

# A Longitudinal Analysis of the Determinants of Citizen Acceptance of Contact Tracing Mobile Apps

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**Abstract**—A significant number of governments worldwide have introduced mobile contact tracing apps in an attempt to contain the spread of COVID-19. The use of these government surveillance technologies provides clear benefits for citizens, health bodies and governments but also raises privacy concerns, which may ultimately undermine the adoption of such technologies. This research comprises two discrete longitudinal studies; the first study explores the influence of privacy perceptions and positive beliefs on citizen acceptance of mobile tracing apps while the second study focuses on the antecedents and behavioural intentions related to trust and privacy perceptions. Preliminary evidence suggests that perceived benefits, social influence and trust are positively related to adoption and disclosure intentions while privacy concerns have a negative effect. Both studies offer valuable theoretical contributions to the academic literature on privacy and technology adoption, and practical and timely contributions to government bodies and practitioners.

**Keywords**—Privacy; Government Surveillance; COVID-19; Contact Tracing; Mobile Application.

## I. INTRODUCTION

It is well established that from the outset COVID-19 posed significant challenges for healthcare systems due to the uncertainty in transmission, pathogenicity and lack of strain-specific control options. As a result, governments focused on non-pharmaceutical interventions including social distancing and social isolation. For the first time, governments and health agencies were able to leverage the widespread adoption of mobile technologies and contact-tracing apps to support these efforts on a national scale. While contact tracing apps provide clear benefits in containing the spread of COVID-19, they constantly track users' location and social interactions and therefore can be seen as a potential form of government surveillance. As such, they generate understandable privacy concerns, which may ultimately undermine adoption, and consequently reduce the potential benefits of these apps in

the fight against the virus [1]. In this research, we combine Privacy Calculus Theory (PCT) with Social Exchange Theory (SEC), and separately with Procedural Fairness Theory (PFT), to explore the influence of privacy perceptions, positive beliefs and trust on citizen acceptance of mobile tracing apps. These theoretical frameworks are briefly presented in Section II. Section III and Section IV present the sample used in the two studies and some preliminary results respectively. Finally, Section V presents some concluding remarks.

## II. THEORETICAL BACKGROUND

Technology adoption is one of the most developed streams of research within the information system literature comprising well known and widely-used theories [2]. Diffusion of Innovation theory, the Technology Acceptance Model, the Theory of Planned Behaviour, the Unified Theory of Technology Acceptance and Use have been used to investigate the determinants of individuals' acceptance of a wide range IT innovations and surveillance technologies [3]. Due to the relatively novel context and early stage of diffusion, factors in extant adoption theories may not be fully applicable to mobile contact tracing apps for pandemics. For this reason, our studies focus on contextually relevant factors, such as social influence and trust that are important factors in health and government surveillance research. More specifically, we combine PCT with SEC (Study 1) and PFT (Study 2).

PCT posits that individuals compare the costs and benefits associated with adopting a new technology or disclosing personal information before they engage in such a behaviour and are likely to do so as long as the benefits outweigh the costs [4]. Consistent with the core values of PCT, SET seeks

to explain human behaviour with an emphasis on social structures and norms, and posits that individuals expect reciprocal benefits when being required to adhere to social norms [5]. In our first study, we combine PCT and SEC to unravel the combinatory effect of privacy concerns and social factors on intention to adopt and use a mobile contact-tracing app.

Our second study focuses more on the role of trust as an antecedent of intention to adopt and use the app. In order to do so, we combine PCT with PFT, which posits that an individual's perception that a particular activity is conducted fairly is an important driver of risk appraisal [4]. In the context of contact tracing apps and privacy, the idea of fairness mostly refers to the perception that data are collected and used fairly.

### III. DATA COLLECTION AND SAMPLE

The Irish Health Service Executive (HSE) launched a national contact tracing application called COVID Tracker on 6 July 2020. Within 48 hours of its initial launch, over 1 million people (almost 50% of adult smartphone users in Ireland) had downloaded the app, and 300,000 people had checked-in [6]. Data was collected using two surveys, one prior to the introduction of the app (T1) and one after the launch (T2). We used existing scales when developing our instrument with minor wording amendments to adapt items to the context. The T1 survey focused more on perceived privacy concerns, situational variables, and propensity to trust and adopt the app. The T2 survey focused more on future intention to use the app. Responses were collected using an online panel of Irish residents provided by Qualtrics with age, gender and regional quotas to ensure the sample was representative of the population of Ireland. A total of 1,109 complete responses were collected at T1. All the respondents were then re-contacted at T2. The final sample consisted of 405 complete responses (37% response rate). Table I provides an overview of the characteristics of the final sample.

TABLE I  
SAMPLE OVERVIEW

Gender	#	Age Range	#
Male	189	18-20	4
Female	225	21-29	29
Rather Not Say	0	30-39	66
		30-49	79
		40-59	86
		60+	89
Employment Status	#	Education Level	#
Employed	186	Secondary School	157
Self-employed	26	Trade	5
Unemployed	36	Diploma	32
Student	11	Bachelor degree	133
Unavailable for work	42	Other Qualification	64
Retired	104	Doctorate degree	14

Responses were analysed using Confirmatory Factor Analysis and Partial Least Squares Structural Equation Modelling (PLS-SEM).

### IV. PRELIMINARY RESULTS

Preliminary results from Study 1 suggest that social influence, reciprocal benefits and perceived health benefits (i.e.,

positive beliefs) have a positive effect on individuals' intention to download the application. On the contrary, negative beliefs related to privacy concern such as risk does not have a significant influence on individuals' intention to download the application. Our results also show individuals' future intentions regarding the use of the application were influenced by their prior adoption intentions and reciprocal benefits, while privacy concern only has a negative influence (at the .10 level). Study 2 focused the role of trust as an antecedent of intention to adopt and use the contact tracing app. Preliminary findings suggest that propensity to trust technology, perceived government motives, perceived need for government surveillance through the contact tracing app, and perceived control have a positive effect on perceived trust in the mobile contact tracing app. In contrast, perceived intrusion through the mobile contact tracing app has a negative effect on perceived trust. Results also suggest that perceived trust and privacy have a positive effect on intention to adopt but do not directly influence usage intention, and that perceived trust and intention to use have a positive effect on users' willingness to disclose personal information.

### V. CONCLUSION

By leveraging a longitudinal dataset, our research adopts a broader conceptualisation of user acceptance that includes both intention to adopt and use over time thus overcoming the typical limitations of cross-sectional samples. Furthermore, we extend PCT by combining it with SEC, and separately PFT, to capture the complexity of privacy consideration and the importance of fairness consideration in the context of government surveillance technologies. The findings of our studies provide useful insights for practitioners and policymakers as they clearly highlight the importance of transparency, perceived benefits, and reciprocity in fostering adoption. Policymakers and public health agencies need to carefully consider what communication and control mechanisms can be introduced to build (and repair) trust, remediate potential sources of distrust in the development and design of such apps, communicate the health and public benefits of using the app and how data will and will not be used, and ensure that collected data is deleted when no longer necessary.

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