Privacy Overview and Privacy by Design

INFR11158/11230 Usable Security and Privacy

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Contact tracing

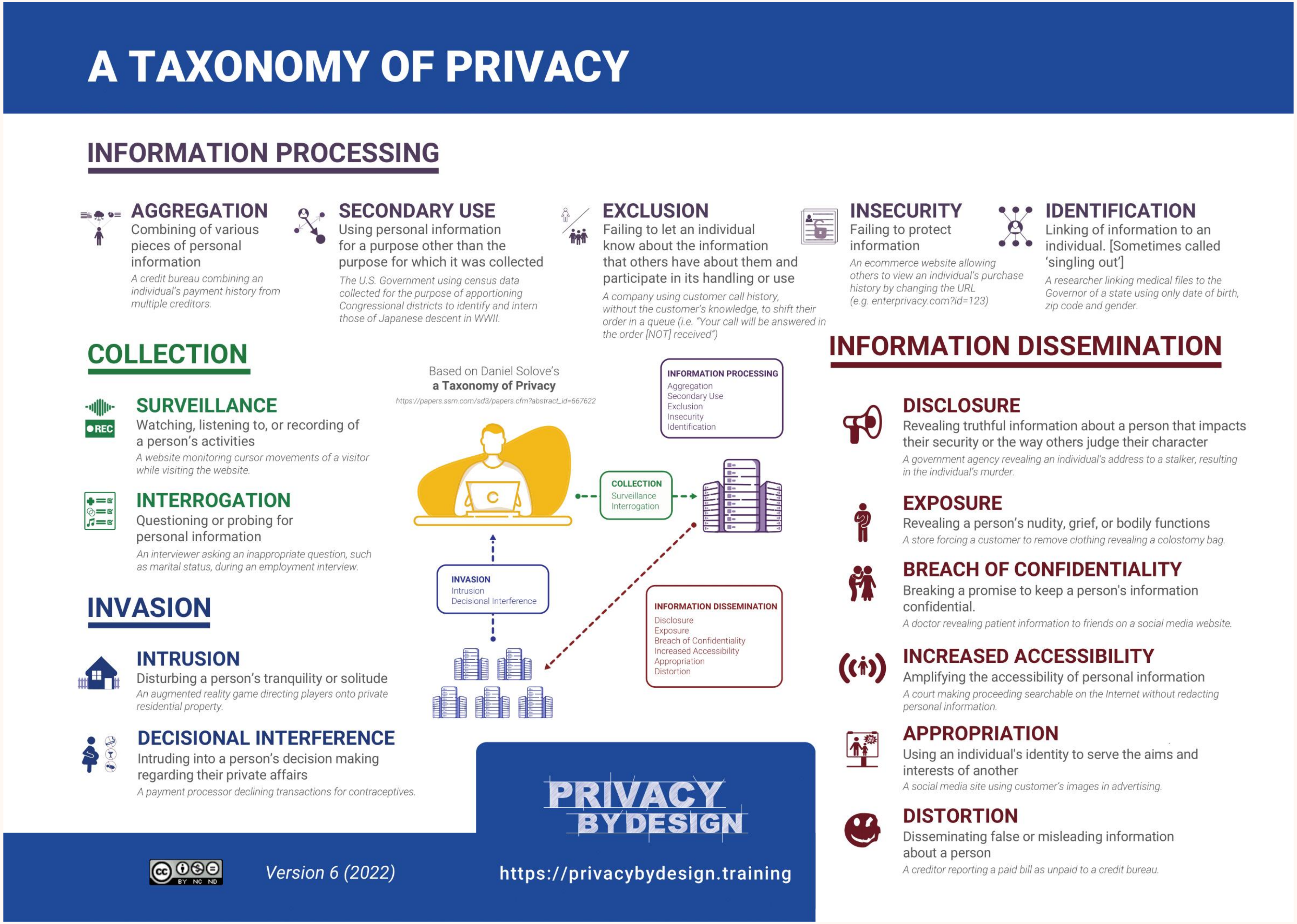
Have you used contact tracing? How’s your experience?

