The Impact of Trust on the Intent to Use Digital Epidemiology

Trust in Digital Epidemiology

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ABSTRACT

This pictorial summarizes a combination of literature, primary research of trust in technology and trust of digital epidemiology applications as well as displays 7 Trust Focused Design Principles derived from the research for use when designing in Difficult to Trust situations, such as a COVID tracker app. The primary research involved a public survey and qualitative interviews and observations conducted by Irish participants covering a range of ages, technical literacy, and trust dispositions. Correct implementation of these design principles aim to increase trust, usability, satisfaction and intent to use of an app compared against an app without these principles.

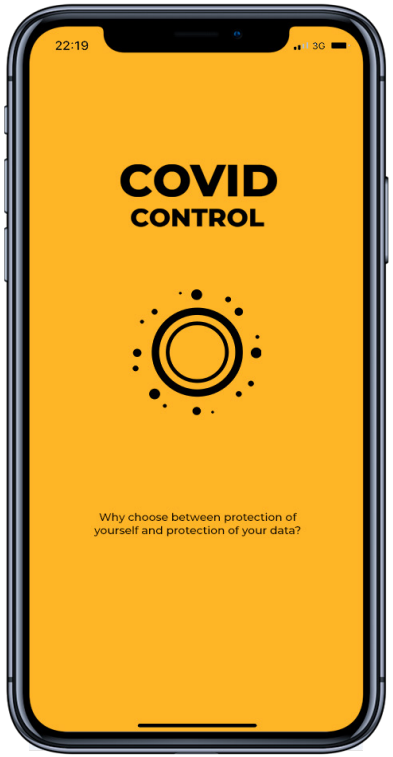
Authors Keywords

Trust; Ease of use; Satisfaction; Intent to use; Digital Epidemiology

INTRODUCTION

In the SARS-CoV-2 pandemic, many countries utilize contact tracing apps to assist in minimizing spread of infection. Although the technical capabilities of such apps were proven to be useful [1, 2, 3], public trust of the apps became commonplace with many societies having privacy concerns [5, 22]. In an Irish survey, 59% of participants expressed some reservations when downloading a contact tracer [6], similar results were found in British and American surveys [7, 8] with fear of greater surveillance being the common theme.

This pictorial proposes 7 Trust Focused Design Principles for use in Difficult to Trust situations, such as within a contact tracing app. These principles aim to increase the assistive capabilities of contact tracer apps through ethical, trustworthy, locally rooted, and adaptive implementation [10].



RELATED WORK

Trust

Trust is a personal belief that other people are able, benevolent and have integrity in their dealings [13], these beliefs translate to user/computer trust [14, 15]. As trust is so personal and influenced by external factors the user experiences [16], designing for trust can be challenging with principles needing to be broad and unspecific [17,18].

Development of contact tracing apps

Attempting to reduce trust issues relating to contact tracers, organisations, such as the WHO, created guidelines for ethical contact tracer development [20, 21]. Although useful, these guidelines were technically focused, COVID-19 specific and arguably ineffective as public reception towards contact tracing was cold with distrust still being widespread amongst the most privacy considerate countries [6, 7, 8, 9, 22].

During this study, Trust Focused Design Principles will be developed for use alongside technical guidelines in Difficult to Trust scenarios, such as in the contact tracing context.

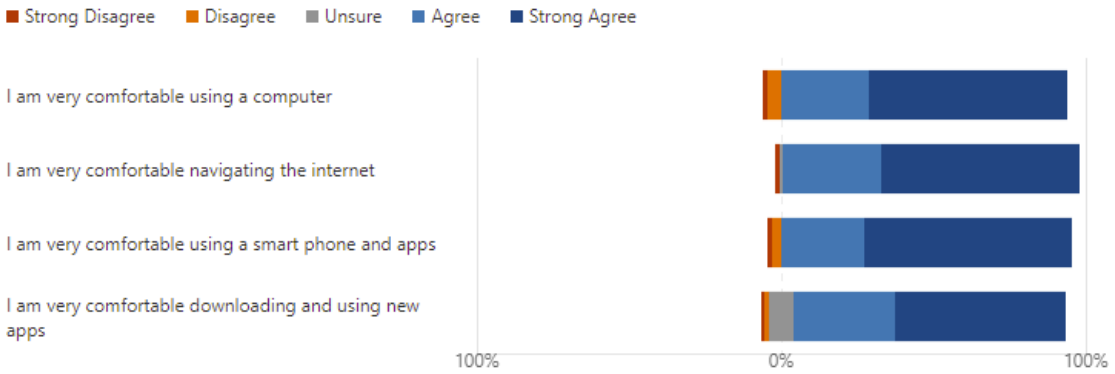
PRIMARY RESEARCH

Quantitative Survey

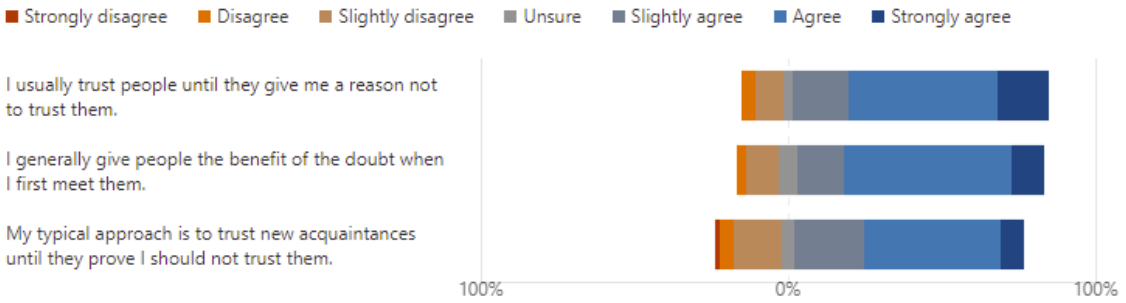
A public survey was conducted to assess the public's opinion on technology use, general disposition to trust, tracking app usage and opinions on COVID contact tracing apps.

