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ORIGINAL ARTICLE

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Bridging values: Finding a balance between privacy and control. The case of Corona apps in Belgium and the Netherlands

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Abstract

This paper focuses on two examples of the introduction and use of COVID-19 contact tracing apps in The Netherlands (CoronaMelder) and Belgium (Coronalert). It aims to offer a critical, sociotechnical perspective on tracing apps to understand how social, technical, and institutional dimensions form the ingredients for increasing surveillance. While it is still too early to gauge the implications of surveillance-related initiatives in the fight against COVID-19, the "technology theatre" put in place worldwide has already shown that very little can be done to prevent the deployment of technologies, even if their effectiveness is yet to be determined. The context-specific perspective outlined here offers insights into the interests of many different actors involved in the technology theatre, for instance, the corporate interest in sociotechnical frameworks (both apps rely on the Google/Apple exposure notifications application programming interface). At the same time, our approach seeks to go beyond dystopian narratives that do not consider important sociocultural dimensions, such as choices made during app development and implementation to mitigate potential negative impacts on privacy.

KEYWORDS
contact tracing apps, COVID-19, surveillance

1 | INTRODUCTION

In the wake of the COVID-19 pandemic, governments and public health authorities have responded with a complex orchestration of surveillance-related initiatives, including the use of automated decision-making systems (ADM) (Harris & Davenport, 2005; Wagner, 2019) in combination with contact tracing apps (Rowe et al., 2020), which are far from being mere technological tools. Contact tracing involves (1) identifying people who have been in contact with an infected person, (2) locating and notifying contacts about their exposure, and (3) regularly following up with contacts to monitor for infection (Müller & Kretzschmar, 2021). ADM can be considered as sociotechnical frameworks that encompass a decision-making model, an algorithm, the data used as input, and the overall political and economic environment surrounding their uses (Automating Society Report, 2020). While ADM solutions vary and can be more or less invasive, they are all inserted into complex decision-making processes and shed light on the governance model(s) behind them (e.g., the prioritisation of public health vs. individual rights to privacy; Automating Society Report, 2020).

It is in this landscape that contact tracing efforts have grown quickly and globally, often pushed by the ideological justification of "technological solutionism" (Morozov, 2014). The COVID-19 crisis can also be considered as just another "opportunity window" and as a legitimate reason for governments to implement surveillance mechanisms and technologies that may have far greater implications for issues such as privacy than intended (Boersma et al., 2014; Wagenaar & Boersma, 2008). For example, contact tracing apps, when downloaded to a smartphone, can be used to inform people that they might have been exposed to someone with the infection or to support those in quarantine (Organisation for Economic Co-operation and Development, OECD 2020), but the question that remains is how long the apps will be used and for what purposes. The sociotechnical and decision-making angle is important as it calls into question both the potential social impact of such systems in terms of their surveillance power as well as the new tendencies in (big) data-driven crisis governance (Boersma & Fonio, 2018). In this context, ethical, legal, and social implications must be considered together with the governance of digital tracking and tracing systems (Bengio et al., 2020; Kahn, 2020; Parker et al., 2020; Taddeo, 2020).

Notwithstanding important differences in the implementation of contact tracing apps, these systems have been deemed necessary to contain and mitigate the spread of the COVID-19 virus in various countries across the globe. In particular, South Korea's measures to control the spread of the virus have been seen as a role model for the world (Choi et al., 2020; J. E. Kim et al., 2021). The most important measure in its approach is intensive screening, testing, and tracing, for which technologies including tracing apps were introduced early on during the COVID-19 outbreak. Their introduction was based on a sociotechnical infrastructure put in place after previous outbreaks of infectious diseases such as the Middle East respiratory syndrome (Dighe et al. 2020). Tracking and tracing technologies are seen as important measures taken by the South Korean government, yet their effects on the spread of the virus must be considered in the broader context of the South Korean society in which the civil society played an important role (Jeong & Kim, 2021). Smartphone penetration in South Korea is relatively high compared to other countries, including the United States (Shahroz et al. 2021). This is an important factor to take into account when assessing the effectiveness of contact tracing technologies and strategies. In addition, while an app's potential is apparent (assuming that a high proportion of the population will utilise the app; Farronato et al., 2020; Ferretti et al., 2020), its efficacy is less obvious because "reducing the spread relies on additional elements: testing capacity and management of limited testing resources" (Almagor & Picascia, 2020). As Kretzschmar et al. (2020) argued in their model, "minimizing testing delay had the largest impact on reducing onward transmission." Testing speed, in combination with contact tracing strategies, would, therefore, play a key role in preventing further transmissions.

