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How to encourage Australians to adopt the contact tracing app? – A privacy lens

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Research-in-progress

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Abstract

Contact tracing apps have been increasingly used for fighting the spread of the COVID-19 pandemic worldwide. Such apps can help control the epidemic if well adopted. The Australian government released a contact tracing app, COVIDSafe, in late April, for controlling the spread of COVID-19. Understanding the critical determinants for the adoption of the COVIDSafe app is becoming critical. This study investigates the critical determinants for the adoption of the COVIDSafe app. A research model is developed based on the unified theory of acceptance and use of technology and the privacy calculus theory for better understanding the adoption of contact tracing apps. Such a model can then be tested and validated in the future study for better exploring the critical determinants of adopting contact tracing apps. This study provides a foundation for understanding the adoption of contact tracing apps. The findings can help the government formulate targeted strategies and policies for promoting the adoption of the contact tracing app. They can inform future epidemic control for better emergency management in Australia with the potential applicability on a global scale.

Keywords: COVID-19 tracing app, UTAUT, privacy calculus, technology adoption, information sharing

1 Introduction

COVID-19 as a global pandemic has been rapidly spreading worldwide. This leads to a high infection rate with increasing fatalities. As of 14 July 2020, there are 13.27 million confirmed cases with 0.58 million claimed lives (Worldometer, 2020). This shows that tracking and controlling the spread of the virus is becoming crucial for all countries in their fight of the pandemic.

There are various means that individual countries have employed for enabling contact tracing to manage the spread of the disease. In Israel, legislation is passed to allow the government to track the mobile-phone data of people with suspected infection. In South Korea, the government has maintained a public database of known patients, including the information about their age, gender, occupation, and travel routes. In Taiwan, medical institutions are given access to patients travel histories, and authorities can track phone location data for anyone under quarantine (Cho et al., 2020). This demonstrates the importance of contact tracing in fighting the pandemic across the world.

Mobile-based contact tracing apps are an advanced tool for fighting virus spread. They are designed to identify the movement of individuals who have tested positive to COVID-19. This helps notify the people of their risk of infection with whom the diagnosed patient has come into contact based on the information shared with health officials via contact tracing apps. Such a contact tracing app is useful because people can infect others before they show symptoms of COVID-19 (Ferretti et al., 2020). Early self-isolation would thus prevent people from transmitting the virus to others unwittingly. If used widely enough, an app of this type could control the pandemic without a sustained nation-wide, and enormously costly, lockdown (NewScientist, 2020). Given the potential benefits of using mobile-based contact tracing apps for controlling the spread of the virus, forty-seven COVID-19 contact-tracing apps have been launched in twenty-five countries (O'Neill et al., 2020).

More than 60 percent of the population would need to sign up to a contact tracing app for it to be effective in controlling the spread of the COVID-19 pandemic (NewScientist, 2020). The actual adoption rate of the contact tracing apps countrywide, however, is not promising. Singapore, for example, launched a mobile-based contact tracing app in late March with only 17 percent of the population installed the app in one month (NewScientist, 2020). India launched a mobile-based contact tracing app with 50 million app downloads in ten days in over 1.3 billion population, which accounts for 3.8 percent of the population (ThePrint, 2020). The Australian government released its contact tracing app in late April, COVIDSafe(Australia Government Department of Health, 2020). As of 14 July, 2020, there are 6.6 million downloads of the app, which only accounts for 25 percent of the population (The Guardian, 2020). This shows that there is a need for better understanding the critical determinants of the adoption of the contact tracing app in informing strategies and policies for better epidemic control.

This research investigates the critical determinants for the adoption of contact tracing apps in Australia. To achieve this objective, this study proposes the following research question: *What are the critical determinants for the adoption of the COVIDSafe app in Australia?*

To adequately answer such a research question in this study, a comprehensive review of the related studies is conducted. This leads to the development of a research model based on the unified theory of acceptance and use of technology (UTAUT) and the privacy calculus theory for exploring the critical determinants for the adoption of contact tracing apps in Australia. Such a model can then be tested and validated using structural equation modelling on the survey data collected at a later stage, leading to the identification of the critical determinants for the adoption of contact tracing apps in Australia. Such a study is timely and important for providing governments with practical guideline in formulating targeted strategies and policies to promote the adoption of the contact tracing app for more effective control of COVID-19 in Australia.

The remainder of the paper is organized as follows. Section 2 presents the theoretical background of this study, leading to the development of a conceptual model for investigating the critical determinants of the adoption of contact tracing apps in Section 3. Section 4 discusses the research methodology of this study. The last section communicates the expected contribution of this research.