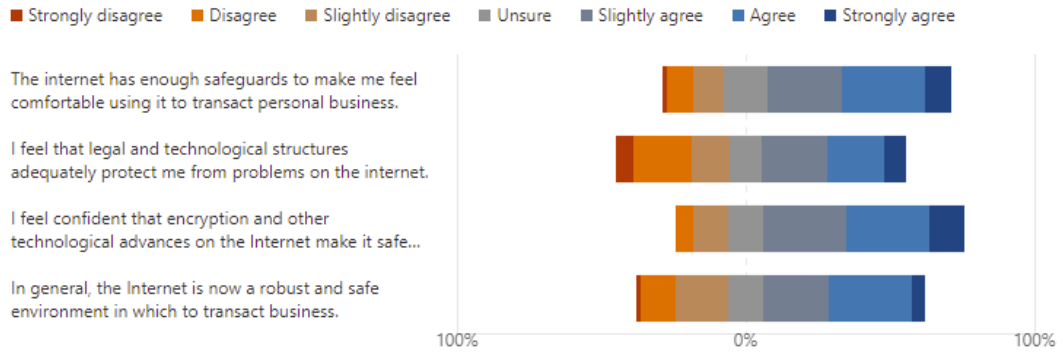
Some key findings from the survey include:

A high level of comfort interacting with technology, with 90% of participants agreeing or strongly agreeing to being comfortable using a computer, the internet, smart phones, and new apps.



Relating to general trust, 79% were positively trusting towards strangers and 61% positively trusting of safeguards and environments on the internet.





Qualitative Interviews & Observations

Secondly, 5 Qualitative Interviews were conducted, covering app usage and preferences, trust levels, a walkthrough of a contact tracing app and questions relating to their experience.

Participants generally distrusted tracking apps but factors including functionality, convenience and control helped quell distrust. Additional comments included size and structuring of privacy policy, lack of proof of success and lack of updates.

Trust Focused Design Principles

With use of the results of the Qualitative and Quantitative tests, 7 Trust Focused Design Principles were created. From the results, the main concerns participants had in relation to contact tracing apps and tracker apps this was done using common trends from the quantitative results and was backed up with results from the qualitative interviews and observations. Using these results, solutions were created in an attempt to remove these concerns from the user, after this, the final result was grouping similar solutions together under a set of principles which, when used together, aimed to overcome all concerns participants might have using a contact tracing app. The created principles are:

1. Have and Accessible Privacy Policy

2. Explain Yourself

3. Affirm Usefulness

4. Engage Your Audience

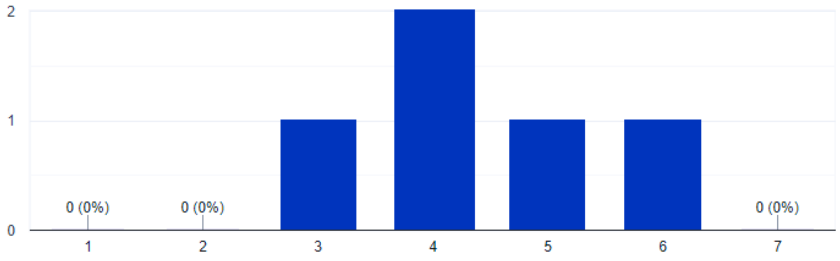
5. Ensure Control

6. Look Professional

7. Be Easy to Use

The following slides of this Pictorial will take each of these principles, explain them in detail, back up the decision process with using results from the testing and present examples of published apps who demonstrate what using that principle well looks like.

Online Interview & Observation screenshot



Online Interview responses to:

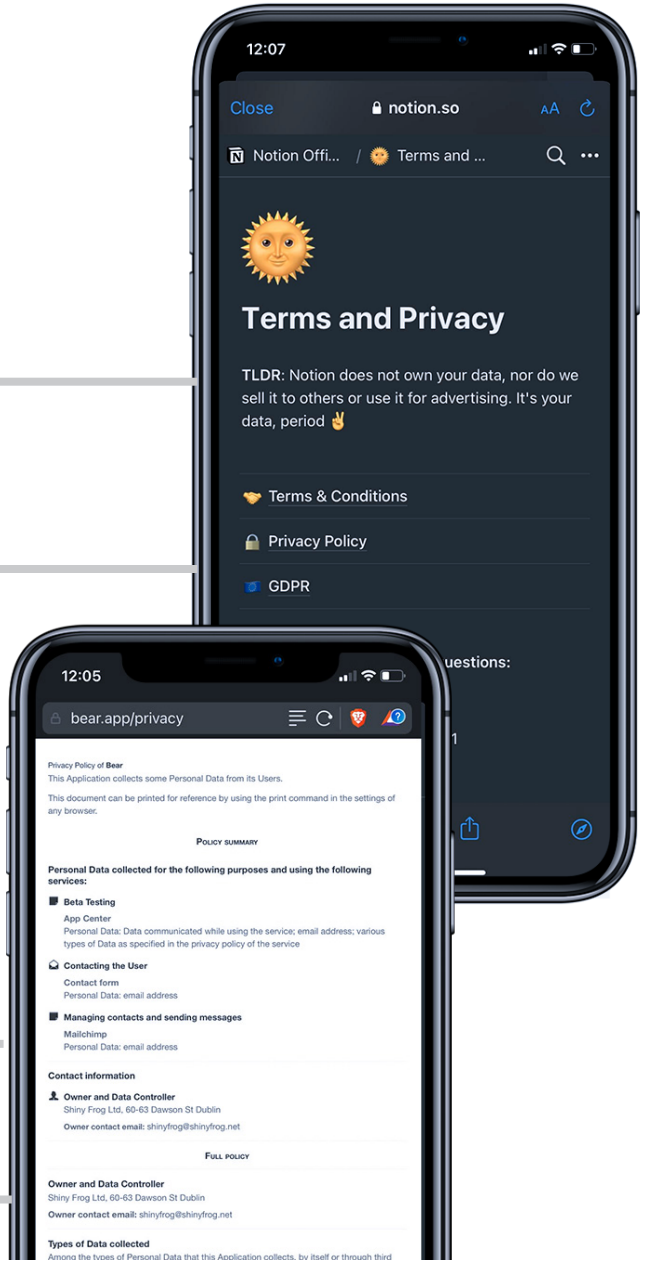
'COVID trackers are capable and proficient at tracing infection'