What is privacy?

Defining privacy

- There are many definitions
  - The right to be let alone
  - The right to control one's own data
- Many common security goals overlap with privacy ones
  - Confidentiality
  - Access control of information
  - Protection from unwanted intrusions

A taxonomy of privacy (by Daniel J. Solove)



A TAXONOMY OF PRIVACY

INFORMATION PROCESSING

AGGREGATION
Combining of various pieces of personal information

A credit bureau combining an individual's payment history from multiple creditors.

SECONDARY USE
Using personal information for a purpose other than the purpose for which it was collected

The U.S. Government using census data collected for the purpose of apportioning Congressional districts to identify and intern those of Japanese descent in WWII.

EXCLUSION
Failing to let an individual know about the information that others have about them and participate in its handling or use

A company using customer call history, without the customer's knowledge, to shift their order in a queue (i.e. "Your call will be answered in the order [NOT] received")

INSECURITY
Failing to protect information

An ecommerce website allowing others to view an individual's purchase history by changing the URL (e.g. enterprivacy.com?id=123)

IDENTIFICATION
Linking of information to an individual. [Sometimes called 'singling out']

A researcher linking medical files to the Governor of a state using only date of birth, zip code and gender.

COLLECTION

SURVEILLANCE
Watching, listening to, or recording of a person's activities

A website monitoring cursor movements of a visitor while visiting the website.

INTERROGATION
Questioning or probing for personal information

An interviewer asking an inappropriate question, such as marital status, during an employment interview.

INVASION

INTRUSION
Disturbing a person's tranquility or solitude

An augmented reality game directing players onto private residential property.

DECISIONAL INTERFERENCE
Intruding into a person's decision making regarding their private affairs

A payment processor declining transactions for contraceptives.

Based on Daniel Solove's
a Taxonomy of Privacy
https://papers.ssrn.com/sd3/papers.cfm?abstract_id=667622

INFORMATION DISSEMINATION

DISCLOSURE
Revealing truthful information about a person that impacts their security or the way others judge their character

A government agency revealing an individual's address to a stalker, resulting in the individual's murder.

EXPOSURE
Revealing a person's nudity, grief, or bodily functions

A store forcing a customer to remove clothing revealing a colostomy bag.

BREACH OF CONFIDENTIALITY
Breaking a promise to keep a person's information confidential.

A doctor revealing patient information to friends on a social media website.

INCREASED ACCESSIBILITY
Amplifying the accessibility of personal information

A court making proceeding searchable on the Internet without redacting personal information.

APPROPRIATION
Using an individual's identity to serve the aims and interests of another

A social media site using customer's images in advertising.

DISTORTION
Disseminating false or misleading information about a person

A creditor reporting a paid bill as unpaid to a credit bureau.

Version 6 (2022)

PRIVACY BY DESIGN

https://privacybydesign.training

https://www.jstor.org/stable/40041279

What are the privacy risks of contact tracing apps given the framework?

Collection — Surveillance

> “What is the harm if people or the government watch or listen to us? Certainly, we all watch or listen, even when others may not want us to, and we often do not view this as problematic. However, when done in a certain manner—such as **continuous monitoring**—surveillance has problematic effects. For example, people expect to be looked at when they ride the bus or subway, but **persistent** gawking can create feelings of **anxiety and discomfort**.”

Collection — Interrogation

"Interrogation resembles intrusion in its invasiveness, for interrogation is a probing, a form of searching. Like disclosure, interrogation often involves the **divulging of concealed information**; unlike disclosure, interrogation can create discomfort even if the information is barely disseminated. [...] However, for interrogation generally, the compulsion need not be direct; nor must it rise to the level of outright coercion. Compulsion can consist of the fear of not getting a job or of social opprobrium."

