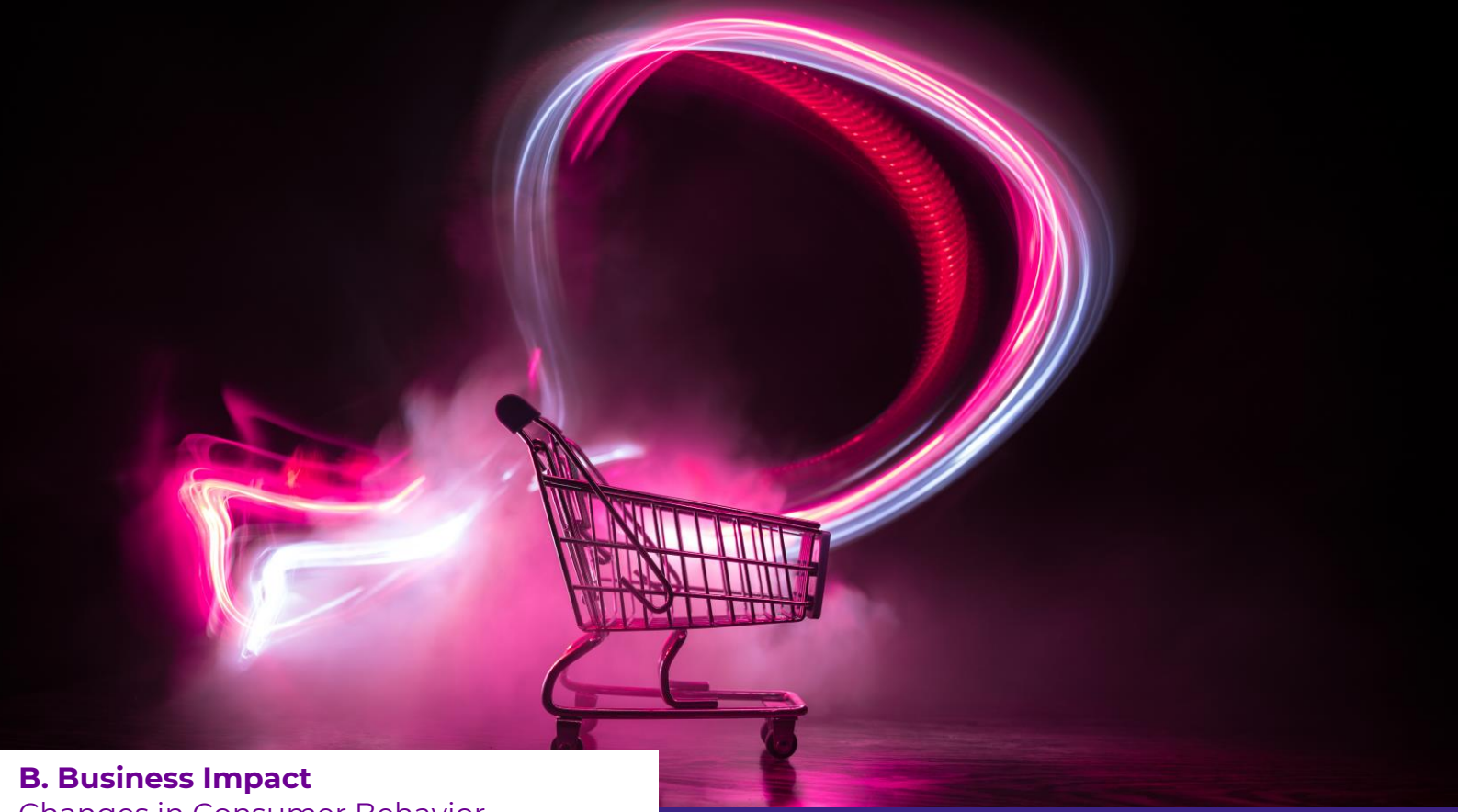

B. Business Impact
Changes in Consumer Behavior

Mobile phone data as an opportunity to fight the pandemic

ESCP Impact Paper No. 2020-03-EN

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Mobile phone data as an opportunity to fight the pandemic

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Abstract

This impact paper shows the anonymous mobile phone user location data, when aggregated and properly analysed, can be of great help to the pandemic combat. It then discusses potential data privacy issues and argues that a 100% confidentially does not exist. It is important to manage and control the data carefully, and make it an opportunity for us in the digital era.

Keywords: Mobile phone data, Pandemic, Privacy, COVID-19, Digitalization

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Mobile phone data as an opportunity to fight the pandemic

Since winter 2019, an outbreak from the Corona Virus Disease 2019 (COVID0-19) has raised intense attention from all over the world. The World Health Organization (2020) recognized the outbreak as a pandemic. As of 9 May 2020, more than 3.93 million cases of COVID-19 have been reported in 187 countries, resulting in over 274,000 deaths (Johns Hopkins University, 2020). The increasing number of cases and widening geographical spread raise grave concerns about its socioeconomic impact. The outbreak is regarded as "the greatest test that we have faced together since the formation of the United Nations" (United Nations, 2020).