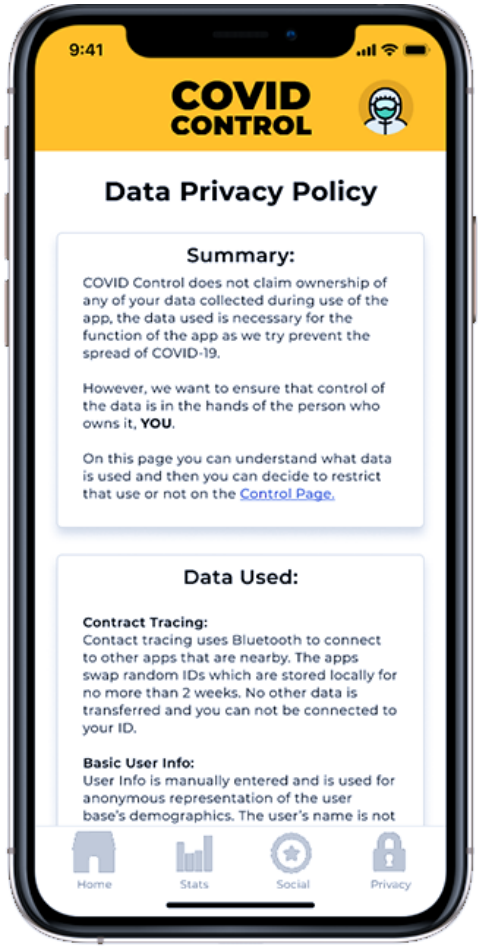
ACCESSIBLE PRIVACY POLICY

The presence of a privacy policy has been shown to be an important factor for establishing credibility and instilling integrity [24]. However, within the context of a contact tracing app the requirement of explanation as to how data collection and processing is conducted within the app is even more paramount, additively information regarding this method of data collection should be clear and unambiguous. [25].

The importance of a privacy policy was shown during the primary research survey where over 45% of participants stated the presence of said policy increased their confidence in an app. Additionally, the requirement for clear, unambiguous and accessible forms of explanation as to how data is being collected, how it is used and how/when it is disposed was reinforced during the qualitative interviews.

Shown in the exploratory research, an accessible privacy policy is necessary to instill confidence in the user. This is the backing for the first Trust Focused Design Principle. Use of clear and accessible privacy policies is demonstrated why by Notion.so and Bear.app both making privacy policies more accessible and transparent [26, 27].





Includes a 'Too Long Didn't Read' stating that they do not claim ownership over any user data and that data is not sold of used for advertising purposes.

Includes a listing of subtitles for the main components of the statement.

Policy Summary identifying what private data is used and where.

Contact information and office address listed.

Quick access from the home page and segmented into sections ordered by importance to the user

EXPLAIN YOURSELF

Avoiding hidden information and being upfront with your intentions have been a key factor for establishing online [34]. This become even more important in a Difficult to Trust scenario. One of the primary fears regarding contact tracing apps was the use of private data in a way the user didn't intend it to be used in [6, 7, 8].

Data misuse in contact tracing apps was a main concern in the primary research and one which would lead to distrust or even refusal to use any app. However, one participant stated:

'I'm willing to give an app access to almost any form of data, so long as it makes sense. But, if an app requires data, I don't think it needs I won't use it.'

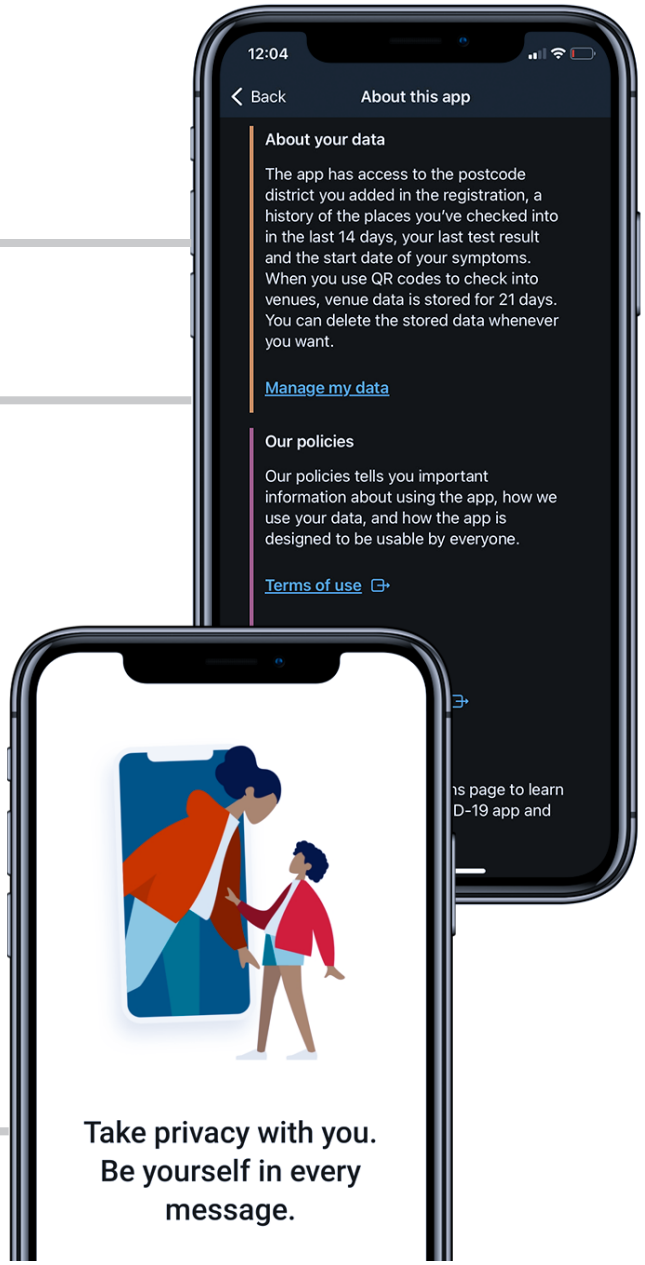
This reenforces the need for explanation and transparency, which is present in previous recommendations for developing COVID contact tracing apps [20, 21]