While the South Koran approach of using tracking and tracing technologies has been widely recognised as successful, the intrusive nature of the technologies gave rise to heated debates about the state surveillance and privacy (M. H. Kim et al., 2020; M. S. Kim et al., 2021; Park et al., 2020). However, digital tracking and tracing systems raise more than just privacy issues, as Vitak and Zimmer (2020) explain, because the appropriateness of sharing data with third parties to support public health is contextually dependent and the moral and political implications of new information flows should be taken into account when assessing a new technology (Nissenbaum, 2010). We, therefore, propose the *sociotechnical systems perspective* to understand the overall potential and limitations of a technology (Pasmore et al., 2019). This requires analysing contact tracing apps along the intertwined technical, social and institutional dimensions that inform one another (Kroes et al., 2006; Van de Poel, 2020). The sociotechnical theory (STT), as defined by Geels (2004), puts emphasis on the interconnected dimensions that are key to the diffusion and development of new technology: technological systems, rules and institutions, social groups, human actors, and organisations. The foundations of the STT were established by Chern (1976, 1987), who outlined a number of principles for effective system design, which were subsequently updated by C. W. Clegg (2000). Complex systems are composed of both socio (people and culture) and technical (technology and infrastructure) elements: changes in one element will cause changes elsewhere in the system "due to its complex interactive nature" (C. Clegg et al., 2017). In analysing technical, social, and institutional dimensions of two contact tracing apps developed and used in two European countries, we aim to critically consider the relationships and complex interactions between multiple elements that cannot be examined in isolation.

In concrete terms, the technical dimension explores the functionality of the technology, its intended uses and shortcomings, the social dimension analyses user practices and expectations, and the institutional component sketches the cultural, normative, and governance embedding. Adopting this perspective avoids framing COVID-19 tracing apps as either a panacea or a destroyer of pandemic management and instead frames them as a localised and complex system that co-produces public concerns and ways to address them.

This article explores the introduction and use of two COVID-19 contact tracing apps developed in response to the COVID-19 crisis, one in the Netherlands (CoronaMelder) and one in Belgium (Coronalert). In both countries, the South Korean approach of using COVID-19 apps was taken as an example to domestically develop and introduce contact tracing apps. We build on the Western dual discourse on privacy and solidarity to reveal that the COVID-19 tracking app technology in both the Netherlands and Belgium is seen as either a surveillance dystopia promoted by government engagement with private corporations or collective responsibility to provide a united response to the pandemic, privacy risks notwithstanding (e.g., Dodd, 2020; Lovett, 2020; Siffels, 2020). In what follows, we introduce how the CoronaMelder and Coronalert apps have been introduced in the Netherlands and Belgium, respectively. We highlight the technical characteristics, the social dimensions, and the institutional contexts of the apps in both countries and end each case with a brief overview of the adoption and use of the app. In the discussion, we use the sociotechnical approach to analyse how the

governments in both countries tried to strike a balance between privacy and control. We end with a brief conclusion about the use of apps during the COVID-19 crisis.