The challenge of COVID-19 requires efforts from various fields. Whereas pharmaceutical approaches are critical in the combat, information and operations management methodologies can also play an important role. Specifically, in the era of digitalization, mobile phone data offer a novel opportunity to fight the pandemic. This paper shows that some of the plain mobile phone data, when aggregated and analysed properly, can be of great help to combat the pandemic. It also discusses data privacy concerns and calls for stakeholders to take this opportunity proactively.

Which data is needed?

A mobile (smart) phone stores various types of data, such as call details, text messages, media files, social media posts, online transaction records, etc., and many of them are indeed private and confidential. These data are critical to the individual phone users but are not of many effects to combat the pandemic. Instead, some of the unremarkable and unimportant data, when aggregated, could play an important role.

Highly accurate location data are recorded by many apps with positioning/navigation functions. With aggregated location data, the positions of phones and the proximity between phones can be tracked. Another useful stream of data is the activation history of apps. Note, this metadata only records, e.g., when a user opens Whatsapp but does not have access to the text sent via Whatsapp. With this history, the so-called user profile can be estimated. For example, a phone that never runs Instagram or TikTok and only occasionally activates news apps might belong to an older person, who is likely to require more medical care during a pandemic.

How can the data support pandemic combat?

Among all opportunities, I find the following four cases especially interesting.

Governments have implemented policies to enforce social distances, mobility restrictions, quarantine controls, etc. In general, they have been proved successful in combating the pandemic. However, improvements are always possible. Are some policies too strict? How can the violations be controlled? Should the policies be tailored for different areas? Aggregated location data can be used to empirically evaluate the efficiency and effectiveness of such policies, which can further guide the policy modifications.

A fundamental parameter in almost all infectious disease progress models is the so-called "basic productive ratio" (Larson, 2007). It is often denoted as R_0 in literature, and is defined as the average number of new infections generated by an infected person. For example, $R_0 = 3$ means an infected patient transmits the disease to three others on average. This ratio

represents the essential characteristics of the disease and changes during the pandemic. If $R_0 < 1$, the virus will soon subside, and everyday life will gradually move back to normal. Obviously, this parameter is dependent on the proximity between people. The location data can be used to improve the calculation accuracy of this ratio in real-time, and predict the date it falls below one.

The locations of a specific individual can also be helpful. It is known that a patient has a so-called "incubation period" after infection, in which he/she is asymptomatic but infectious. When the patient is diagnosed after showing relevant symptoms, he/she could have already unintentionally spread the virus to many others. Using the location data, the people who have had close contact with the patient during the incubation period can be found and proactively tested.

The so-called "patient zeros" mean the first patients infected and are of great importance to investigate the origin of the virus for its cure. Because the virus spreads very quickly with possible mutation, time-consuming laboratory tests are difficult to keep track of the route of transmissions. If the location data from all populations can be well maintained, it is possible to efficiently trace back to “patient zeros” digitally.

Data privacy concerns

Unavoidably, the use of mobile phone data raises legitimate concerns about privacy data protection issues that nobody should ignore.

