as outliers. Several decisions had to be made in regards to the data set. The data set was already checked for missing and out of range values. Different authors present different arguments for removing, keeping or transforming the outliers. In this case, the decision was made to keep the outliers in the current data set, as they were part of the studied sample. It was decided not to delete cases simply because they do not fit very well (Tabachnick & Fidell, 2013). Moreover, removing one outlier can turn another subject into an outlier instead (Farrokhi & Mahmoudi-Hamidabad, 2012). However, while keeping the outliers, it is worth noting that they may bias the variance and standard error (Pallant, 2011). Therefore, the 5% trimmed mean was inspected for each item, and it revealed very similar numbers, close to the original mean (see Table 4). Therefore, the outliers were kept in the data set.

Following the data is checked for skewness and kurtosis, and the results can be seen in Table 4. To some extent, skewness is present in the data, most of the items have a small or moderate skew, indicating that distribution is moderately skewed. Pallant (2011) argues that the results are often skewed in social sciences, which is not caused by bias or measurement error, but rather reflects the nature of the constructs being assessed. A vast number of researchers agree that the acceptable range of skewness for normal distribution of data should not exceed -1 and 1 (Hair et al., 2019; Tabachnick & Fidell, 2013) and for kurtosis is -2 and 2 (George, 2011). Furthermore, Tabachnick et al. (2007) stated that with larger samples, with over 200 cases, risks of skewness and kurtosis can be reduced. With the larger samples, it is suggested to check the shape of the distribution instead of entirely relying on formal inference tests (Tabachnick & Fidell, 2013). The inspection of histograms confirmed fairly normally distributed data. Following, the items from the scales were grouped for analysis, and Tabachnick and Fidell (2013) stated that in grouped data, it is the sampling distributions of the means of variables that should be normally distributed. In this case, Central Limit Theorem reassures us that with large samples, the sampling distribution of means will always be normally distributed (Field, 2016).

**Table 4**

Descriptive statistics

Scale	Item	Mean		Std. Deviation	5% trimmed mean	Skewness	Kurtosis
		Statistic	Std. Error				
Attitude	Q1	4.70	.099	1.909	4.77	-.473	-.787
	Q2	4.79	.100	1.921	4.88	-.570	-.791
	Q3	5.34	.085	1.648	5.47	-.843	-.106
Subjective Norm	Q1	3.88	.089	1.714	3.87	.060	-.754
	Q2	4.45	.085	1.635	4.50	-.293	-.558
	Q3	4.15	.091	1.755	4.16	-.035	-.957
PBC	Q1	5.79	.073	1.411	5.91	-.235	-.069
	Q2	5.57	.071	1.369	5.66	-.775	-.076
	Q3	5.96	.060	1.160	6.04	-.748	.241
	Q4	6.45	.040	.774	6.50	-.886	-.622
Perceived Privacy Risk	Q1	4.09	.095	1.831	4.10	-.117	-.932
	Q2	4.01	.094	1.819	4.01	-.080	-1.000
	Q3	4.47	.095	1.832	4.53	-.351	-.932
Trust in the Government	Q1	5.15	.081	1.562	5.27	-.836	.249
	Q2	4.78	.094	1.804	4.87	-.655	-.487
	Q3	4.83	.089	1.712	4.92	-.664	-.294
Behavioural Intention	Q1	4.92	.100	1.928	5.02	-.587	-.886
	Q2	4.30	.103	1.982	4.33	-.150	-1.181
	Q3	4.61	.099	1.905	4.68	-.369	-.897

Finally, the items were combined into an index, and the scale's reliability was investigated. Pallant (2011) recommends a minimum .7 of Cronbach coefficient alpha value. The Cronbach coefficient alpha for the attitude scale is .921, for subjective norm .766, PBC is .711, for perceived privacy risk .922, trust in the government .892 and behavioural intention .910 (see Table 2). It is worth noting that one item has been removed from the PBC scale in order to improve index reliability. As all the instruments in the study were based on published validated scales (Hasan et al., 2019; Shalender & Sharma, 2021), it was expected that they would sustain high internal consistency. Following, the descriptive statistics were computed for the new scales. All means, standard deviations, 5% trimmed mean, skewness and kurtosis are shown in Table 5.

**Table 5**

Descriptive statistics of index

Scale	Mean	Std. Error	Std. Deviation Of Mean	5% trimmed mean	Skewness	Kurtosis
Attitude	14.38	.240	4.620	14.57	-.561	-.451
Subjective Norm	12.42	.213	4.101	12.43	.014	-.495
PBC	17.65	.149	2.871	17.83	-.581	-.404
Behavioural Intention	13.70	.271	5.234	13.87	-.259	-1.001
Privacy Risk	12.56	.263	5.082	12.62	-.133	-.874
Trust in the Government	14.76	.239	4.613	15.04	-.776	.039

The new scales remained slightly skewed to the left, with scores clustering at the higher end. The difference between the mean and 5% trimmed mean remained small, with very similar numbers. The initial assessment of normality for new scales revealed the Sig. value of the Kolmogorov-Smirnov test on all items was .000 indicating violation of the assumption of normality, which is quite common in larger samples (Pallant, 2011). Kolmogorov-Smirnov and Shapiro-Wilk tests are not fool proof methods for identifying the normality of the data. These tests, with larger samples, are likely to be overpowered and lead to believe that the data is non-normal in cases where it does not actually matter (Field, 2016). Hence, the following inspection

of histograms revealed a normally or relatively normal distribution of sampling means. Basis the central limit theorem, assumptions and the observation from histograms, the decision was made to keep the data and not to perform any transformations, as transformations of scales often increase the difficulty of interpretation of analysis (Tabachnick & Fidell, 2013).

## 4.2. Standard Multiple Regression Analysis

After performing multiple regression analysis, the first step was to reconfirm that all the assumptions of multiple regression have been met (Pallant, 2011). The data was inspected for multicollinearity, according to Field (2016), correlations between the independent variables that exceeded .9 would indicate an issue of multicollinearity. As seen from the correlations table (see Table 6), no issue was identified. The strength of the relationship between the independent and dependent variables revealed a medium to large strength of relationship according to the guidelines specified by Pallant (2011). This means that all independent variables indicated a correlation with the dependant variable exceeding .3. Where only PBC (.389) and perceived privacy risk (-.454) showed medium strength, and the remaining independent variables had a large correlation with the dependent variable: attitude (.743), subjective norms (.636) and trust in the government (.596). Moreover, a large correlation is also present between attitude and subjective norms (.651), attitude and trust in the government (.688) and a small correlation between subjective norms and PBC (.138), PBC and trust in the government (-.137). Large correlation between attitude and subjective norms, attitude and trust in the government do not pose a threat of multicollinearity. The correlations between the independent variables did not exceed .7 (Pallant, 2011). The correlations table also confirms that all variables negatively correlate with perceived privacy risk, which means that high scores on perceived privacy risk are associated with lower scores on other variables in the model. Following, the coefficients table was inspected for Tolerance and VIF values. It can identify multicollinearity issues not evident in the correlation matrix (Pallant, 2011). Tolerance for all variables was above .10 and VIF (Variance inflation factor) values were below 10, confirming that the multicollinearity assumption has not been violated (See Table 8).