2 | THE DUTCH CORONAMELDER APP: A SOCIOTECHNICAL SYSTEMS ANALYSIS

In the Netherlands, the trial launch of CoronaMelder started in August 2020, earlier than the launch of the Coronalert app in Belgium. The CoronaMelder relies on the Google/Apple exposure notifications application programming interface (API), which raises concerns about corporate interference in defining the management infrastructure for public health-related issues. One of the most interesting aspects of the social dimension of this app was the prominence given to ethical considerations, which were thoroughly addressed in ad hoc panels with experts and citizens. The app was not formally launched until October 2020 due to multiple policy gaps and disagreements with The Dutch Data Protection Authority.

2.1 | The technical characteristics

CoronaMelder is a voluntary COVID-19 tracking app developed by the Dutch government (Rijksoverheid, 2021) that relies on the Google/Apple exposure notifications API. The API uses the Bluetooth infrastructure in smartphones to capture the proximity of phones in contact with each other for longer than 15 min. The Bluetooth signal is coupled with GPS data for verifying the established contact but not for storing the location or presenting it to users. This API generates and shares random tokens for identifying phones without capturing the personal user information; the tokens are stored on the phone for 2 weeks. Phones with CoronaMelder installed continuously generate, broadcast, and exchange the Bluetooth tokens. When people receive a positive COVID-19 test confirmation, the epidemiological institution invites them—as a separate and voluntary measure—to indicate their positive carrier status in CoronaMelder. If a person confirms their status in the app, the exposure system will identify the tokens of other devices that were registered in its proximity for longer than 15 min in the past 2 weeks. CoronaMelder will then alert the linked phones, prompting the users to test themselves and to stay at home to reduce the risk of spreading the virus.

In parallel, certain technological affordances limit the app's functionality and broader public appeal. It is prone to issue false positive alerts because the Bluetooth signal can penetrate through walls and glass. When a user receives an alert, they cannot see where or when they might have been exposed, due to the app's enhanced privacy features. This challenges the app's credibility and people's trust in it, making swiping the notification away and potentially disregarding it an easy choice. A desire for social contact contributes to the selective use of the app, as users may turn it off periodically to avoid potentially receiving a notification with the recommended isolation that follows. Users are also pragmatic about the battery-draining nature of the app, which is intensified by the always-on GPS signal. This nonexhaustive technical sketch suggests that CoronaMelder does not exist in a vacuum; discussing the app's technological factors requires understanding the social dimension of the users, their preferences, and understandings.

2.2 | The social dimension

To enhance the apps' relatability and usefulness, the Dutch government gave ethics a prominent place in CoronaMelder's development, implemented in the ethics-as-accompaniment approach (Verbeek, 2011). Implemented with input from the ECP Platform for the Information Society and the University of Twente, ethical reflection accompanied the developmental stages from the start. Designated expert and citizen panels provided feedback during the test phase (until late August 2020). The goals of the expert (Verbeek et al., 2020) and citizen (Verbeek, 2020) panels were to identify the salient features of the app and the citizen values it could promote, as well as to suggest design requirements that could support them. The citizen panel report is particularly telling because it combined representatives from different segments of Dutch society, including different age and education groups.

The citizen report found that CoronaMelder contributed to a gap between privacy and solidarity by focusing on the individual (e.g., the rhetoric of "your privacy," "you are in control") and by allowing choice in whether to use it. Panel members identified that emphasising privacy and individual freedom, while of paramount importance, led to downplaying the shared experience of the pandemic and the values of solidarity and collective responsibility (Verbeek, 2020, p.8). The citizen panels' findings suggested that the public health potential of the tracking app risked being underutilized because of the strong focus on privacy, running contrary to global concerns and scholarly attention on privacy risks (Sharon, 2020; Volk, 2020).