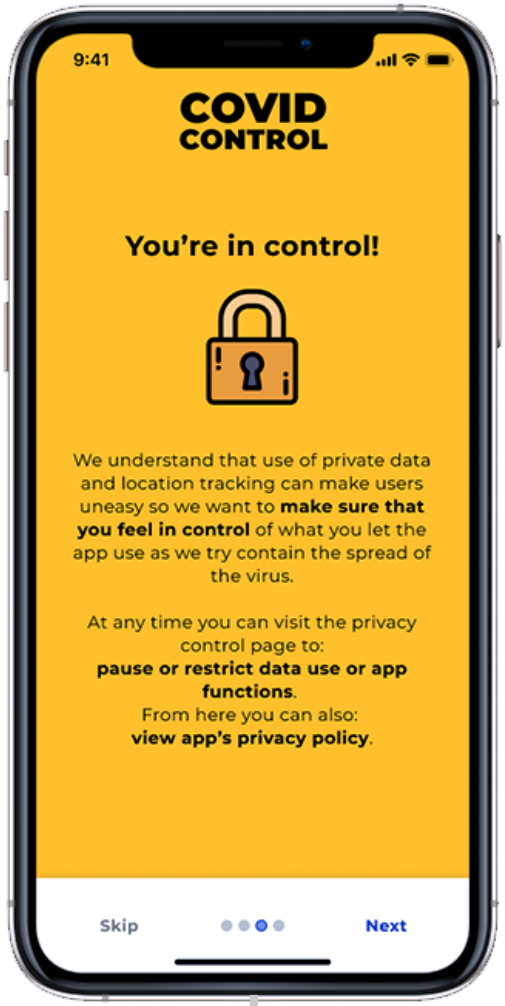
The NHS COVID app [27] and Signal app [35] display this principle well. Both apps included detail explanations for data use and the Signal app includes an onboarding experience, reassuring privacy.

About your data section detailing specific pieces of data collected, how and when it is collected and stating how long this data is kept for.

Ability to manage and delete specific data the app has stored about you.

Easily understood onboarding experience assuring privacy.





Onboarding screen explaining data usage and assuring user of their ownership.

AFFIRM USEFULNESS

Unlike conventional apps, the usefulness of a COVID contact tracing app can be unclear. With other apps, users determine usefulness based on their interactions. Apps where the main functionality is unseen by the user, must prove their usefulness in other ways in a measurable manner.

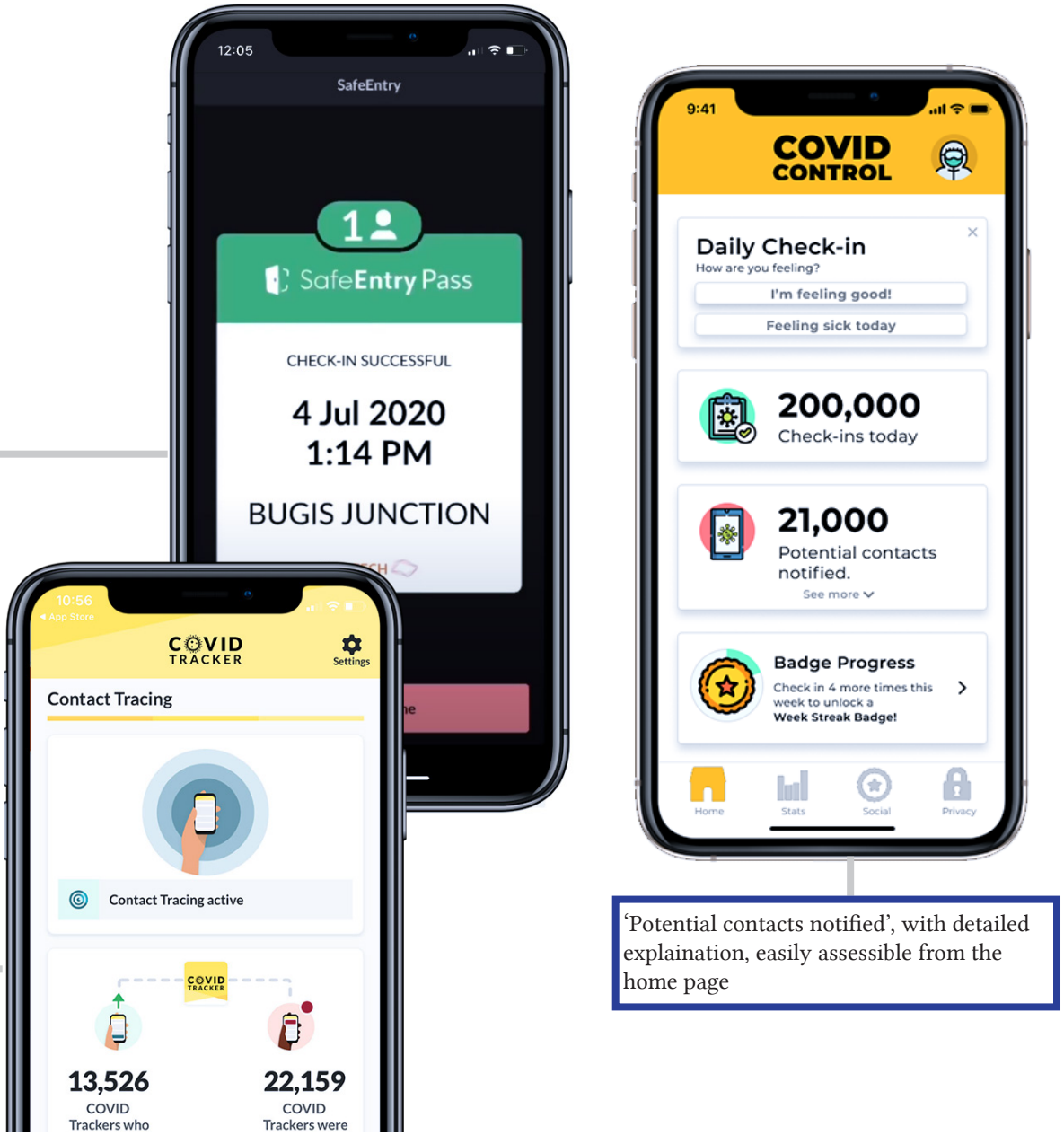
From the primary research, doubts that a COVID contact tracing app would be useful was the most common reason for not downloading the app. Additionally, the majority of participants believed that the app was not useful or wasn't as useful as it could be, one participant expressed that their uncertainly of usefulness because they had heard no 'success stories'.