**Table 6**

Pearson Correlation

Scale	1	2	3	4	5	6
1. Attitude	-	.651	.261	.688	-.445	.743
2. Subjective Norm		-	.138	.580	-.257	.636
3. PBC			-	.137	-.176	.389
4. Trust in the Government				-	-.465	.596
5. Perceived Privacy Risk					-	-.454
6. Behavioural Intention						-

Afterwards, the residuals were checked for normality, linearity, and homoscedasticity (Pallant, 2011). The residuals should be normally distributed with a linear relationship between independent and dependent variables. Normal P-P Plot of the regression standardised residuals output presents that the points lie in a reasonably straight line, suggesting no major deviations. The Scatterplot of standardised residuals suggests no major deviations (see Appendix 3).

Furthermore, no cases were found above 3.3 or below -3.3, indicating the absence of outliers. Mahalanobis distance was checked for multivariate outliers (Tabachnick & Fidell, 2013). The critical chi-square value was obtained from Pallant (2011) with the degree of freedom as a number of independent variables and alpha level of .001. For the five independent variables used for the multiple regression analysis, the critical value equals 20.515. The residuals statistics table (see Appendix 3) presents a maximum value of 19.203 which does not exceed the critical value and does not identify any outliers. However, the Casewise Diagnostics have revealed two unusual cases which are below -3.0. The first case (case number 295) with a residual value of -3.149 and the second case (case number 330) with the value of -4.519. Cook's Distance was inspected to check if these cases have undue influence on the model. According to Tabachnick and Fidell (2013), values over 1 in Cook's Distance pose a potential problem. However, the maximum value is .045, which is way below the cut-off point. This indicates that the 2 cases did not significantly influence the model. Therefore, there was no reason to delete them, as they do not have a significant effect on the regression analysis (Tabachnick et al., 2007). Additionally, in normally distributed samples, it is usually expected that around 1 % of cases to fall outside the range.

The multiple regression generated output for the extended TPB model. The extended model explains 65.7 % of the variance (R Square .657). As the R square value tends to be rather optimistic, the adjusted R square presents a better estimate of 65.2 % (Adjusted R square .652). This result is statistically significant, as seen from the ANOVA table (see Appendix 3), which indicates the Sig. = .000 ( $F(5, 366) = 140.093, p < .001$ ). Therefore, the model is statically significant, and the null hypothesis is rejected.

**Table 7**

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.810 <sup>a</sup>	.657	.652	3.087

a. Predictors: (Constant), Privacy Risk, PBC, Subjective Norm, Trust in the Government, Attitude

b. Dependent Variable: Behavioural Intention

Standardized Coefficients Beta (see Table 8) demonstrates each independent variables contribution to the final model (Pallant, 2011). The strongest unique contribution is made by attitude (.404,  $p < .001$ ), following subjective norm (.268,  $p < .001$ ), PBC (.213,  $p < .001$ ), perceived privacy risk which negatively correlates with the dependent variable (-.135,  $p < .001$ ) and trust in the government (.070,  $p < .120$ ). However, trust in the government variable is not making a significant unique contribution to the prediction of the dependent variable as Sig. is .120, which is greater than .05.

The inspection of part correlation coefficients provided an indication of contribution of each variable to the total R square: attitude .253 (6.4 %), subjective norm .196 (3.8 %), PBC .204 (4,2 %), perceived privacy -.116 (1.3 %). It is worth noting that both beta values and part correlation coefficients represent the unique value that each variable contributes to the equation by statistically removing overlapping effects of all other variables. Hence these values, when combined will not add up to the total value of R square. (Pallant, 2011).

**Table 8**Coefficients<sup>a</sup>

Model	Standardized Coefficients		Sig.	Correlations			Collinearity Statistics	
	Beta	t		Zero-order	Partial	Part	Tolerance	VIF
(Constant)		-2.495	.013					
Attitude	.404	8.278	.000	.743	.397	.253	.393	2.544
Subjective Norm	.268	6.415	.000	.636	.318	.196	.536	1.865
PBC	.213	6.670	.000	.389	.329	.204	.921	1.086
Trust in the Government	.070	1.558	.120	.596	.081	.048	.459	2.178
Privacy Risk	-.135	-3.784	.000	-.454	-.194	-.116	.739	1.353

a. Dependent variable: Behavioural Intention

Therefore, the extended TPB model explains 65.2 %,  $F(5, 366) = 140.093$ ,  $p < .001$ , of variance in behavioural intention construct, which is a respectable result. The standard multiple regression analysis was conducted to test the hypothesized relationships between the dependent variable (behavioural intention) and independent variables. The results of the conducted analysis are presented in Table 9.

**Table 9**

Hypothesis	Sig	Remarks
H1. Attitude has a positive and significant effect on individuals' intention to use the contact tracing app SmitteStop.	.000	Supported
H2. Subjective Norms have a positive and significant effect on individuals' intention to use contact tracing app SmitteStop.	.000	Supported
H3. Perceived behavioural control has a positive and significant effect on the intention to use the SmitteStop contact tracing app.	.000	Supported
H4. Perceived privacy risks have a negative and significant effect on the intention to use the SmitteStop contact tracing app.	.000	Supported
H5. Trust in the government has a positive and significant effect on the intention to use the SmitteStop contact tracing app.	.120	Rejected

## 5. Discussion

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The study aspired to explore the intentions to use the SmitteStop contact tracing app in a diverse sample of the Danish population. Since the COVID-19 pandemic has emerged as a highly contagious respiratory infection and halted worldwide economies, causing countries to slip into lockdowns to control the spread of the infection. One of the effective measures to control the spread of the infection has been contact-tracing apps (CTAs). However, for this measure to be effective, a sufficient number of users is required. It is suggested that at least 60 % of the population actively use the app (Von Wyl et al., 2021). At the pandemic's beginning, some countries like China and Singapore successfully implemented the CTAs. As a result, these countries could lift the lockdown and reopen much earlier than the rest of the world (Ngan & Kelmenson, 2020). Therefore, this thesis focused on the Danish population's intentions to adopt the CTA. It explored how well a model was able to predict an intention to use a CTA. This knowledge contributes to the debates in strategic communication in a setting of crisis communication. The insights' purpose is to help to tailor communications to the public in order to advocate for the use of the CTA.