Panel members suggested stronger media messages and broader public campaigns that would increase the public awareness of how much control and influence a single person with CoronaMelder has in facilitating the wellbeing of other people (Verbeek, 2020). At the same time, it was important to promote CoronaMelder as a voluntary measure, carefully balancing motivating its use without being coercive, to prevent societal division, and to ensure that nobody would be discriminated against if they chose not to use it (Lanzing, 2020). The panel members felt strongly that making the government narrative regarding the app more balanced would allow repositioning CoronaMelder from a tradeoff between privacy and solidarity to a pragmatic bridge satisfying seemingly conflicting values.

Another worry discussed by the citizen panel concerned a sense of false security (Verbeek, 2020). CoronaMelder, like any tracking app, can be perceived as a technological fix to the pandemic, prompting false confidence based on trust in technology. The panel members emphasised the need to continuously promote the measures of social distancing, testing, and wearing masks, with CoronaMelder as a complementary way of strengthening the existing

measures. Germany's experience was mentioned as exemplary in this regard. There, the government aggressively campaigned for the local tracking app and promoted public trust by discussing its opportunities and limitations (Connolly, 2020). Overall, public perception of the app in its trial phase marked institutional shortcomings regarding public awareness of the app and messaging about its use. They identified a strong need to intensify the message of individual responsibility and the ability to help others to ensure that CoronaMelder brings social cohesion instead of additional confusion in a time of moral uncertainty.

2.3 | The institutional context

The Dutch government attempted to open up the CoronaMelder developmental process, sharing the application features and statistics on GitHub[1] and setting up the expert and citizen assessment panels that accompanied the developmental cycles and fed into the public debate on the app (Van der Veelde, 2020). The proprietary hidden nature of the Google/Apple API, the core aspect of CoronaMelder, tainted these efforts, raising a long-asked question about corporate interference in defining management infrastructures for public health and what concerns matter (Sharon, 2020). Even though the thorough anonymization and data minimisation efforts mitigate the short-term privacy concerns, the way the Dutch government, and many others, relied on Google and Apple to alleviate the pandemic crisis manifests the corporate power to define public interests and concerns, exponentially expanding their spheres of influence (Sharon, 2020). Teaming up with Google/Apple requires a high degree of foresight regarding the long-term social costs of such partnerships and the devising of appropriate safeguards (e.g., a clear definition of when this partnership will be terminated and how the government will manage on its own after that).

Similarly, foresight is essential for the governance of CoronaMelder, examining how it fits with existing policies. CoronaMelder went into limited release for a test phase from July 1 to August 17, 2020, with the firm intention of launching it nationwide after necessary tweaks. By late August 2020, the app had passed the test phase and the scrutiny of the expert and citizen panels, but it did not formally launch until October 10, due to multiple policy gaps and disagreements with The Dutch Data Protection Authority (Seveno, 2020). Additionally, although the government started media promotions for the app in early summer 2020, vouching its support for the app in time for the development and trial phases, by the time CoronaMelder was ready in late August, there were no more public awareness campaigns. Instead, there were media messages about policy disagreements regarding the app while the country was entering into another phase of rapidly increasing infection rates. Together, this created a conflicting public message regarding the CoronaMelder app, which was technologically ready but not politically ready, hampering both public interest and trust in the app when it launched nationally within the context of increased fatigue from new social safety measures.

In sum, the Dutch COVID-19 tracking app showcases how technological dimensions are combined with sociocultural and institutional embedding. Given global experiences with privacy issues, CoronaMelder's development prioritised individual privacy to ameliorate surveillance concerns. While extremely important, this inadvertently reduced the overall complexity of the app to its technological component, suggesting that achieving optimal data protection and privacy safeguards would be sufficient conditions to promote successful use of the app.

