



EXPLORING USER-UPTAKE OF DIGITAL CONTACT TRACING (D-CT) APPS

A PRACTITIONER GUIDE

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EXECUTIVE SUMMARY



ABOUT OUR LAB

Our research aims to shed insight into the different ways digital technologies are used in disasters and emergencies, the challenges and risks, and benefits and opportunities associated with digital technology use. We seek to provide strategies for guidance, and support efficacy-focused, ethical, low-risk interventions around the world. Our research adopts systems and complex networked perspectives, where we creating understanding through interconnectivity. We engage experts and organizations, both academic and practitioner, across disciplines to evolve research at the intersection of systems to enhance context-driven understanding.

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Exploring User-Uptake of Digital Contact Tracing (D-CT) Apps

Executive Summary

00.1. Background

Since the emergence of COVID-19, societies around the world have experienced significant digital transformation, invention, and innovation and witnessed the rise of digital pandemic response tools to facilitate digital contact tracing (D-CT), social behaviour surveillance and monitoring, public communications, and remote diagnostics and treatment. Although D-CT apps are revolutionizing public health initiatives, particularly at the intersection of manual contact tracing, little research has been conducted on the risks and benefits of these apps from a user perspective. This understanding is vital in successfully rolling out this technological intervention in a manner that mitigates the risks and amplifies the benefits for users across four stages of user engagement 1) uptake (i.e. users download the app), 2) use (i.e. users run the app and keeps it updated), 3) report (i.e. users report a positive COVID-19 diagnosis via the app), and 4) react (i.e. users follow necessary next steps upon receiving an exposure notification from the app). As a result, D-CT apps have faced problems such as inconsistent and variable rates of user-uptake and self-reporting across geographical contexts.

00.2. Our Study

The [Digital Global Health and Humanitarianism Lab's](#) (DGHH Lab) study — "[Exploring User-Uptake of Digital Contact Tracing Apps](#)" — aims to gain insight into these problems by identifying and analyzing the individual, community, and system level factors that influence users' engagement with stage one of the user engagement continuum: downloading D-CT apps. The study poses four user-oriented questions:

1. Why is there higher user-uptake of D-CT apps in some countries over others?
2. How does uptake vary across contexts?
3. What factors influence user uptake across contexts?
4. How does risk-benefit perception influence uptake?

Ultimately, this study aims to provide D-CT app developers, implementers, and regulators with data-driven strategies for increasing user-uptake while minimizing risk and improving the effectiveness of D-CT apps. As said by the DGHH Lab's Director, [Dr. Jennie Phillips](#), "It is hoped that our findings can help enhance the efficacy of D-CT apps by prioritizing the needs and wants of the individuals expected to use these apps."

To understand D-CT apps through the lens of those using the apps, the DGHH Lab adopted a multiple case study approach, analyzing the context surrounding D-CT app use in Iceland, Cyprus, Ireland, Scotland, and South Africa. These countries were selected because they (1) use voluntary, decentralized D-

CT apps, (2) represent both small and large populations, (3) demonstrate sufficient regional similarity and variation, and (4) reflect the broad range of user-uptake rates that exist globally. For instance, Iceland and Ireland, two developed countries with relatively small populations, have high D-CT uptake at 40% and 43% respectively. Conversely, Scotland's app has seen moderate uptake at 27.5%. Cyprus, a small developed nation, and South Africa, a developing nation with a larger population, both have uptake rates of 1%.

00.3. Factors Influencing Uptake

The DGHH Lab's research indicates that user-uptake is influenced by **eight factors**.

- 1. Perceptions of Data Collection & Management:** *This individual level factor refers to individual perceptions of data collection and management as well as personal knowledge of privacy and security.*
Finding: This study found that level of trust in government and private institutions; extent of user input in the development, implementation, and regulation of D-CT apps; the extent and nature of data collected; risk of poor data management; and misunderstandings or misinterpretations that exist in relation to privacy were common themes that influenced user-uptake.
- 2. Sense of Community:** *This community-level factor reflects a community's level of shared trust, identity, duty, communitarian values, and connectedness with each other.*
Finding: Our research indicates that the strong communitarian values can increase user-uptake, while levels of inequality can negatively impact user-uptake.
- 3. Communications & Misinformation:** *A community-system level factor that measures the timeliness, transparency, method, and nature of information dissemination as well as the prevalence, spread, and control of misinformation.*
Finding: Our research indicates that positive and negative narratives, the presence of malicious actors, and the spread of misinformation can influence user-uptake. Transparent and consistent messaging increase uptake while contradictory messaging, fake apps, and social media misinformation negatively impact uptake.
- 4. Accessibility & Inclusion:** *A system level factor that considers the degree to which D-CT apps are equally accessible to, usable for, and inclusive of, the entire population as well as the level of discrimination and marginalization that results from interventions that fail to meet the principles of universal design.*
Finding: Across all case studies, digital constraints, app usability, discrimination, digital literacy, and the digital divide impeded uptake of D-CT apps. While some countries took action to increase accessibility & inclusion, there was a general lack of apps that were universally accessible.
- 5. Trust in Public/Private Institutions:** *A system level factor considering the citizenry's level of trust and faith in public and private institutions as well as D-CT app developers.*