In order to show usefulness in a Difficult to Trust scenario, users must be reassured of an apps usefulness in a novel manner. This could be achieved through displaying in-app information regarding what is occurring behind the scenes or by displaying 'success stories'.

Good examples of this include, firstly, The Irish COVID tracker app [28] which display the number of notifications sent to potentially infected individuals. However, this feature is nested within the app and should be easily seen. Secondly, Signapore's TraceTogether app [29] achieves usefulness by requiring a 'check in' when visiting a public building.

Required check-in functionality for public areas providing usefulness to TraceTogether App.

Number of symptom updates and number of potential close contacts notified displayed in Irish COVID tracker app.



'Potential contacts notified', with detailed explaination, easily assessible from the home page

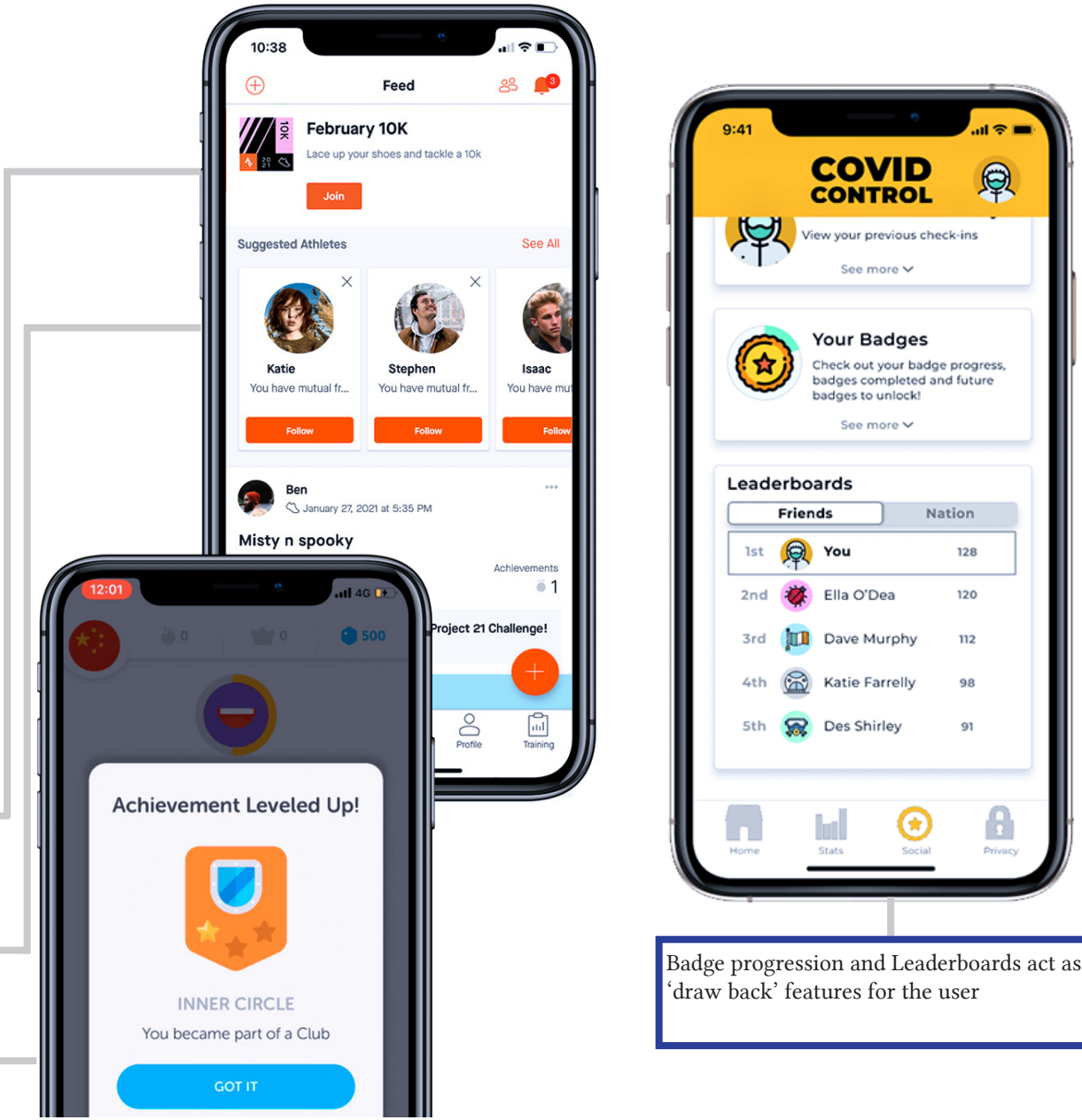
ENGAGE YOUR AUDIENCE

Engagement in applications gives users incentive to use them and is an important component of gaining trust and increasing satisfaction [33, 30]. Gamification, leaderboards and social features, when implemented in medical applications increased the popularity of it as well as significantly increasing the follow up periods of a self-management app compared against one without these features, regardless of assistive potential [33, 36].