2.4 | The adoption and use

In general, COVID-19 tracking apps require highly cooperative requirements to work (Volk, 2020), some citing 15% (Howell O'Neill 2020) to 60% adoption rates (Hinch et al., 2020) needed for effectiveness. In the Netherlands, upon getting a positive test result, more than 110,000 people agreed to share their results through CoronaMelder, which allowed the identification of 9000 additional positive virus cases (Hinch et al., 2020). Researchers from the University of Twente (Jansen-Kosterink et al., 2021) and the University of Tilburg (van der Laan et al., 2021) issued reports presenting their results of research on the adoption and use of the app. The researchers from Twente reported that the main reason people downloaded and used CoronaMelder was to control the spread of the virus, whereas the main reason for not downloading it was privacy. The researchers from Tilburg concluded that as of January 25, 2021, CoronaMelder had been downloaded more than 4.5 million times (25.8% of the entire population). According to the report, this makes the adoption rate in the Netherlands relatively high compared to adoption rates for tracking apps in other European Union member states, with only Germany (30%), Portugal (29%), Ireland (48%), and Finland (52%) reporting higher adoption rates. The researchers further concluded that the early adopters of the app intended to continue using it. Among later adopters, less than 1 in 10 intended to use it at all, and 16% were neutral about its use. The researchers also found that adequate communication by the Dutch government about the app and its characteristics was important to increase its use. A lack of trust in the government and the feeling that surveillance has increased were the main reasons for not downloading the app.

3 | THE BELGIAN CORONALERT APP: A SOCIOTECHNICAL SYSTEMS ANALYSIS

Belgium was one of the last countries in Europe to install an app, the Coronalert app. It went live on September 30, 2020, on Play Store and App Store. In contrast to the Netherlands, the public narrative in Belgium was less dualistic. Coronalert was designed in a privacy-conscious way, a public consultation was organised and the app received positive responses from the privacy community (Ministry of Privacy, 2020). Therefore, privacy was not one of the main reasons for not downloading the app. The way the app worked also led to

little public debate, probably because the database being used for human contact tracing raised many more privacy and surveillance concerns (Dumortier, 2020). Since the pandemic, there has been an increase in CCTV installations in Belgium and more attention on privacy in the newspapers (Haeck, 2020a, 2020b; Verbergt, 2021). In addition, a documentary on Flemish television raised concerns about privacy and surveillance cameras,[2] and an active new NGO, the Ministry of Privacy,[3] has been raising awareness about surveillance. Thus, public debate about surveillance has increased significantly in Belgium.

3.1 | The technical characteristics

The Belgian Coronalert app is based on a German app[4] and was built by the Belgian company Devside with support by IXOR. It uses the Decentralised Privacy-Preserving Proximity Tracing protocol (DP-3T).[5] This protocol uses Bluetooth Low Energy To track and log encounters with other users. By using this protocol, Coronalert is interoperable with similar applications in other European states. Coronalert stores data on users' smartphones. Only data relating to the proximity and duration of the contact is collected and recorded by the application. The tool is privacy-friendly as no data is stored centrally by the government. It is also designed in such a way that it avoids function creep. The app will be deactivated and removed from all app stores as soon as the Belgian government officially declares the pandemic at an end. Users will be asked to delete the app and data stored locally on phones will become unusable.[6]

The app supports human contact tracing, and its main goal is to enable the identification of individuals who have had contact with a confirmed carrier of the coronavirus for more than 15 min in the last 14 days (Jacob & Justin 2021). Coronalert works differently than CoronaMelder: a user asks the app to generate an anonymous random code before getting tested for COVID-19. They present this code to the doctor, who enters the code, the patient's national registry number, and their telephone number on a digital form. If the test is positive, Sciensano, the company that acts as a data controller, asks the user for permission to access their crypto identifiers to inform other users (Jacob & Justin 2021).

Although the app is designed in a very privacy-friendly way, it is not without risks. While the app in itself is not a tool for surveillance and is designed in such a way that it avoids function creep (i.e., use of the technology beyond its primary intended purposes; Lyon, 2003), it does provide legal and sociotechnical infrastructures that could be used for surveillance in the future. Like CoronaMelder, Coronalert is dependent on the Google/Apple exposure notifications API, which provides the core functionality and infrastructure for the app (Apple/Google, 2021). This leaves the door open for the possibility of surveillance by these two companies, as no legal framework has been set up to regulate this.