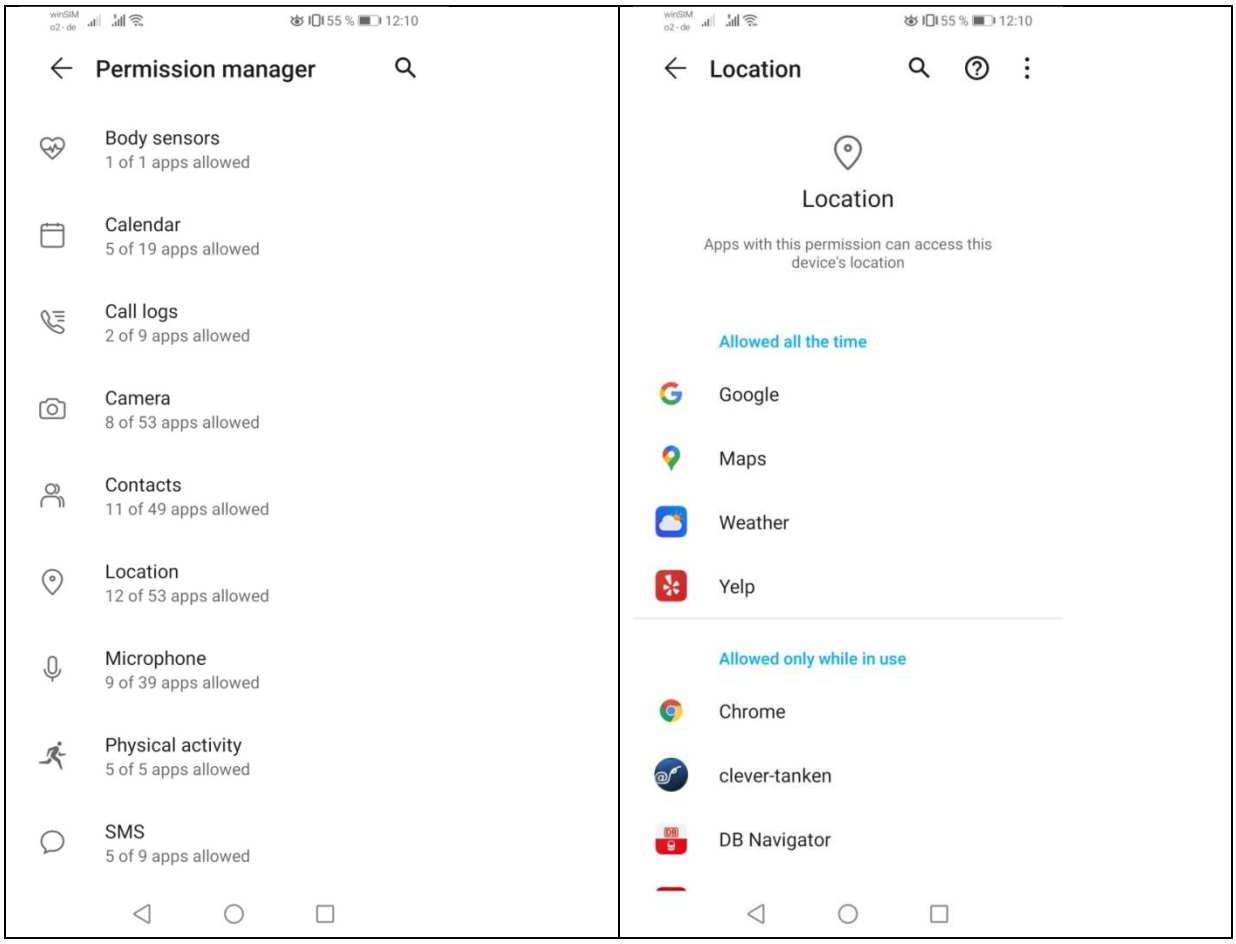
May I invite you to open your smartphone settings and check your Permission Manager? The left-hand side of Figure 1 shows the different types of privacy permitted to the apps installed on my Android phone. For example, 53 apps have requested to access the location data of my phone, and 12 of them have been granted. Some of the apps even have access to my contacts and SMS, which I believe are even more confidential than location. The right-hand side of Figure 1 lists part of the apps that know my location. Every day, many apps are intentionally collecting all types of private data from users. If you (have to) allow commercial firms to access your location, calendar, camera, etc., why don't you voluntarily have your location retrieved to support the pandemic combat, which is arguably the biggest challenge of our human beings now? In addition, the location data are anonymous, whereas the commercial firms know (too much of) your privacy in terms of calendar, contacts, call logs, etc.

It is fair to argue that perfect anonymity does not exist. Rocher et al. (2019), for example, find it possible to re-identify the phone users to 97% accuracy by only analysing the location data. I would argue that a 100% confidentiality does not exist, and it is more important to proactively control and manage the data. A knife can be a weapon to hurt people, or, a tool to serve people. The difference does not depend on the knife itself, but the person in the use of it. Data is a much more useful tool compared to a knife, and it deserves much careful management and control.

In Asia, ambitious smartphone apps with governmental support are already working effectively, such as the Corona 100m app in South Korea, the TraceTogether app in Singapore, and government apps in China. In the US, Apple and Google have teamed up to create technology to trace COVID-19 infections across IOS and Android phones (Apple, 2020). In Europe, several research universities, research centers, and companies have established the Pan-European Privacy-Preserving Proximity Tracing (https://www.pepp-pt.org/) to develop GDPR-compliant tracing. The EU Commission on 23 March 2020 called upon European mobile network operators to hand over anonymized and aggregated data to the Commission to track virus spread and determine priority areas for medical supplies (Financial

Times, 2020). Recently, a group of world researchers has launched a called in *Science* (Oliver et al., 2020) to encourage governments, mobile network operators, technology companies, and researchers to collaborate and make good use of the mobile phone data to combat the pandemic. These are optimistic initiatives.

Figure 1: Screenshots of the author's Android phone, listing how the private data are accessible by the apps installed.



Conclusion

In this short paper, I present how the plain mobile phone data can be used to combat the pandemic, and discuss the relevant privacy concerns.

Many argue that COVID-19 is the main driving force in an organization to digitalization (McKinsey, 2020). This also applies to the use of mobile phone data. Data can be even more valuable than oil, as long as they are properly managed, controlled, and analysed. They give us a new opportunity to fight the pandemic, which has never happened before the digital era. We should proactively take this opportunity era to protect ourselves. COVID-19 may subside soon, but other pandemic or new challenges will always come again.

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