Information processing

- **Aggregation:** "[...]the gathering together of information about a person. A piece of information here or there is not very telling. But when combined together, bits and pieces of data begin to form a portrait of a person. The whole becomes greater than the parts. This occurs because combining information creates synergies. When **analyzed, aggregated information can reveal new facts about a person** that she did not expect would be known about her when the original, isolated data was collected."
- **Identification: Anonymity and pseudonymity protect people from bias based on their identities** and enable people to vote, speak, and associate more freely by protecting them from the danger of reprisal"
- **Insecurity:** Insecurity is not about a privacy harm already inflicted on someone, but about negligence leading to potential future harms.
- **Secondary use:** "The potential for secondary use generates **fear and uncertainty over how one's information will be used in the future**, creating a sense of powerlessness and vulnerability. In this respect, secondary use resembles the harm created by insecurity."
- **Exclusion:** "[...] a harm created by being shut out from participating in the use of one's personal data, by **not being informed about how that data is used**, and by not being able to do anything to affect how it is used."

Information dissemination

- **Breach of confidentiality:** Breach of confidentiality causes trust issues
- **Disclosure**
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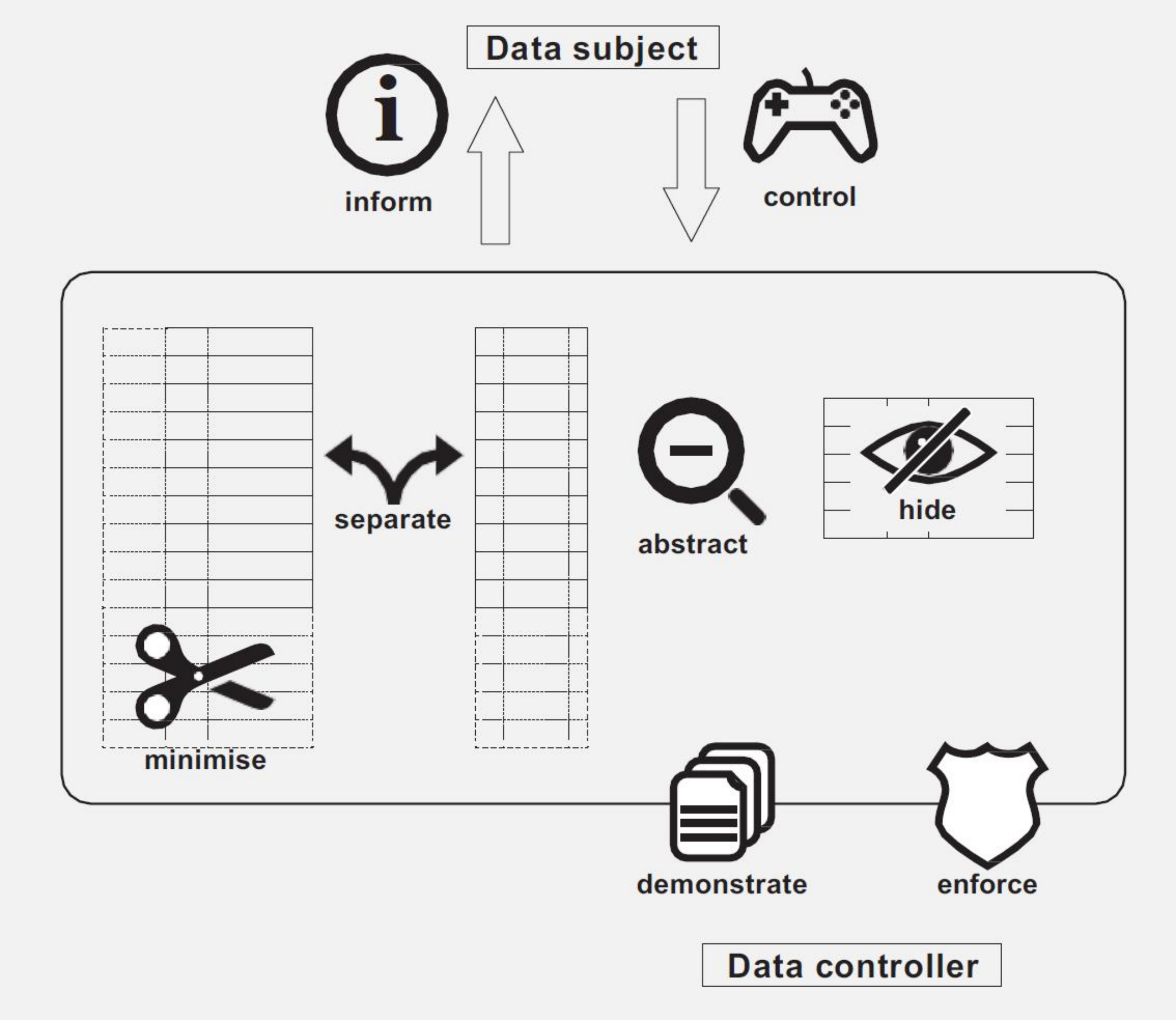
Privacy by design