From the qualitative interviews, when asked about the reason for initially installing their specified tracker app most users stated specific features which increased their experience to a higher degree compared to competitors.

Strava [37], along with conventional exercise features, uses social features and leaderboards to engage its audience. Users can connect with friends, post exercise, join challenges and compete with others. Audience engagement is also seen in the language app, Duolingo [38]. Duolingo encourages users to continue using through use of badge awards and leaderboards.

Integrating engaging features in contact tracing apps should be done in a cautious manner. Friend networks and social connections increase the amount of private information asked from the user and could reduce trust in the app just by its presence. Use of nicknames and avatars are to be used when implementing in a contact tracer.



Monthly challenges users can take part in and compete against others also taking up the challenge.

Ability to add friends, view their exercise history, compare it against your own and share achievements

Achievement badges awarded based on completing challenges

Badge progression and Leaderboards act as 'draw back' features for the user

ENSURE CONTROL

It is important to make sure the user believes and can be confident that they are in control of the data the app uses and that they feel that it's their voluntary choice to use the app to the give the app the data requested.

Without ensuring control and voluntariness, the challenge of gaining trust is significantly greater [4, 22]. This is stated in current guidelines for developing contact tracing apps as being a crucial factor for ethical development [20, 21].

In the primary research, 'my data could be misused' was the second highest concern from participants who had installed a contact tracing app, it was also a reason for many participants not installing one. When asked 'What private data would you be unwilling to give to an app?', one participant stated:

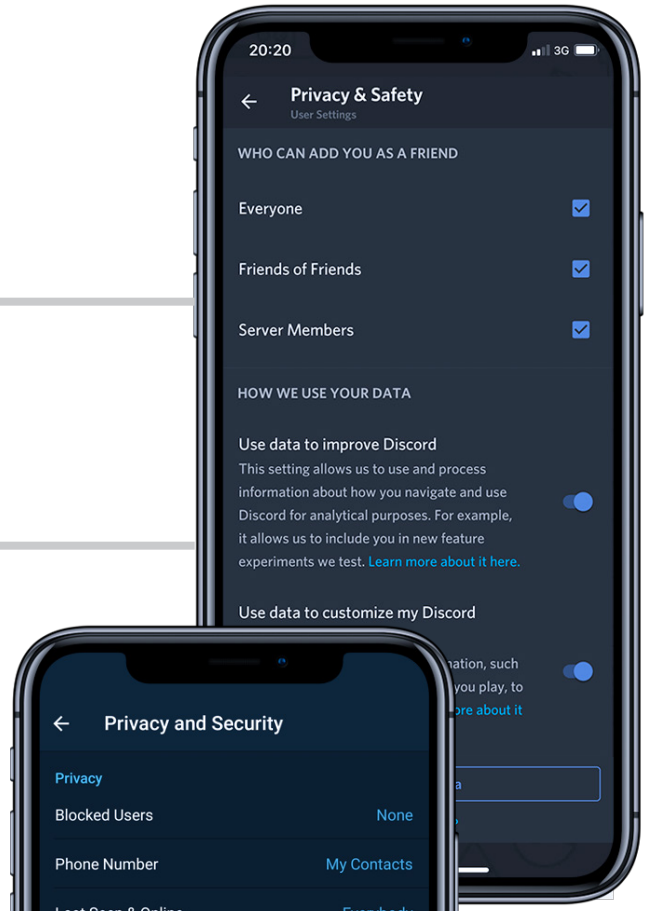
'I think I'd be willing to give any relevant data, so long as I felt I was still in control of it.'

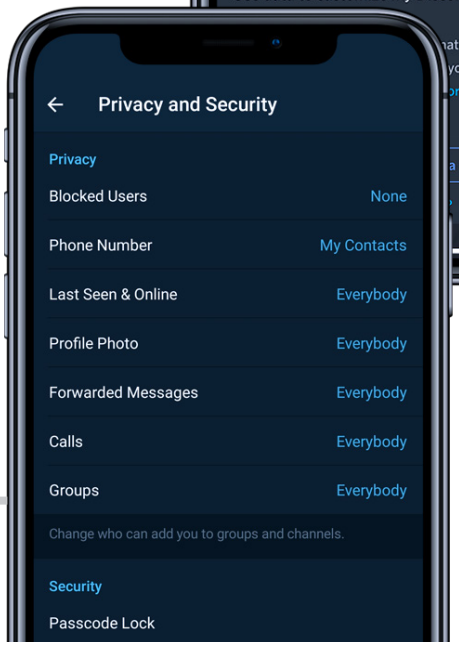
Discord [39] and Telegram [40] are examples of ensuring control. Discord's privacy page allows users to control who has access to data and allows them to see all their data being stored. Telegram offers a control page allowing users control who can view the data and restrict bots and websites from using data.

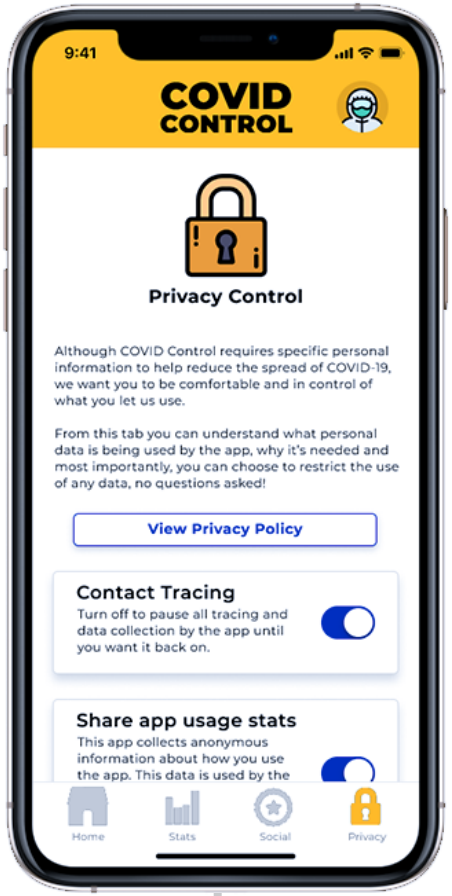
Ability to restrict your presence and the data accessible to others.