Though the app was not made for surveillance, the COVID-19 pandemic has seen an expansion of police surveillance technologies to enforce lockdown rules and control corona measures in Belgium. For instance, mobile phone signals are used to track people's movements and to indicate in real-time how busy certain areas get. With a 2–3 min delay, the algorithms give a warning when the maximum number of people has been reached. The algorithms can also distinguish between residents and passers-by and will not count phones that only connect for a couple of seconds, as it is assumed that there is a road close by. The system was tried out earlier when the Tour de France passed through Brussels (Haeck, 2020a).

In addition to the surveillance of telecom data, "corona cameras," as they are being called in the Flemish press, have been installed at the Belgian coast and in several big cities such as Ghent and Antwerp. Their purpose is to monitor busy places such as shopping streets and coastal areas (Haeck, 2020b). In Ghent, 16 cameras were installed in the summer, and their use is being prolonged until the end of October to ensure that no big groups of people come together (Van Meer, 2020). More recently, in Antwerp, cameras that were installed in 2013 to ensure the security of the Jewish community in response to terrorist threats in Europe at that time are now being used to see how many people enter synagogues (Verbergt, 2021). Talking drones have been used in Brussels to spread messages about social distancing. Other types of drones had thermal imaging cameras mounted on them to identify if people were staying in their second homes on the Belgian coast when that was not allowed (Belpaeme & Mariën, 2020). Finally, the local police in Ghent have asked to start using drones with infra-red cameras to check for big gatherings during the Christmas holidays.

3.2 | The social dimension

In June 2020, an interdisciplinary working group of experts[7] was set up by Bart Preneel, a professor of cryptology at the Catholic University of Leuven, to advise the government on technical, legal, and sociological matters. Their goal was to develop policy measures for the Belgian version of the Coranalert app, including making sure it would be privacy-friendly and inclusive so that people would be more inclined to install it. In addition to writing a privacy statement and thinking about how to implement the design in a way that most respected privacy, the working group also launched a public consultation to get people's input on the app's charter, proposal, privacy statement, policy on minors and Data Protection Impact Assessment.[8] The consultation received 23 submissions.

The main conclusions from the consultation were the following: (1) that full transparency, user-friendliness, and clear communication about how the app works and its associated risks are essential to ensure people's rights and to build citizen trust in the app; (2) that the independent oversight committee should reflect the Belgian society concerning gender, race, and age and should involve civil society and end-users from all parts of society; (3) that it should be made very clear that the app does not store location data, and clarification should be given about what the app's lifecycle is, how the app will be shut down and how any related data will be deleted once the project is over; and (4) that there are still important privacy and security risks

that need to be considered, especially regarding the cooperation with Google and Apple.[9]

3.3 | The institutional context

At the end of March 2020, the Minister of Health and the Minister of Digital Agenda and Privacy launched the taskforce Data & Technology against Corona. The taskforce included representatives from the Ministry of Health, Sciensano, the eHealth platform, and the Belgian Data Protection Authority. The taskforce's goal was to oversee and coordinate all e-health initiatives. The possibility of developing a contact tracing app was explored, but ultimately, the taskforce concluded that such a decision should be made by the regional Flemish, Walloon, and Brussels governments rather than the federal government. At the time of this writing, experts involved in the taskforce and those in the exit committee generally envisioned the app as complementing human contact tracing. The work of the taskforce was not transparent, and several open letters signed by academics and opinion pieces were published raising human rights and privacy issues about a possible app (Dumortier, 2020; Vandamme et al. 2020).

