A Preliminary Analysis of the Determinants of Acceptance of Contact Tracing Apps in Brazil

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***Abstract*—This research investigates the factors driving acceptance and use of mobile contact tracing apps in Brazil. The study leverages Theory of Planned Behaviour (TPB), Privacy Calculus Theory (PCT) and social contract theory, and a sample of 1,114 Brazilian residents to demonstrate the importance of perceived control and perceived surveillance in the formation of individuals' perceptions of privacy. Preliminary findings suggest that perceived privacy, reciprocal benefits, and social influence have a positive effect on individuals' intentions to download or continue use of contact tracing mobile apps. Similarly, intention to adopt, perceived privacy, and reciprocal benefits have a positive effect on intentions to disclose information.**

***Keywords*—Privacy; Social Contract; Social Influence; COVID-19; Mobile Apps; Contact Tracing.**

I. Introduction

The COVID-19 pandemic has radically changed all aspects of our lives. Given the initial lack of effective pharmaceutical countermeasures, a number of exceptional public health measures have been introduced by various governments in order to reduce the transmission of the virus. Most governments mainly focused on keeping the public informed, timely contact tracing, and isolation of individuals who have been exposed to the virus. Digital technologies have proven to be particularly useful in this context by enabling fast dissemination of information to citizens and location-based contact tracing. Contact tracing apps in particular have become a common feature of the battle against COVID-19 [1]. Some of these apps have been introduced by national governments while others have been introduced by application developers [1] .

Brazil is one of the countries that have been most affected by COVID-19 [2]. A number of mobile contact tracing apps have been introduced in the country including one funded by a local state government to monitor symptoms and self-isolation (Monitora), and a contact tracing app, which links information from healthcare organizations with geo-location data to infer users' risk of infection (Dycovid). While these apps require users to disclose different information, they both collect sensitive data, such as users' health information and location. As such, the use of these apps raise significant privacy concerns as they can be perceived as a form of government surveillance. Widespread adoption and users' willingness to disclose information are necessary conditions for the success of these apps [3], thus it is important to investigate how individuals' perceptions regarding privacy and benefits associated with these applications influence their acceptance and ultimate use of the apps. In this study, we combine Theory of Planned Behaviour (TPB), Privacy Calculus Theory (PCT), and Social Contract Theory (SCT) to answer the following research question: *what roles do individuals' perceptions of privacy and benefits play in determining their acceptance and use of contact tracing applications?* By doing so, we aim to contribute to the growing literature on privacy and the adoption of new online services, and to the emergent literature on the benefits and challenges of digital technologies during a pandemic. The remainder of this article is organised as follows. Section II introduces the theoretical framework; Section III provides a brief overview of the sample and data collection; Section IV presents a summary of some preliminary findings; and Section V presents some concluding remarks.

II. Theoretical Background

Academic research on privacy and technology adoption has recently begun to focus on emerging online services and the privacy implications of such technologies. However, most studies follow the Antecedents-Privacy Concerns-Outcomes (APCO) framework presented by Smith et al. [4] and do not examine the relationship between antecedents, privacy and behavioral outcomes. In this study, we aim to the overcome such a limitation by investigating the role of privacy in the context of contact tracing mobile apps across the entire APCO framework. To this aim, we leverage TPB as our underlying framework. It posits that the behavioural intentions of an individual are a function of their attitudes towards the

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behaviour, subjective norms, and perceived behavioural control [5]. While TPB has been the dominant theoretical approach for investigating health-related behaviour for decades, it has also attracted a number of criticisms mostly because of its low explanatory power in real-life experiments [6]. For these reasons, we combined TPB with SCT and PCT and as a result take into account a larger number of factors that might affect the behavioural intentions of a given user.

According to SCT, a social contract exists every time an exchange of information is required; this equally applies to the use of a mobile app. Such a contract is directly related to how information should be used. Individuals are more likely to engage in the exchange when they believe that the social contract will be honored [7]. SCT also states that organisations must provide the individual with control over how their information is used [8]. We argue that the same logic applies to contact tracing apps and that, if individuals' perceive that these apps can be used for government surveillance purposes, their perception of privacy will diminish. In turn, a lower perception of privacy would negatively affect their willing to accept and use the contact tracing app. In contrast, PCT posits that individuals compare positive and negative outcomes associated with a behavior prior to deciding whether or not to engage in that behavior [7], and that they will then engage in the behavior if the positive outcomes outweigh the negatives [9]. In this study, we adopt PCT to examine the influence of perceived privacy and several positive beliefs on users' acceptance of mobile contact tracing apps.

III. Data Collection and Sample

Data was collected using an online survey in Portuguese based on validated scales with minor wording amendments to adapt items to the context. Given the existence of several contact tracing apps in Brazil, participants were initially asked if they had downloaded any of the main apps. We only explored benefits and privacy perceptions of the users who had experience with this type of apps. Participants with no prior experience using contact tracing apps were presented with a neutrally-framed description of a hypothetical contact tracing app and asked questions on their intentions to (i) adopt such an app, (ii) disclose accurate data, and (iii) rely on the app for health advice. Responses were collected using stratified sampling with gender, age and regional quotas and an online panel provided by Qualtrics. 1,175 complete responses were collected however 50 responses were filtered out due to low standard deviation in the responses and other 11 responses due to a completion time that was too short. Table I provides a breakdown of the 1,114 responses included in our final sample. Responses were analysed using Confirmatory Factor Analysis and Partial Least Squares Structural Equation Modelling (PLS-SEM).

TABLE I
Sample Overview

Gender	**#**	**Age Range**	**#**
Male	524	18-20	79
Female	589	21-29	252
Rather Not Say	1	30-39	286
Other	0	40-49	214
		50-59	175
		60-69	96
		70+	12
Employment Status	**#**	**Education Level**	**#**
Employed	507	Primary School	9
Self-employed	272	High School	467
Unemployed	149	Technical College	14
Student	86	Bachelor degree	382
Unavailable for work	11	Masters degree	294
Retired	89	Doctorate degree	35
		Other	13

IV. Preliminary results

Preliminary findings suggest that perceived privacy, reciprocal benefits, and social influence have a positive effect on individuals' intentions to download or continue use of contact tracing applications. Similarly, intention to adopt, perceived privacy, and reciprocal benefits have a positive effect on intentions to disclose information. Interestingly, the results also show that perceived health benefits have a positive effect on intention to continue to use the app by current users while it has a negative effect on non-users' intention to adopt.

V. Conclusion

Our research aims to contribute to the academic literature on privacy and technology adoption in at least two ways. First, we combined PCT and SCT to investigate the role that privacy antecedents play in the context of mobile contact tracing app acceptance. Second, we compared the role of perceived privacy on acceptance of both users and non-users. The findings of our study have also practice implications as it demonstrates that the perception of privacy is a major driver of acceptance in the context of contacting tracing apps. It is therefore important for developers and organisations invested in these apps to foster these perceptions prior to the introduction of new applications.

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