Ability to restrict data used by Discord.

Single page of control, able to restrict other users access to data, options to restrict external websites' access to data etc.







Ability to control all data usage and view data used from one page.

LOOK PROFESSIONAL

Professional Look is a common principle of good design and contributes to instilling trust and credibility [17, 18]. It is crucial to ensure the look and feel of an app's features and components seem professional and are visually appealing.

Participants of the exploratory research highly rated 'Visually Appealing' and 'Professional Look and Feel' as major attributes that increases their confidence in an app. Additively, buggy features and poor page structure were attributes of an app which lessens the participants trust in an app.

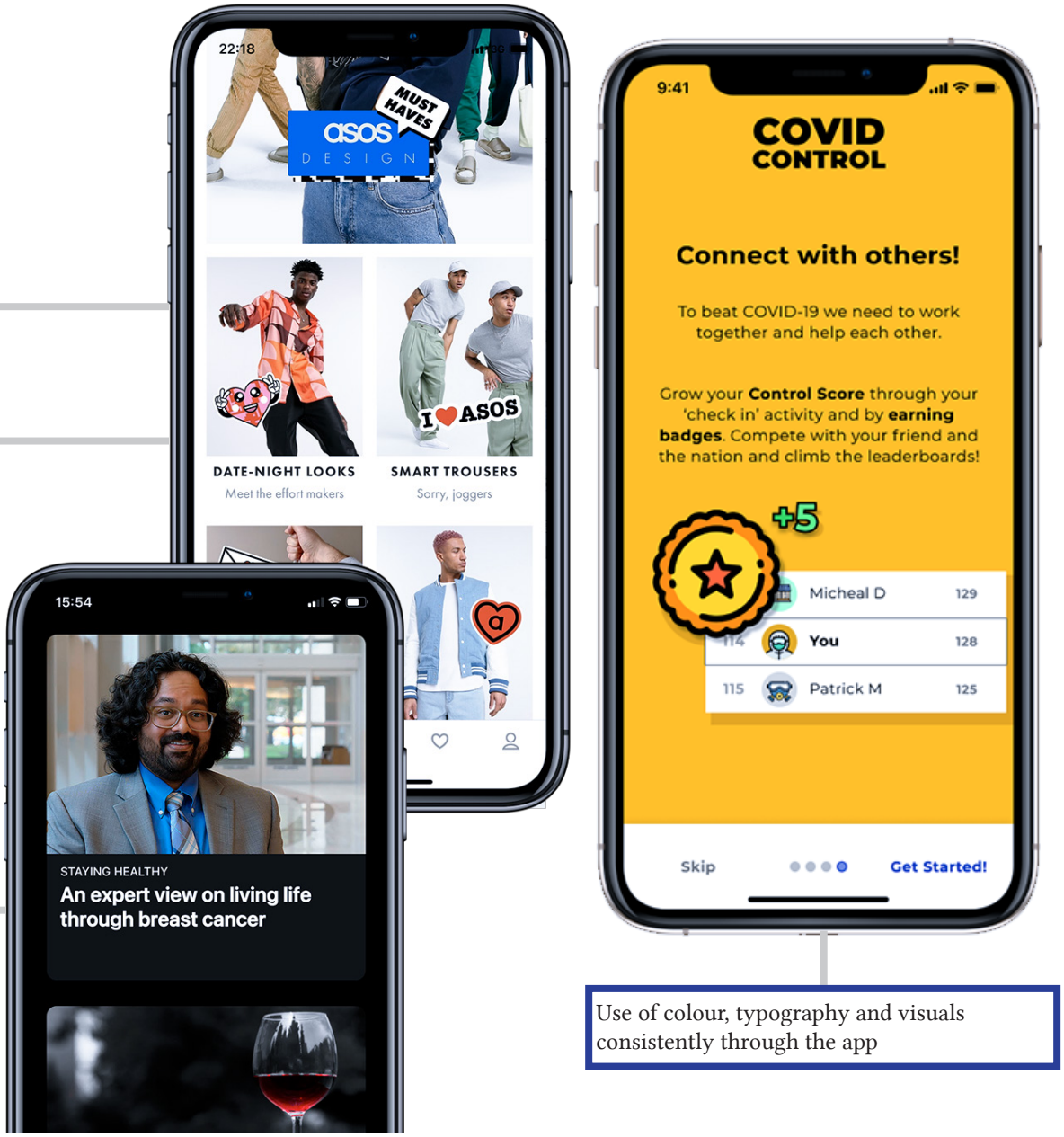
Looking professional is seen in the ASOS app [41] and the Mayo Clinic app. Both apps predictable layouts, clean colour schemes, typography, professional photography, and regular updates [18].

Implementing Professionalism in a contact tracing app is restricted by less opportunities to implement photography or visuals. However, tracing apps can ensure predictability, use clean and consistent colour and typography, include extensive content and ensuring the content is up to date and frequently updated.

Predictable with use of professional photography.

Continually update with new content (themed content). Display of recognisable brands.

Use of friendly imagery, clean and consistent colour scheme and typography.



Use of colour, typography and visuals consistently through the app

EASY TO USE

Ease of Use has been a longstanding principle of UX design and a crucial aspect of gaining trust [16, 18]. Features and navigation should be as intuitive as possible to the user, allowing them to seamlessly conduct their intended task.