Previous studies have indicated a connection between psychological processes and behaviour change towards adaptive health behaviours during a pandemic (Bish & Michie, 2010; Tomczyk et al., 2021; West et al., 2020). Therefore, the TPB was chosen to study the population's intention to use a CTA. Based on the literature review, the extended model of TPB was proposed and later on statistically explored. The following research question was asked: To what extent the revised model of TPB measures the intention to use the SmitteStop CTA in Denmark? The research question was investigated by testing hypotheses. As mentioned previously, the research model and hypothesis were based on the extensive research of the TPB model and additional constructs were added, extending the model. The analysis chapter presents the statistical analysis in exploring how well the extended model is able to predict behavioural intention. Four hypotheses were supported through the multiple regression analysis, and one was rejected. The current section sets out to answer the research question and discuss how the empirical findings are related to previous literature and theoretical framework.

### 5.1.1. Hypothesis Discussion

Performed multiple regression analysis allowed a more complex exploration among the variables. It is based on correlation, which made it possible to explore the strength of the relationships between the variables and their contribution to the overall model (Pallant, 2011). It uses probability testing that creates evidence to reject or support ideas, but it does not prove them conclusively (Haig, 2013). Therefore, it was conducted to test the extended TPB model.

Firstly, the collected sample contained 372 cases, where 54.6 % were female and 43.3 % were male (2.2 % preferred not to disclose their gender). The sample contains close to equal distribution basis gender. Nationality was also well represented between Danes (51.6 %) and other nationalities residing in Denmark (48,4 %). The largest age group represented in the sample aged between 20-30 (55.9 %) followed by 31-40 (24.5 %), 41-50 (4.6 %), 51-60 (4.6), 60< (3.2 %) and >20 (0.5 %). Which is also a fairly good distribution between different age groups. Descriptive statistics demonstrated that the sample had a fairly positive attitude towards the intention to use a CTAs, as the mean value was 14.37, with a minimum value of 3 and a maximum of 21, trust in the government at 14.76, the subjective norm and privacy risk means were lower, with 12.42 and 12.56 respectively. It is worth noting that perceived privacy risk negatively correlates with the other variables. Therefore, a low mean on perceived privacy risk means that the population has a lower concern in regards to privacy risk posed by the use of CTA, and a high mean would indicate high concern. A lower mean on subjective norms would also indicate that individuals perceive that there is less social pressure from their significant others to behave in a certain manner. However, while the means are lower compared to other constructs when taking into account the scales of the items, the mean scores are close to the scale's midpoint. This indicates that there is still an overall substantial social pressure, as well as a fairly high perceived privacy risk. The highest mean value was for perceived behavioural control (PBC), 17.65, indicating that the studied sample perceives the behaviour as easily performed and has sufficient control to perform specified behaviour.

Standardized Coefficients Beta indicated how much each variable contributed to the final model. The biggest contribution in predicting intention was made by attitude  $\beta = .404$ ,  $p < .001$ . This is also confirmed by semi partial correlation coefficients (which excludes any shared variance with other variables), which indicated each variable's contribution to the total R square, where attitude contributed 6,4 %. This is consistent with Ajzen (1991), as he stated

that attitude is a central construct in the model, and if attitude does not predict intention, the theory will be rejected. The first hypothesis (H1) states that attitude has a positive and significant effect on individuals' intention to use the contact tracing app SmitteStop. This hypothesis has been supported, as a positive attitude has a significant unique contribution to the behavioural intention. This is in line with other studies that have also observed that attitude had a significant effect on technology adoption, often resulting in attitude's highest contribution to the model (Egbue & Long, 2012; Ozaki & Sevastyanova, 2011; Sharma et al., 2020).

The second hypothesis (H2) states that subjective norms have a positive and significant effect on individuals' intention to use contact tracing app SmitteStop. This hypothesis is supported, as it has been observed that subjective norms have a significant effect on the intention to use a CTA. The constructs beta coefficient of  $\beta = .268$ ,  $p < .001$ , with semi partial correlation coefficients indicating 3.8 % of unique contribution to the model, controlling for other constructs. This means that the Danish population is significantly influenced by the social pressure to perform a certain behaviour. This observation is in line with findings from previous studies where Sharma et al. (2020), Megnin-Viggars et al. (2020), and Kokkoris and Kamleitner (2020) have reported similar findings. In their research paper, Megnin-Viggars et al. (2020) specifically have observed that during a pandemic, collective responsibility to reduce the spread of the virus created social pressure to perform the behaviour of adopting the CTA. It also has been observed that politicians have already been using social pressure as a tool to entice the population to perform a certain behaviour, for example, to get vaccinated (Ritzau, 2022).

The third hypothesis (H3) states that perceived behavioural control has a positive and significant effect on the intention to use the SmitteStop contact tracing app. This hypothesis has been supported. The PBC makes the third strongest contribution to explaining the behavioural intentions construct,  $\beta = .213$ ,  $p < .001$ . The PBC part correlation coefficient value of .204, uniquely contributes 4,2 % of the variance in behavioural intention to the total R square. This indicates that the studied sample's perception of ease of performing the action affects the intention to perform it. Ajzen (1991) has stated that PBC may be less powerful in predicting intentions with powerful subjective norms and strong attitudes. This is not evident from the beta coefficient values, as PBC contribution to the model is slightly less than the subjective norm and attitude. However, the correlation table indicates that PBC has the smallest correlation with behavioural intention (.389,  $p < .0005$ ).

Subsequent, perceived privacy risk variable contributes  $\beta = -.135$ ,  $p < .001$  to the model, with semi partial correlation coefficients indicating 1.3 % of unique contribution. The fourth hypothesis (H4), which states that perceived privacy risks have a negative and significant effect on the intention to use the SmitteStop contact tracing app, has been supported, as the result of the analysis was significant. While the perceived privacy mean was the smallest of all the constructs 12.42 (minimum value 3, maximum 21), it still indicates the presence of some concern that the public holds in relation to privacy risk posed by CTA's. Recent studies have reported that individuals perceived privacy risk reduces the acceptance and use of the new technology (Duan & Deng, 2020; Yang et al., 2012; Kokkoris & Kamleitner, 2020; Lee, 2019; Thompson et al., 2020). Aligned with these findings, the current study has observed the same negative relationship between perceived privacy risk and behavioural intention.