As a result, a new interfederal working group was established (i.e., Bart Preneel's working group discussed above). In addition to providing policy and technical advice, the privacy statement, and public consultation, the working group also proposed to install an independent multidisciplinary oversight committee including members of civil society to improve trust in the app. However, the working group's advice was translated in the law as "*The functioning and necessity of the app is regularly monitored, evaluated and adjusted under the direction of the Inter-federal Committee of Testing and Tracing, consisting of representatives of the federated entities, Sciensano, the eHealth platform and two scientific experts. This committee can be supported by an interdisciplinary working group of scientific experts*."[10] The law excluded the members of civil society, removed independent oversight, and made the interdisciplinary working group optional. Six months after the implementation of the app, the optional working group of experts had not been formed. Other advice from the interfederal working group with regard to inclusion and a sufficient communication strategy has only been minimally followed up by the government.

Developments in smart video surveillance in Belgium began long before the COVID-19 pandemic. A camera law was enacted in 2007 and was recently updated in May 2018 to be consistent with the General Data Protection Regulation and to provide regulations for the use of mobile cameras and cameras enabled with smart software. In practice, it seems that the regulation has had an enabling effect on the installing of surveillance cameras, and the COVID-19 pandemic has accelerated this trend, even more, making it easier for cities and police to implement surveillance infrastructure with minimal democratic safeguards and transparency. More recently, a public debate has been taking place, one initially triggered by media attention on the use of drones to control corona measures (De Morgen, 2020). The Belgian Supervisory Body on Police Information (COC), which is a specially appointed data protection authority for the police, has launched an investigation (COC, 2020).

3.4 | The adoption and use

Two surveys were conducted in Flanders asking about public acceptance of a possible contact tracing app. Half of the respondents indicated they would not install it. In June 2020, the VIAS Institute and the Knowledge Centre for Data and Society conducted a countrywide survey in Belgium ($N = 1000$) and found that 37% of respondents were willing to install the app and people above the age of 55 were the most willing. The effectiveness of the app in Belgium has not been as hoped. Just about 28% of smartphone users in Belgium have downloaded the app; this is about 2.5 million downloads. However, only 37% of people who have the app and have tested positive actually press the button to make sure the people they have been in contact with receive a message that they may have been exposed (Vanhecke, 2021). Furthermore, consumer research from late 2020 showed that the app did not reach the main risk groups: only 50% of elderly people and people with underlying conditions have installed the app. The same research also indicated that the higher the level of education the higher the percentage of people who installed the app. Finally, the research showed that the main reason given for not installing the app was that people do not see the point (Visterin, 2020). Another survey ($N = 1850$) conducted in Flanders at the end of 2020 found that 29.3% of respondents who have not installed the app ($N = 991$) fear that their privacy is not guaranteed, and 17.8% do not trust the app (Walrave et al 2021). A possible reason for the low adoption of the app is that the government did not provide a budget for a PR campaign that would reach diverse groups in society (Geusens & Tarck 2020). No evaluation of the app's effectiveness is planned, only an information security audit.

4 | CONCLUDING REMARKS

In both cases presented here, the sociotechnical systems perspective shows that even if optimal technical conditions are achieved, they alone do not suffice to promote social trust and acceptance of COVID-19 tracking apps. More often than not, even if the technological landscape is ready (in terms of both technical features and technical–corporate frameworks), social, legal, and ethical considerations and concerns should not be underestimated and should therefore be taken into consideration in every phase of the design. Additionally, both in Belgium and in the Netherlands, the governance models and the public discourses around the use of those apps rarely concern their effectiveness. However, their effectiveness not only depends on their adoption rates but also involves rigorous assessment, for instance, whether the apps reduce the effective reproductive number (R_{eff}) of the virus. At the time of this writing (August 2021), very few studies have addressed the issue in a comprehensive manner, as Grekousis and Liu (2021) show.

An interesting similarity between Belgium and the Netherlands seems to have emerged. While, from a technical point of view, both the Belgian and the Dutch apps are relatively privacy-friendly, they are also both dependent on the Google/Apple contact tracing API, which, in the long run, and in the absence of specific regulations, raises some concerns. However, neither this technical feature alone nor other technical characteristics capture other "nodes" or elements of the complex social and institutional systems in which the apps are used.