2 Theoretical background

There are numerous theories that help explore the adoption of specific technologies under various circumstances (Deng et al., 2019; Chau et al., 2020). Prominent theoretical frameworks for investigating the adoption of technologies by the individuals include the theory of reasoned action, the theory of planned behaviour, the diffusion of innovation theory (DOI), the technology acceptance model (TAM), UTAUT and its extension, UTAUT2 (Venkatesh, et al., 2016). Such theories view the adoption

of technologies as the result of a set of beliefs about the technology and a set of affective responses to the adoption intention of individual users. Among these frameworks, the UTAUT framework is a comprehensive model based on eight major theories for investigating the adoption of technologies by individuals. It has been well used in the technology adoption studies due to its advantages of a superior explanation power. The UTAUT framework explains 77% of the variance in behavioural intention to use technologies and 52% of the variance in technology use (Venkatesh et al., 2016).

There are four constructs that have been identified as the critical determinants for the adoption of technologies in the UTAUT framework, including performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy is the degree to which an individual believes that using the technology would enhance job performance. It is theoretically derived from the critical determinants such as perceived usefulness from TAM, extrinsic motivation from the motivational model, and relative advantage in the DOI theory. Effort expectancy is the degree of easiness associated with the use of technologies. This determinant is the same as the perceived ease of use in TAM and DOI. Social influence is the degree to which individuals perceive that others important to them believe that they should use the technology. It is represented as subjective norm in other models such as the theory of reasoned action, the theory of planned behaviour, and the image in DOI. Facilitating condition is related to the degree to which an individual believes that there are resources available to support the use of the technology. It is derived from perceived behavioural control in TAM and the theory of planned behaviour, and the compatibility in DOI.

The UTAUT framework has been widely used as the theoretical base for investigating the adoption of various technologies (Venkatesh et al., 2016) including mobile banking (Zhou et al., 2010), social media sites (Gruzd, et al., 2012); biometrics (Miltgen et al., 2013), m-health (Sun et al., 2013), wearable technologies (Wang et al., 2015), m-shopping (Chopdar et al., 2018), mobile payment (Lee et al., 2019). Along this line, this study extends the use of the UTAUT framework in the adoption of contact tracing apps for identifying the critical determinants of such adoption.

Whilst there are many potential benefits of using contact tracing apps for controlling the spread of the virus, there are ongoing privacy concerns about such applications by individuals (Farr, 2020). As more personal data is being collected via the contact tracing apps, individuals are more concerned with their privacy (Cho et al., 2020). The adoption of the contact tracing apps involves a highly salient privacy calculus in which individuals may face the trade-off between perceived benefit and perceived privacy risk. This conflict of balancing the risks of sharing personal information with the promised benefits has been termed as the privacy calculus paradox (Dinev and Hart, 2006).

The privacy calculus theory has been widely adopted for explaining the intention of individuals to share personal information in adopting specific technologies (Dinev and Hart, 2006). Such a theory suggests that people perform a cognitive evaluation of the consequences of their choices during privacy decision making by weighing the perceived benefit against the perceived privacy risk. If perceived benefits exceed perceived privacy risks, individuals are more likely to disclose their personal information for sharing (Bol et al., 2018).

Existing studies have incorporated the constructs from the privacy calculus theory in the technology adoption frameworks for better understanding the adoption intension of individuals in the context of information sharing. Cazier et al. (2008) and Muller-Seitz et al. (2009), for example, introduce privacy risk likelihood and privacy risk harm for investigating the adoption of the RFID technology. Kowatsch and Maass (2012) integrate the TAM framework and the privacy calculus theory for investigating the adoption of IoT-based services. Wang et al. (2015) introduce privacy risk in the UTAUT2 framework for investigating the adoption of wearable technologies in healthcare. Chopdar et al. (2018) add perceived privacy and security risks in the UTAUT2 framework for explaining the adoption of m-shopping apps. Lee et al. (2019) incorporate privacy risk in the UTAUT framework for examining the adoption of mobile payment. The above studies have demonstrated the usefulness and applicability of incorporating the privacy calculus theory in the technology adoption framework for better understanding the adoption intension of individuals in the context of information sharing.

The adoption of contact tracing apps involves a careful evaluation of the risks of sharing personal information for gaining the perceived benefits. A comprehensive framework that captures these dimensions is highly desirable for better understanding the adoption intention of users with the privacy concerns. This study integrates the privacy calculus theory with the UTAUT framework for exploring the critical determinants of adopting contact tracing apps in Australia.