Finally, the fifth hypothesis (H5) states that trust in the government has a positive and significant effect on the intention to use the SmitteStop contact tracing app. However, this construct did not make a significant unique contribution to the prediction of the dependent variable. While this construct had the second highest mean 14.76, indicating that, on average most of the sample had high trust towards the Danish government. However, the beta coefficient value observed was the lowest of all the independent variables in the model,  $\beta = .070$ ,  $p < .120$ . This contradicts with the findings of the larger body of research (Altmann et al., 2020; Belanger & Carter, 2008). However, while it contradicts with the majority of studies, some researchers have observed that the construct of trust has a significant positive effect on the construct of attitude (Amaro & Duarte, 2016; Ibrahim et al., 2020). Stewart (2003) further claimed that individuals' trust in one area could influence initial trust in another domain. As in this study, it was observed that attitude and trust in the government had a reasonably high correlation, the value of .688. This could indicate that further research is required to investigate the relationship among these variables. These findings lead to new questions that can inquire into new research of TPB model and the construct of trust in the government.

In order to answer the study's research question, the performed analysis has found that the extended model of TPB explained 65.2 % (Adjusted R Square 65,2 %) of variance in the behavioural intention. This is a significant result, as seen by Sig. .000,  $F(5, 366) = 140.093$ ,  $p < .001$ . This is a fairly respected result as other studies have received similar results where Tomczyk et al. (2021) reported 63 % and Hasan et al. (2019) reported 78.5 %. However, contrary to what was expected from the two new constructs added to the model, the construct of trust in the government did not contribute significantly to the model. Although it does not

directly affect the behavioural intention to use the SmitteStop, it has a fairly high correlation with the attitude construct. This indicates that, as some of the other studies have found (Amaro & Duarte, 2016; Ibrahim et al., 2020), that trust could contribute to the construct of attitude instead. This would require further investigation and adjustment of the extended model of TPB. The second added construct to the TPB perceived privacy risk indicated that the construct had a significant impact on the intention to use the CTA SmitteStop. This is interesting to note as perceived privacy risk is an important determinant to use the CTA in Denmark. As the population is less likely to use a CTA when they have high concerns for the privacy of the app. The original constructs of the TPB all have significantly contributed to the prediction of the intention. In line with Ajzen (1991), attitude has uniquely contributed the most to the prediction of intention to the use of CTA ( $\beta = .404$ ). Following second highest result was contributed by subjective norms ( $\beta = .268$ ). This implies that the Danish population is significantly influenced by the social pressure to perform a certain behaviour even though the mean value of the construct was the lowest 12.42. The PBC ( $\beta = .213$ ) provides the third-highest contribution to the prediction of the behavioural intentions. The results are in line with the findings from previous research. Barbera and Ajzen (2020) have discovered that PBC behaves as a moderator of attitude in subjective norms. This means that attitudes prediction of intention is strengthened with greater PBC, while simultaneously weakening the importance of subjective norms. However, the current study has not found any strong evidence for this.

### 5.1.2. Behavioural Interventions Discussion

Interventions are designed with the intention to change the behaviour. They can be directed at one or more of TPB determinants. Ajzen (2006) believes that changes in the factors should result in changes in behavioural intentions. TPB provides general guidelines for the interventions, but does not specify which one is most effective. The following discussion focuses on identifying a target for intervention.

The first step is to inspect if there is room for change in the specified construct. This is achieved through formative research of the mean levels of predictor variables (Ajzen, 2006). The descriptive statistics have revealed the constructs of subjective norm and perceived privacy risk with lower means of 12.42 and 12.56, respectively. The PBC and attitude constructs are not considered for the intervention. In cases where means are already fairly high, it is unlikely that any interventions will influence the behaviour (Ajzen, 2006). The construct of trust in the



government is not considered for the interventions either, as it did not make a significant unique contribution to the prediction of the dependent variable. Following it is possible to take the construct's relative weights into account when predicting interventions for behavioural intentions. In general, the larger the construct's relative weight, the more likely it is that modifying it would impact behavioural intentions (Ajzen, 2006). The subjective norm contributes  $\beta = .268$ ,  $p < .001$  of variance to the behavioural intention, the second-largest amount. While perceived privacy risk variable contributes  $\beta = -.135$ ,  $p < .001$ , which is the second smallest contribution to the prediction of behavioural intention. However, it is worth noting that interventions to these two constructs do not necessarily guarantee an increase in behavioural intention. The estimates of relative weights are often affected by variables that have nothing to do with the relative importance of the predictor constructs. The degree of variance in the items used to measure the predictors has a significant impact on them (Ajzen, 2006). This entails that after interventions are decided for and implemented, further research is required to observe if interventions were successful in increasing the behavioural intentions.

In conclusion, the conducted research has identified that subjective norms and perceived privacy risk are the two constructs that the behavioural interventions may be created for when developing the communication strategies. It is most reliable to select construct which accounts for significant variance in behavioural intention. Therefore, the subjective norm is suggested as a construct in which interventions will have the most effect. However, interventions to both constructs may be applied for the communication campaigns. This means that the Danish population at the moment of the study did not perceive substantial social pressure to use the SmitteStop app. Therefore, the mean value of the subjective norms was at the scale's midpoint. Taking into account that the data was collected at a time when Denmark was slowly removing restrictions from the lockdown, this might have affected the construct. However, the subjective norms had the second-highest standardized coefficients beta result. According to Ajzen (2006) this implies that construct of subjective norms and perceived privacy risk have room for change. Therefore, behavioural interventions may be applied to these constructs through future crisis communication models.

## 6. Conclusions and Implications

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In conclusion, this research provided insights into the Danish population's intentions to adopt the CTAs, SmitteStop app in a setting of an ongoing crisis. The research explored how well a model predicted the intentions to use a CTA. In line with the post-positivism tradition, the theory was applied deductively by investigating the relationships between variables. Through the application of the TPB model, the study explored relevance of including two more constructs in the original framework. This further builds the understanding and applicability of the model and tests the extended model and how well it explains the variance. This knowledge contributes to the debates in strategic communication in a setting of crisis communication. The insights' purpose is to help to tailor communications to the public in order to advocate for the use of the CTA. Especially when communicating the message to a broader audience, the framing theory in crisis communication frames the message in a specific way for the audience to perceive it (Sellnow et al., 2013). The objective of the current study was to investigate the following research question: To what extent the revised model of TPB measures the intention to use the SmitteStop CTA in Denmark?