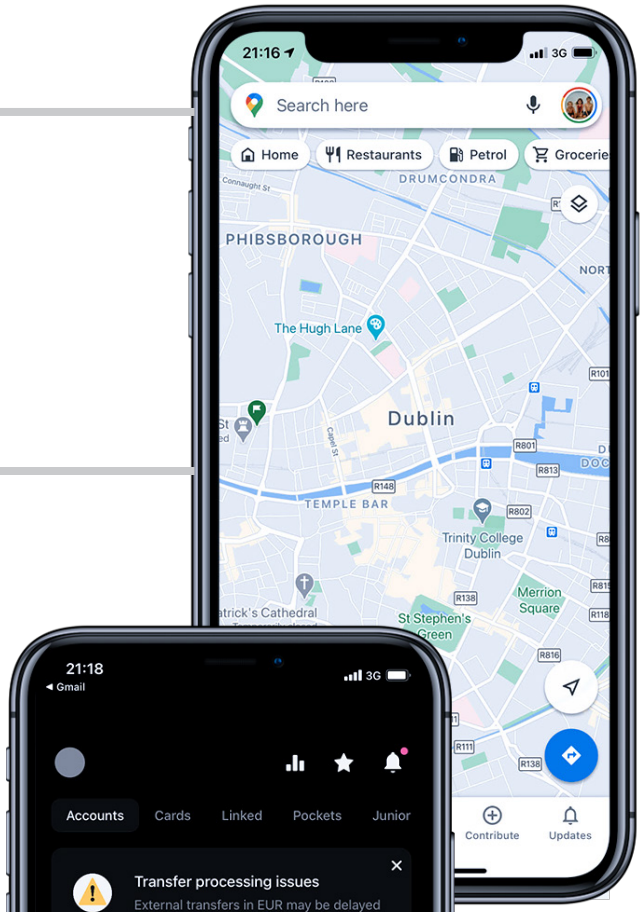
The requirement for ease of use for gaining the trust of the user was shown in the exploratory research, over 30% of participants stating that ease of use is a major factor when choosing between apps. It was also mentioned as a factor which contributed to a participant's trust in an app.

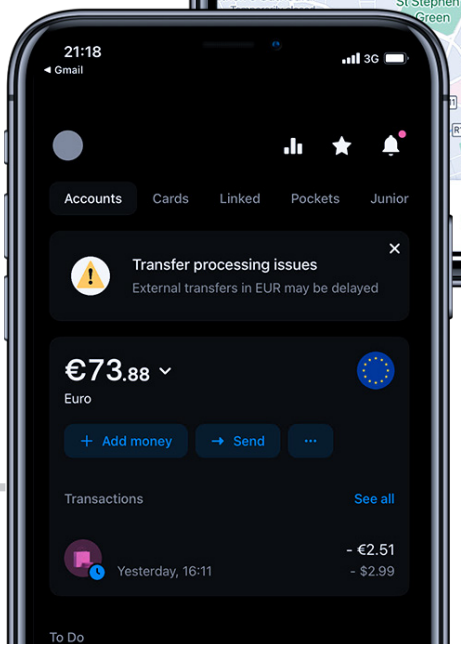
Two prominent examples of easy to use designs are Google Maps [43] and Revolut [44]. Although some mentioned uncertainty with it, Google Maps was chosen by 4/5 participants as a preferred tracker app for its convenience and ease of use. If a contact tracing app can achieve ease of use, it would be able to increase the likelihood of retaining users, building trust and, as seen with Google Maps, ease of use can become a placeholder for trust in difficult to trust situations. Revolut, as mentioned, is also a prominent example of easy to use technology. Revlout has done particularly well in achieving ease of use as the function of online banking and money transfer has traditionally be a complex and onerous task.

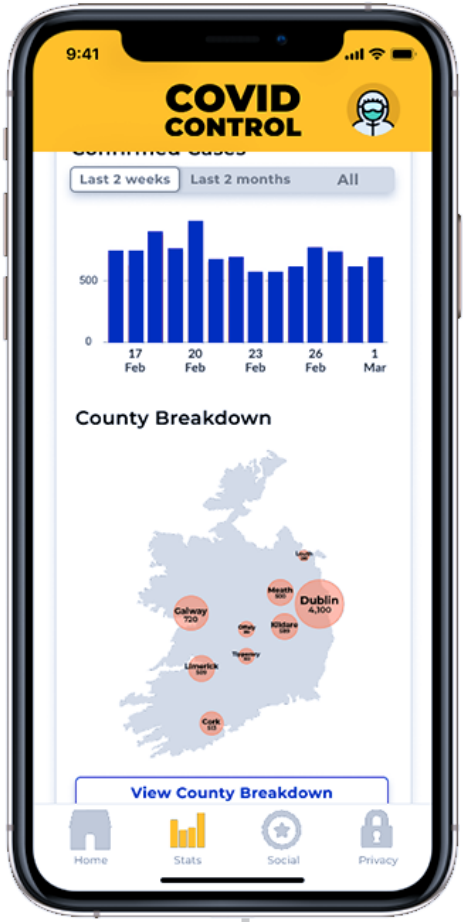
Minimal controls with clear access to most desired functions.

Straight forward map design with Real World Feel.

Easily accessible and usable features which would traditionally be complex and onerous







Intuitive layout. Data visualized in a 'Real World' format

DISCUSSION

Implementing these principles into these designs statistically increased the level of trust a user has in a tracing app compared to one without the principles. The trust of the user was measured using the McKnight Trust scale [23].

As these principles statistically increased the trust of the user they can be used alongside functional development guidelines from other publishers, such as WHO [20] in the future development or updating of infection contract tracing apps, which should lead to an increased acceptance of contact tracing apps, it is possible that, only then, a true test of the effectiveness of contact tracing can begin.

Although significance was shown these principles should be tested further with a larger sample size and should be tested individually, not as a group.

Home page | Stats page | Social page | Control page

Onboarding screens

Privacy policy | Profile page | Delete confirmation

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