3 Research Model

Figure 1 presents a conceptual model for facilitating the investigation of the critical determinants for the adoption of contact tracing apps in Australia with the use of the UTAUT framework and the privacy calculus theory. Whereas the UTAUT framework explains the critical determinants in the adoption of contact tracing apps, the privacy calculus theory captures the trade-off between the perceived risk of disclosing private information and the perceived benefits of using the contact tracing app.

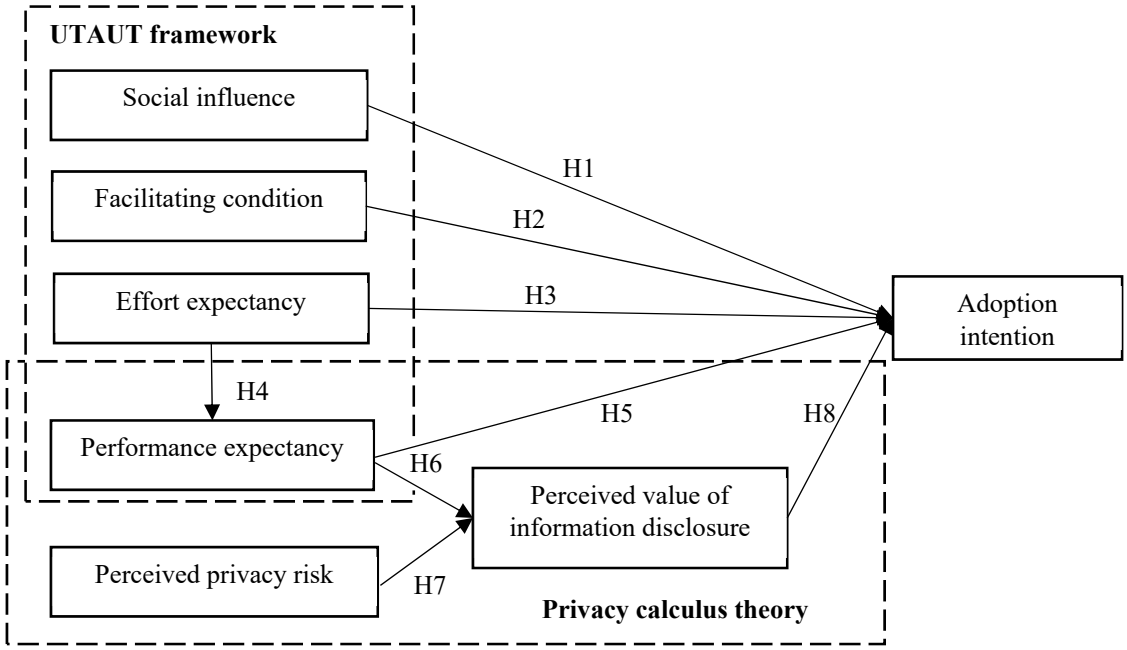

Figure 1. The conceptual model

Social influence

Social influence is related to the degree to which individuals perceive that others important to them believe they should use the technology (Venkatesh, et al., 2016). It reflects the fact that the use of a technology is influenced by the view of important people like friends, family and colleagues. Along this line, the stronger the influence from peers on the use of COVID-19 contact tracing apps, the more likely one is to follow along. The following hypothesis is therefore proposed:

H1. Social influence positively influences the intention to adopt a contact tracing app.

Facilitating condition

Facilitating condition captures the perception of individuals on the resources and support available to perform a behaviour (Venkatesh, et al., 2016). It includes both external and internal conditions that can influence the intention of adoption. External condition is related to the degree to which individuals have adequate external resources such as the training or support to perform a behaviour. Internal condition focuses on the degree to which individuals have the ability to undertake the behaviour (Miltgen et al., 2013). Lack of competence to use the technology as the internal condition is found as a major barrier inhibiting the adoption of technology (Sun et al., 2013). People who deem facilitating conditions to be adequate are less averse to using a technology, thus strengthening their use intentions. The following hypothesis is therefore proposed:

H2. Facilitating condition positively influences the intention to adopt a contact tracing app.

Effort expectancy

Effort expectancy describes individuals' perception of the effort associated with the use of a technology (Venkatesh et al., 2016). Users prefer a user-friendly technology with maximum efficiency (Wang et al. (2015). The technology which is easy to use in the adoption phase has positive influence on the user's

intention to adopt it. COVID-19 contact tracing apps need to be well designed to make it simple and convenient for users to manage. The more effort users need to devote to such an app, the less likely they will adopt it. The following hypothesis is therefore proposed:

H3. Effort expectancy positively influences the intention to adopt a contact tracing app.