The results of the analysis provide evidence for the TPB model's ability to predict intentions to use a CTA. The extended model of TPB explained 65.2 % of the variance in behavioural intention. This is a significant result that corresponds to the findings from other studies which observed similar results, like 63 % (Tomczyk et al., 2021) and respectfully 78.5 % (Hasan et al., 2019). However, contrary to what was expected from the two new constructs added to the model, the construct of trust in the government did not contribute significantly to the model. The original constructs of the TPB all have significantly contributed to the prediction of the intention. In line with Ajzen (1991), attitude has uniquely contributed the most to the prediction of intention to the use of CTA. Nonetheless, despite the rejected hypothesis, the construct of trust in the government still provides the evidence and contributes new knowledge to the intention to use the CTA during the ongoing pandemic. As well as further builds on the research of the TPB model. In further research, the extended model would require certain adjustments in relation to the construct of trust in the government. Finally, regarding the communication strategies, the research has suggested two constructs that the behavioural interventions may be created for. The constructs of subjective norm and perceived privacy risk may be chosen for future interventions for communication strategies. Both constructs may be applied to the

communication campaigns. These aspects can be addressed for future crisis communication in Denmark.

## 6.1. Implications

The results from the conducted study contribute to the existing body of knowledge. They further build an understanding of public attitudes about CTAs by examining theoretical (hypotheses) and practical implications. In terms of theory, this will further build the understanding and applicability of the TPB model, as well as test the extended model and how well it explains the variance.

Attitude is the strongest predictor of behavioural intention. This finding is consistent with the statement from Ajzen (1991) and previous researchers who have observed similar results (Amaro & Duarte, 2016; Shalender & Sharma, 2021; Sharma et al., 2020). This construct's lack of predictive power would have led to the model being rejected, as it is a central construct to the theory (Ajzen, 1991). Based on this evidence, it is also essential to examine other factors which might be affecting this construct. For example, prior studies have found trust to significantly influence the construct of attitude (Yang et al., 2017), as well as privacy concern construct to indirectly influence intentions through its impact on attitude (Sharma et al., 2020).

The PBC made the third strongest contribution to explaining the behavioural intentions construct. It also had the highest mean value indicating that the studied sample perceived the behaviour to be easily performed and had sufficient control to perform specified behaviour. This means that the Danish population does not perceive any barriers to using the SmitteStop contact tracing app. It is also interesting to note that some studies have observed a relationship between attitude, subjective norm and PBC. Where PBC takes on the role of the moderator of attitude in subjective norm (Bosnjak et al., 2020). Furthermore, Ajzen (1991) has also observed that PBC may be less powerful in predicting intentions with powerful subjective norms and strong attitudes. This study found that the largest contribution to the behavioural intention was provided by attitude and subjective norms. While it doesn't necessarily confirm or deny this assumption, further research is required. Therefore, this study demonstrates that the Danish population have the capabilities and resources to download and use the SmitteStop contact tracing app during a crisis situation like a pandemic.

The results indicate that the perceived privacy risk has an impact on behavioural intention. This result is in line with previous studies by Duan and Deng (2020) and Thompson et al. (2020). The Danish population retains certain concerns towards the privacy risk posed by CTAs. This, as a result affects the intention to use the SmitteStop negatively.

Although the construct of trust in the government did not have a direct effect on the intention to use a CTA, it had the second-highest mean 14.76. Indicating that on average most of the sample had high trust towards the Danish government to ensure safe implementation and management of the CTA. While this study's hypothesis was rejected, the results indicate that instead of a direct measure of intention, the construct of trust in the government may indirectly impact behavioural intentions through the construct of attitude. This was also observed in research published by Amaro and Duarte (2016) and Ibrahim et al. (2020). These findings lead to new questions that can inquire into new research of the TPB model and the construct of trust in the government.

Lastly, the findings provide knowledge of the public intentions to adopt the SmitteStop app during the ongoing crisis. This knowledge is particularly important for communication strategies to be developed for future crisis communications. In the state of the crisis the communication specialists must reach the majority of the public and influence their behaviour. Thus, the finding provides new knowledge in the field of strategic communication. Ultimately, the conducted research has provided insight into Danish public's perception of SmitteStop – a Danish alternative to a CTA. Additionally, the study has also discussed possible behavioural interventions for improving the behavioural intentions and as a result changing the behaviour. It has been observed that the constructs of subjective norm and perceived privacy risk are the two constructs that the behavioural interventions may be created for when developing the communication strategies. The construct's mean scores revealed that there was room for change. As well as, both constructs accounted for significant variance in behavioural intention. As a result, it is suggested to apply interventions for the construct of subjective norms, as it accounts for more significant variance in the behavioural intentions construct. However, interventions to both constructs may be applied for the communication campaigns. Nevertheless, this method is not unassailable, interventions to a construct do not guarantee improvement to the behavioural intentions. The estimates of relative weights are often affected by variables that have nothing to do with the relative importance of the predictor constructs. Therefore, TPB provides general guidelines for the interventions, but does not specify which one is most effective. The methods considered could include persuasive communications like social media,

press or any other model (Ajzen, 2006). As a result, the method for the interventions is developed through investigator's experience and creativity (Ajzen, 2006).

## 6.2. Limitations

While research has provided valuable insights into the extended model's ability to predict the intentions, it is also important to note limitations. Firstly, the study applied the convenience sample method for data collection due to the restrictions in the ability to reach the target group. However, the convenience sample poses a certain risk to the generalisability of the population. Hence, the generalization of the results must be made with caution and the representation of the Danish population limits this thesis. The findings hold a cross-sectional value only, as the study is conducted during an ongoing pandemic and explores behavioural intentions to use an app in a setting of the ongoing crisis. For instance, when the pandemic comes to an end, there won't be any need for the SmitteStop contact tracing app. Additionally, the chosen research design holds certain limitations as well. The variance theory entails a certain perspective in which the phenomena is being studied. The variance theory represents the events as changes in the variables, which are building blocks for the process model (Van de Ven, 2007). As a result, this causes a highly restrictive representation of the studied phenomena. Since the reality is constructed in a certain way of slicing the world into researchable pieces. Further causality of the variables serves as the basis of explanation, which poses a risk of downplaying other sources contributing to the change in the variables, as well as restricts the investigation of how social entities change and develop (Van de Ven, 2007).