Finding: The role of government in developing D-CT apps, the role of politics in the country's COVID-19 response, and the D-CT app development approach were common themes identified as potentially influencing user-uptake. Whereas apps that were developed by open source code and non-political, science-driven pandemic responses seemed to increase uptake, low levels of trust in government and/or police seemed to disincentivize users.

6. **Policy & Governance:** *A system level factor that considers the degree to which policies and governance mechanisms regulate D-CT app development, implementation, and use alongside the extent of data collected, the method and length of time data is stored, and when and how data is deleted.*

Finding: This study found that levels of compliance with existing privacy regulations alongside the intersection of policy transparency and lack of additional safeguards impacted user-uptake. Apps that were at risk of breaching laws saw lower uptake, whereas apps that had transparent policies and/or implemented additional safeguards saw higher uptake.

7. **Response Infrastructure:** *A system level factor that considers the degree to which healthcare and emergency management infrastructure is able to mitigate and respond to COVID-19.*

Finding: Response experience, response infrastructure capability, and the dynamics between manual and digital contact tracing were seen as influencing user-uptake. Countries experienced with emergencies and had the infrastructure to support the COVID-19 response seemed to contribute to high uptake, whereas infrastructure deficiencies alongside systemic inequality dissuaded uptake.

8. **Digital Capability:** *This system level factor considers the efficacy and efficiency of D-CT apps in serving their purpose and aiding in the management of the COVID-19 pandemic.*

Finding: Interoperability, poor app functionality in less connected environments, single-purpose functionality, app reliability, and centralized versus decentralized data collection were themes seen to influence user-uptake. App interoperability, offline capacity, and decentralized data collection can incentivized uptake. While low app reliability seemed to serve as a disincentive.

00.4. Recommendations

The study identified five cross-case challenges that decreased D-CT uptake and developed recommendations for countering these uptake barriers, as summarized below.

CHALLENGE 1. "Fears of immediate and future surveillance, and alternative uses of personal data."

Across all cases, user-uptake was adversely impacted by fears regarding data harvesting, immediate and future surveillance, and data security.

RECOMMENDATIONS

- ☐ Build open and transparent communication between government officials, citizens, and residents
- ☐ Establish clear data-deletion and D-CT surveillance period end-dates
- ☐ Build and/or leverage trust building relationships
- ☐ Make D-CT apps open-source
- ☐ Employ ethical hacking as a proactive cybersecurity strategy

CHALLENGE 2. “Privacy perceptions may override privacy-by-design principles.” Users may have perceptions around app functionality and privacy safeguards that do not reflect the reality of privacy-preserving D-CT apps which will negatively impact user-uptake.

RECOMMENDATIONS

- ☐ Increase data privacy education and awareness
- ☐ Encourage apolitical, science-led response
- ☐ Create a national hotline to report D-CT app misuse/scams
- ☐ Ensure data collection and management processes are open and transparent

Challenge 3. Some communities, such as the elderly, persons with disabilities, or highly surveilled communities, **“are disproportionately affected by and/or excluded from D-CT apps/measures.”**

RECOMMENDATIONS

- ☐ Build perceptions of working together and highlighting shared values
- ☐ Understand and prevent/mitigate differential impacts
- ☐ Expand media coverage with more inclusive social media campaigns
- ☐ Build multilingual functionality
- ☐ Ensure compliance with accessibility standards
- ☐ Ensure equal incentives

Challenge 4. “Perceptions of D-CT app effectiveness are poor.” While D-CT app effectiveness is dependent on a majority of the public downloading the app, the public is reluctant to download D-CT apps because they believe them to be ineffective.

RECOMMENDATIONS

- ☐ Build, strengthen, and communicate the relationship between manual and digital contact tracing
- ☐ Strive to limit false positives as well as better embed incubation and infection risk into D-CT software
- ☐ Minimize digital glitches
- ☐ Build communication channels between app users and app developers
- ☐ Build app functionality

Challenge 5. “Digital limitations inhibit people from downloading D-CT apps.” From owning outdated technology to having limited Internet access to lacking digital literacy, digital limitations (and the digital divide) inhibit people from accessing and downloading D-CT apps.

RECOMMENDATIONS

- ☐ Minimize technical and connectivity requirements
- ☐ Publish short yet instructive app-installation and app-use tutorials
- ☐ Giving individuals free mobile devices or alternative technologies to enable participation