Understanding the complex moral and ethical landscape becomes increasingly important, as does provide timely measures for bridging seemingly conflicting values and supporting the public in navigating the moral uncertainty that the pandemic entails. It is in this landscape that normative discourses and narratives are framed, for instance, the privacy versus solidarity argument in the Dutch context and the consultation processes and recommendations towards transparency in the Belgian case, tactics that did not lead to more acceptance at a societal level in Belgium or to more inclusive governance strategies.

Though they are not comprehensive, the two short country sketches outlined in this article contribute to the debate about sociotechnical frameworks for digital contact tracing. Vinuesa et al. (2020) propose an evaluation framework based on 19 criteria divided into three categories: the impact on citizens, technology, and governance. Each criterion is measured on a scale from 0 to 2. Some criteria have been touched upon in this article, even though Vinuesa et al.'s (2020) proposed framework was not the point of departure: for example, the use of decentralised protocols, the design impact assessment, and the open development processes. Hence, our article can be the basis for expanding the sociotechnical perspective by enriching our analysis with additional elements to carry out a robust evaluation in both countries and beyond.

Though the cases described in the article are unique due to the peculiarities of their social, technical, and institutional dimensions, the "technological theatre" (McDonald 2020) taking place on the same stage shows a certain degree of global technological positivism, although coupled with important efforts. Careful assessments of technological solutions in crisis situations are needed to better support decision-making.

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DATA AVAILABILITY STATEMENT

Data are available on request from the authors. The data that support the findings of this study (i.e., the article "Bridging values: Finding a balance between privacy and control. The case of Corona apps in Belgium and the Netherlands") are available from the corresponding author, Kees Boersma, upon reasonable request.

ENDNOTES

[1] https://github.com/minvws—Official GitHub resource for the CoronaMelder app.

[2] https://www.vrt.be/nl/over-de-vrt/nieuws/2021/03/11/privacy-ik-documentaire-van-tim-verheyden/

[3] https://ministryofprivacy.eu

[4] See https://www.bundesregierung.de/breg-de/themen/corona-warn-app/corona-warn-app-englisch

[5] For all DP-3T protocol documents and code, see https://github.com/DP-3T/documents

[6] How long will Coronalert exist? Frequently asked questions Coronalert: https://coronalert.be/en/faq/

[7] This description of the working group's activities comes from the personal experience of one of the authors, who is a member of that group.

[8] Public consultation Coronalert: https://www.esat.kuleuven.be/cosic/sites/corona-app/

[9] For conclusions from the public consultation about Coronalert, see https://www.esat.kuleuven.be/cosic/sites/corona-app/wp-content/uploads/sites/8/2020/09/Public_consultation_v1_0_sep25_2020-1.pdf

[10] Original: Article 6. De werking en de noodzaak van de app wordt regelmatig gemonitord, geëvalueerd en bijgesteld onder aansturing van het Interfederaal Comité Testing en Traing, bestaande uit vertegenwoordigers van de gefedereerde entiteiten, Sciensano, het eHealth-platform en twee wetenschappelijke experten. Dit comité kan ondersteund worden door een interdisciplinaire werkgroep van wetenschappelijke experten. Uitvoerend samenwerkingsakkoord tussen de Federale Staat, de Vlaamse Gemeenschap, het Waalse Gewest, de Duitstalige Gemeenschap en de Gemeenschappelijke Gemeenschapscommissie, betreffende de digitale contactopsporingsapplicatie(s), overeenkomstig artikel 92bis, § 1, derde lid, van de Bijzondere wet van 8 augustus 1980 tot hervorming der instellingen, Oktober 13, 2020. http://www.ejustice.just.fgov.be/cgi_loi/change_lg_2.pl?language=nl%26la=N%26nm=2020010440

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