Furthermore, some limitations may lie in the TPB model itself. Ajzen (2011) has stated that the model has limits to its predictive validity and claims that even in carefully assessed constructs lies random measurement error. The constructs rarely exhibit reliability statistics over 0.80. Therefore, even with good measures, in terms of correlations, the best results the researcher can expect are the coefficients of about 0.60. (Ajzen, 2011). Another limitation of the model can be accounted for by the measures of TPB being indirect, as actual observations of the behaviours are not possible. Additionally, the TPB model assumes that people are rational beings who make systematic judgments. Therefore, unconscious motives are not considered. As the model is designed to measure a specific behaviour, the generalizability can only be applied to that unique action (Knabe, 2012). In this case, the model studies the

intentions to use a SmitteStop contract tracing app during an ongoing pandemic. When applied to a particular behaviour like in this case, the theory retains a solid framework for further investigation.

It is also important to note some limitations of the regression analysis itself. As the associations among the variables in regression analysis are not causal but apply correlational designs instead. Moreover, it can be influenced by currently unmeasured variables. Overall, the regression solution is sensitive to the type of variable included.

### 6.3. Suggestions For Further Research

The study's findings raise new questions for academics and practitioners, indicating the need for more research in the field of health communications and crisis communication. This thesis set out to explore and gain better understanding of the Danish population's intentions to adopt the CTA. During an ongoing crisis, in order to explore how well the extended model predicted the behavioural intention. It was revealed that one of the constructs, trust in the government, did not provide a significant contribution to the model. While this contradicted with the majority of findings, it also revealed the possibility for future research. Some researchers have also previously observed a similar phenomenon (Amaro & Duarte, 2016; Ibrahim et al., 2020). Therefore, some adjustments need to be made to the extended TPB model. Since the construct of trust does not have significant a direct impact on behavioural intentions, but some of the researchers have observed that it indirectly impacts behavioural intentions through attitude. As a result, these findings lead to new questions that can inquire into new research of the TPB model and the construct of trust in the government.

While the study has provided some suggestions for which constructs are suitable for behavioural interventions, it requires further research. As first the communication campaigns need to be developed and a new study must be conducted to observe the difference in behavioural intention among the two studies. Therefore, further research is required.

Furthermore, this research did not focus on cross-cultural differences between the Danish and expat population. Future research could explore the differences in behavioural intentions between the two groups. This could be of importance for future research looking to generalize the findings across different cultures.

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## 8. Appendix

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### Appendix 1 – Codebook

Original data name	SPSS variable name	Coding instructions
Age	Age	In 6 Categories: 1 = >20 2 = 20-30 3 = 31-40 4 = 41-50 5 = 51-60 6 = 60<
Gender	Gender	1 = Female, 2 = Male, 3 = prefer not to say
Place of Residence	Residence	1 = Denmark, 2 = Other
Nationality	Nationality	1 = Danish, 2 = Other
Currently, using the SmitteStop app?	APPUSE	1 = Yes, 2 = No
The people who are important to me (family, friends) think I should use a contact tracing app SmitteStop	SubNorm1	1 = Strongly Disagree, 7 = Strongly Agree
If people who are important to me will use the contact tracing app SmitteStop, I will also use it	SubNorm2	1 = Strongly Disagree, 7 = Strongly Agree
It is expected of me to use the contact tracing app SmitteStop when everybody in my immediate surrounding uses it	SubNorm3	1 = Strongly Disagree, 7 = Strongly Agree
Installing contact tracing app SmitteStop on my mobile phone is a right thing to do	Attitude1	1 = Strongly Disagree, 7 = Strongly Agree

Installing contact-tracing app SmitteStop on my mobile phone is a good idea	Attitude2	1 = Strongly Disagree, 7 = Strongly Agree
Installing contact-tracing app SmitteStop on my mobile phone is beneficial for the society	Attitude3	1 = Strongly Disagree, 7 = Strongly Agree
I can easily download and use the app SmitteStop without any difficulty	PerceivedBehControl1	1 = Strongly Disagree, 7 = Strongly Agree
For me to download and use the SmitteStop app is easy and does not require any effort	PerceivedBehControl2	1 = Strongly Disagree, 7 = Strongly Agree
The decision to use the SmitteStop app is beyond my control	PerceivedBehControl3	1 = Strongly Disagree, 7 = Strongly Agree
Whether I decide to use the SmitteStop app is entirely up to me	PerceivedBehControl4	1 = Strongly Disagree, 7 = Strongly Agree
By using SmitteStop app I will be at risk of my personal information being collected excessively	Privacy1	1 = Strongly Disagree, 7 = Strongly Agree
By using SmitteStop app my personal information is at risk of being accessed by unauthorized people	Privacy2	1 = Strongly Disagree, 7 = Strongly Agree
By using SmitteStop app my location and personal information are at risk of being tracked and monitored	Privacy3	1 = Strongly Disagree, 7 = Strongly Agree
I believe the Danish Government is taking the right decisions to mitigate the spread of Covid-19 virus	Trust1	1 = Strongly Disagree, 7 = Strongly Agree
I trust the Danish Government to carry out implementation of SmitteStop app faithfully	Trust2	1 = Strongly Disagree, 7 = Strongly Agree

I trust Danish state government agencies keep my best interests in mind	Trust3	1 = Strongly Disagree, 7 = Strongly Agree
I would be willing to use the SmitteStop app	Intention1	1 = Strongly Disagree, 7 = Strongly Agree
I intent to use SmitteStop app in the future	Intention2	1 = Strongly Disagree, 7 = Strongly Agree
I intent to continue using the SmitteStop app in the future	Intention3	1 = Strongly Disagree, 7 = Strongly Agree

### Total scale scores

Full Variable Name	SPSS Variable Name	Coding Instructions
New PerceivedBehControl3	NewPerBehCon3	Recode the negatively worded responses PerceivedBehControl3
Sum of Attitude	SumAtt	Add all scores
Sum of Subjective Norm	SumSubNr	Add all scores
Sum of Perceived Behavioural Control	SumPerBehCon	Reverse the PerceivedBehControl3 and add all scores
Sum of Intention	SumInt	Add all scores
Sum of Perceived Privacy Risk	SumPerPrivRsk	Add all scores
Sum of Trust in the Government	SumTrGov	Add all scores

## Appendix 2 – Survey

# Survey

Thank you very much for taking part in this study.