Effort expectancy and performance expectancy are theoretically derived from perceived ease of use and perceived usefulness respectively from TAM (Venkatesh et al., 2016). The positive influence of perceived ease of use on perceived usefulness has been validated in various technology adoption studies (Sun et al., 2013; Venkatesh et al., 2016). Along this line, individuals who perceive that less effort is needed for using COVID-19 contact tracing apps tend to perceive such apps as useful. The following hypothesis is therefore proposed:

H4. Effort expectancy positively influences performance expectancy.

Performance expectancy

Performance expectancy is the degree to which using a technology will provide benefits to individuals in performing certain activities (Venkatesh et al., 2016). It is referred as perceived usefulness or relative advantage in various technology adoption models. Performance expectancy has been repeatedly validated as the critical determinants for the acceptance and use of a technology (Duan et al., 2012; Chopdar et al., 2018). Along this line, the following hypothesis is proposed:

H5. Performance expectancy positively influences the intention to adopt a contact tracing app.

Perceived value of information disclosure is the perception of individuals on the trade-off between the perceived benefits of information disclosure and the risks associated with it (Dinev and Hart, 2006). Performance expectancy is associated with perceived value of information disclosure (Venkatesh et al., 2016). COVID-19 contact tracing apps have possible benefits such as early detection and notification of people who have been in contact with the diagnosed COVID-19 carrier for controlling the spread of the disease. With the understanding of the benefits of contact tracing apps, individuals are more likely to disclose their personal information for using the app. The following hypothesis is therefore proposed:

H6. Performance expectancy positively influences perceived value of information disclosure.

Perceived privacy risks

Perceived privacy risk is about the degree to which an individual believes that a potential loss is associated with the release of personal information (Dinev and Hart, 2006). The privacy risk from information disclosure is related to the misuse of personal information by third parties due to cybercrime or weak security protocols (Xu et al., 2011). Individuals do not disclose personal information if they sense that their personal information is not well protected (Xu et al., 2011; Bol et al., 2018). The following hypothesis is therefore proposed:

H7. Perceived privacy risks negatively influence perceived value of information disclosure.

Perceived value of information disclosure

Perceived value of information disclosure captures the trade-off between perceived benefits and perceived privacy risks (Dinev and Hart, 2006). Individuals are likely to give up a degree of privacy in return for potential benefits through information disclosure. In the adoption of COVID-19 contact tracing apps, individuals are likely to adopt such an app if the perceived benefits of the adoption outweigh the perceived privacy risks. The following hypothesis is therefore proposed:

H8. Perceived value of information disclosure positively influences the intention to adopt a contact tracing app.

4 Methodology

This study investigates the critical determinants for the adoption of contact tracing apps in Australia. To achieve this objective, a survey-based quantitative approach is adopted. The adoption of such an approach is due to the confirmatory nature of this study in which specific relationships identified through the literature review need to be tested and validated using the data collected in a real situation (Creswell and Creswell, 2017; Deng et al., 2019). Survey is a technique for studying the cause of a phenomenon as well as the attitudes and behaviours of individuals with empirical evidence (Duan et al., 2012; Creswell and Creswell, 2017). The use of survey is appropriate in this study because it is possible to test and validate the proposed model while pinpointing the critical determinants for the adoption of contact tracing apps in Australia. Data will be collected from 300 survey respondents aged 18 years or older who are the owner of a smartphone in Australia.

The paradigm for validating a measurement model proposed by Creswell and Creswell (2017) is followed in data collection. The measurement items are developed from a comprehensive literature review based on the research model, followed by the pilot test with subject matter experts for ensuring the content validity (Creswell and Creswell, 2017). The construct will then be tested and refined using the confirmatory factor analysis using AMOS version 25.0 based on the survey data.

5 Expected Contribution

The success of using contact tracing apps for controlling COVID-19 depends on the network effect and the critical mass. Before the app takes effect in pandemic control, there must be a high adoption rate in the population (Cho et al., 2020). The increased adoption rate for the contact tracing app in the population can lead to increased efficacy of such a contact tracing app. This helps governments formulate targeted strategies, interventions and policies for better epidemic management in the future.

This study presents a research model for exploring the adoption of COVID-19 in Australia. Such a model can then be tested and validated using the collected data in the future study. Theoretically, this study develops a validated model with the integration of the UTAUT framework and the privacy calculus theory for investigating the critical determinants for the adoption of contact tracing apps in Australia. Practically, this study provides valuable information to inform future policies on how to encourage the public to adopt the contact tracing app.

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