This survey is a part of my Master Thesis in Strategic Communication at Lund University.

I'm conducting this study to learn of public attitudes towards contact tracing apps, specifically SmitteStop app.

The SmitteStop app has been launched by the Danish Ministry of Health, as a mean to stop the spread of Covid-19 virus. In case an individual is tested positive, the app is used to easily notify other app users that they have been in close contact with a positively tested person, however users cannot identify the individual. The SmitteStop app was created and made available on June 18th 2020, and currently is available in two languages: Danish and English.

The survey is made out of two parts, the first one gathers demographic information and the second part requires you to choose how strongly you agree or disagree with a series of statements.

### Informed Consent

If you decide to participate, your identity as a participant in this study, and any other personal information gathered about you during the study, will be kept strictly confidential and will never be made public. All data containing personal information from which you could be identified will be removed. The answers will only be used for the study.

You are free to discontinue participation at any time, and all data collected up to that time as a result of your partial participation will be destroyed without being used in the study.

Thank you in advance,  
Evelina Choruzik

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\*Required

### 1. Please choose your age \*

*Mark only one oval.*

- >20
- 20-30
- 31-40
- 41-50
- 51-60
- 60<
- Other: \_\_\_\_\_

2. Please choose your gender \*

*Mark only one oval.*

- Female
- Male
- Other
- Prefer not to say

3. Please choose your place of residence, country. \*

*Mark only one oval.*

- Denmark
- Other

4. What is your nationality? \*

*Mark only one oval.*

- Danish
- Other

5. Are you currently using the SmitteStop app? \*

*Mark only one oval.*

- Yes
- No

6. The people who are important to me (family, friends) think I should use a contact tracing app SmitteStop \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

7. If people who are important to me will use the contact tracing app SmitteStop, I will also use it \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

8. It is expected of me to use the contact tracing app SmitteStop when everybody in my immediate surrounding uses it \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

9. Installing contact tracing app SmitteStop on my mobile phone is a right thing to do \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree



10. Installing contact-tracing app SmitteStop on my mobile phone is a good idea \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

11. Installing contact-tracing app SmitteStop on my mobile phone is beneficial for the society \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

12. I can easily download and use the app SmitteStop without any difficulty \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

13. For me to download and use the SmitteStop app is easy and does no require any effort \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

14. The decision to use the SmitteStop app is beyond my control \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

15. Whether I decide to use the SmitteStop app is entirely up to me \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

16. By using SmitteStop app I will be at risk of my personal information being collected excessively \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

17. By using SmitteStop app my personal information is at risk of being accessed by unauthorized people \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

18. By using SmitteStop app my location and personal information are at risk of being tracked and monitored \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

19. I believe the Danish Government is taking the right decisions to mitigate the spread of Covid-19 virus \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

20. I trust the Danish Government to carry out implementation of SmitteStop app faithfully \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

21. I trust Danish state government agencies keep my best interests in mind \*

Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

22. I would be willing to use the SmitteStop app \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

23. I intent to use SmitteStop app in the future \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

24. I intent to continue using the SmitteStop app in the future \*

*Mark only one oval.*

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

THANK YOU FOR YOUR PARTICIPATION

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## Appendix 3 – SPSS Output

### Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	,810 <sup>a</sup>	,657	,652	3,087	,657	140,093	5	366	,000

a. Predictors: (Constant), Privacy Risk, PBC, Subjective Norm, Trust in the Government, Attitude

b. Dependent Variable: Behavioural Intention

### Coefficients<sup>a</sup>

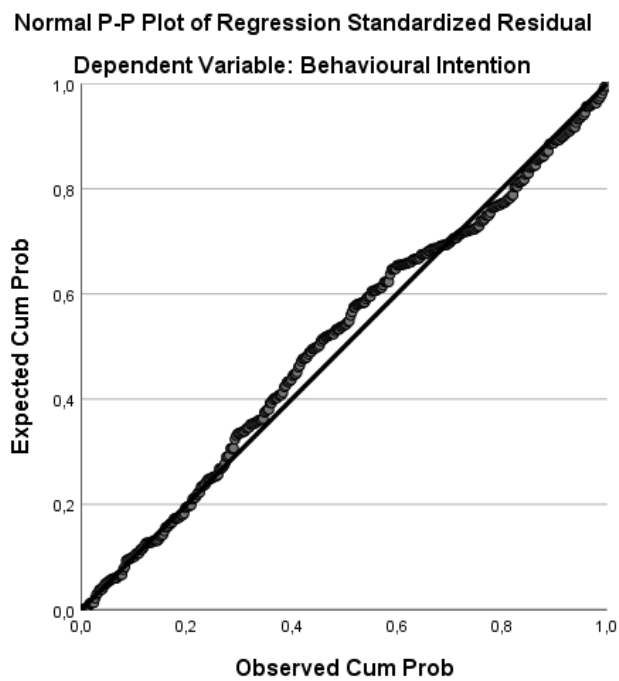
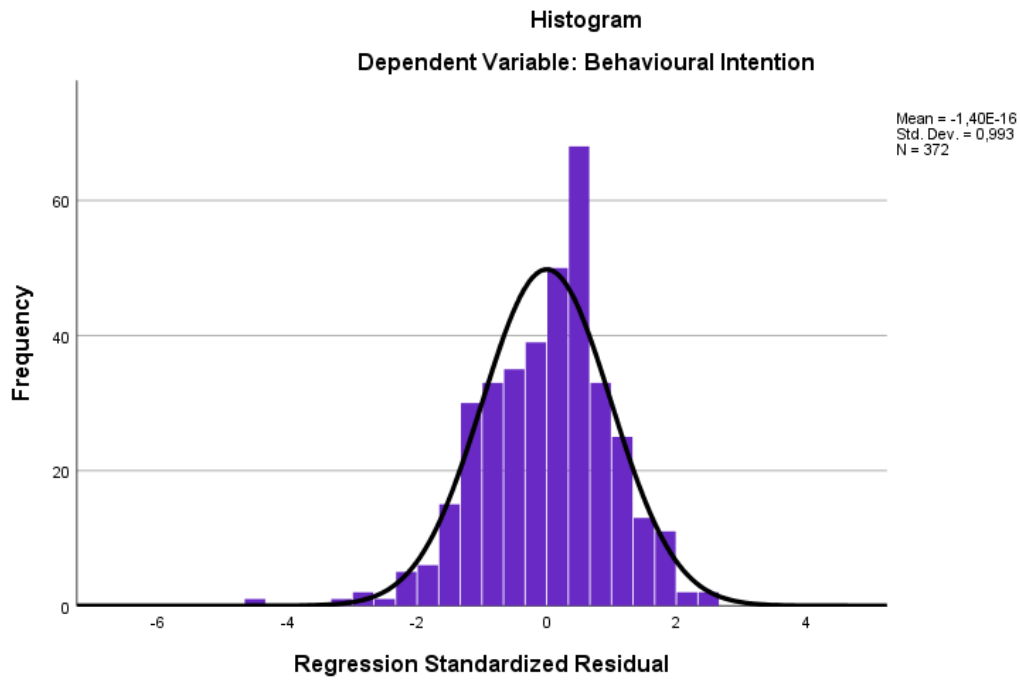
Model		Unstandardized Coefficients		Standardized Coefficients		Correlations			Collinearity Statistics		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-3,418	1,370		-2,495	,013					
	Attitude	,458	,055	,404	8,278	,000	,743	,397	,253	,393	2,544
	Subjective Norm	,342	,053	,268	6,415	,000	,636	,318	,196	,536	1,865
	PBC	,388	,058	,213	6,670	,000	,389	,329	,204	,921	1,086
	Trust in the Government	,080	,051	,070	1,558	,120	,596	,081	,048	,459	2,178
	Privacy Risk	-,139	,037	-,135	-3,784	,000	-,454	-,194	-,116	,739	1,353

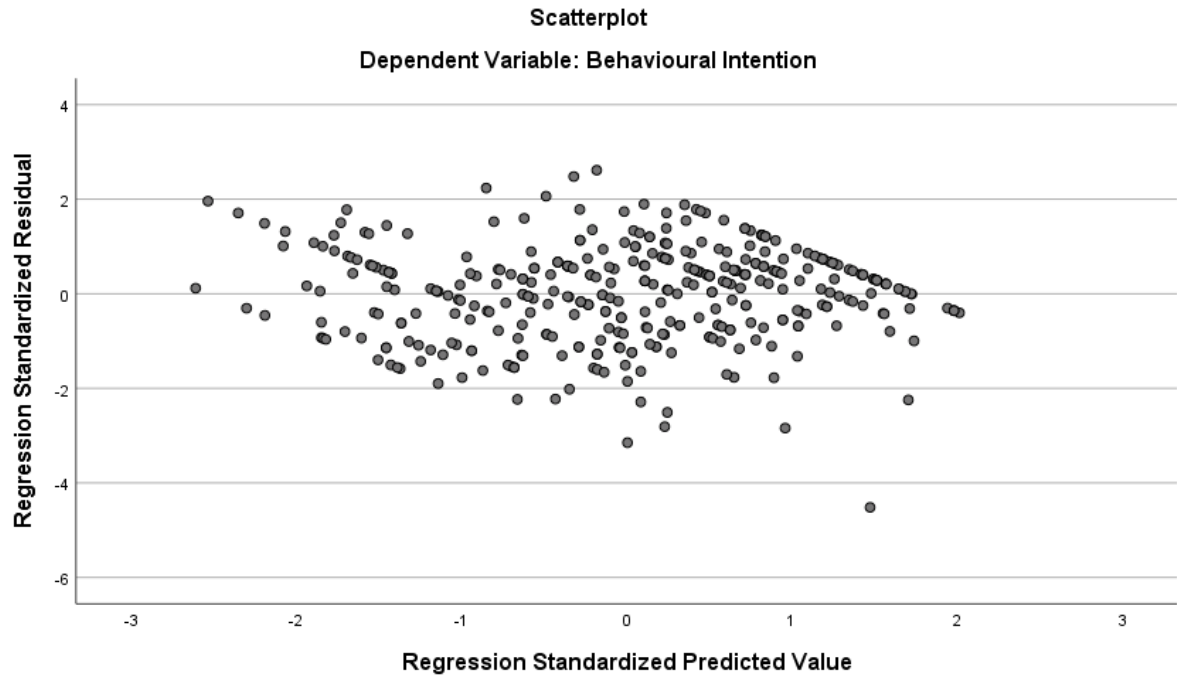
a. Dependent Variable: Behavioural Intention

### Residuals Statistics<sup>a</sup>

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2,64	22,24	13,70	4,242	372
Std. Predicted Value	-2,610	2,013	,000	1,000	372
Standard Error of Predicted Value	,178	,720	,380	,096	372
Adjusted Predicted Value	2,63	22,27	13,70	4,244	372
Residual	-13,950	8,068	,000	3,066	372
Std. Residual	-4,519	2,613	,000	,993	372
Stud. Residual	-4,545	2,663	,000	1,002	372
Deleted Residual	-14,110	8,377	,002	3,118	372
Stud. Deleted Residual	-4,672	2,686	,000	1,006	372
Mahal. Distance	,237	19,203	4,987	2,983	372
Cook's Distance	,000	,045	,003	,005	372
Centered Leverage Value	,001	,052	,013	,008	372

a. Dependent Variable: Behavioural Intention





## Appendix 4 – Social Media Groups

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### Social Media Groups the Survey was made available through

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Vejle Job Network

Students in Kolding

Det sker på Østerbro

Kolding Students Accommodation Group

International Students in Vejle

Viborg International Community

Technical University of Denmark (DTU)

Det sker i Svendborg

Slagelse, Korsør, Skælskør, Sorø og Vestsjælland NÆSTEN ALT ER TILLADT

Facebook Randers Midtby/Kommune

Foreigners in Randers

International students in Aarhus

Nørrebro i gamle dage

GANSKE GRATIS i Valby

Gamle Valby

Dansk genealogi (Danish Genealogy)

Dansk statsborgerskab - tålmodighed påkrævet

Danske Padel Entusiaster

Dansk humor

Dansk, Litteraturvidenskab og Kultur & Formidling

University of Copenhagen

Aalborg Students

Tilflytternetværk Sønderborg / Newcomers Network Sønderborg

International Aalborg

Odense Online

Mundo Lingo Copenhagen

International Events in Copenhagen

Copenhagen Sakura Festival (The Official Group)

Praktik og studenterjob til antropologer, sociologer og lignende



Velkommen i den danske natur

Dansk spids

Oresundskollegiet

TEDxCopenhagen Community

Housing in Aarhus

Tilflytternetværk Sønderborg / Newcomers Network Sønderborg

Gamle Valby

Internationals in Amager (Amager Village)

EURO2020 Volunteers Copenhagen

CopenUp

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