Privacy by design — definition

Framework for building privacy proactively into new systems, proposed in 2009.Widely accepted as an international standard for good privacy engineering. GDPR also basis some of its principles on Privacy by Design.

- **Proactive** not Reactive; **Preventative** not Remedial
- Privacy as the **Default**
- Privacy **Embedded** into Design
- **Full** Functionality — Positive–Sum, not Zero–Sum
- End–to–End Security — Lifecycle Protection
- Visibility and Transparency
- **Respect** for User Privacy

Privacy by design — strategies



Privacy by design — Minimize

- Definition
  - Limit as much as possible the processing of personal data.
- Tactics
  - **Select** only relevant people and relevant attributes for processing.
  - **Exclude** people or attributes in advance of processing it, or better delete it.
  - **Strip** away (remove) data as soon as it is no longer needed. Also, auto-delete after is it no longer needed.
  - **Destroy** data that is no longer needed. Build systems that support complete destruction of data and do not leave it in unexpected parts of the system.
- Example
  - "Google announced a revised log retention policy, saying 'we'll anonymize IP addresses on our server logs after 9 months,' instead of the previous 18–24 months."

Privacy by design — Separate

- Definition
  - Separate the processing of personal data as much as possible.
- Tactics
  - **Isolate.** Collect and process data in different databases or applications.
  - **Distribute** the collection and processing over different entities. Use the equipment of the user as much as possible.
- Example
  - Tor's Onion Routing structure along with the many organizations that host exit nodes ensures that no one entity has visibility over the whole network. Data is distributed across many nodes, knowledge of who sent the data and where it is going is also strictly distributed between nodes.

Privacy by design — Abstract

- Definition
  - Limit as much as possible the detail in which personal datais processed.
- Tactics
  - **Summarise** detailed attributes into more coarse-grained, general attributes. For example, use age categories instead of birthdate.
  - **Group.** Aggregate information about a group of people instead of processing data individually. Present data as averages.
  - **Perturb** data values to create an approximisation, for example,by adding random noise.
- Examples
  - Pubs are required to check that patrons are above the legal drinking age. But they don’t need to know the exact birthdate of the person, just if they are above that age or not.

Privacy by design — Hide

- Definition
  - Protect personal data or make it unlinkable or unobservable. Make sure it does not become public or known.
- Tactics
  - **Restrict** access to personal data. Setup a strict access-control policy.
  - **Obfuscate.** Use tools like encryption, hashs, and pseudonym's to ensure that only people with the ability to decyper can get the data.
  - **Dissociate.** Break the link between events, persons, and data.
  - **Mix** data into larger sets to ensure that data is not easy to re-connect.
- Examples
  - Most user studies promise to disassociate participants' names from their data: "you will be assigned a random participant number, your name will be stored seperately from the data we collect."

Privacy by design — Inform

- Definition
  - Inform data subjects about the processing of their personal data in a timely and adequate manner.
- Tactics
  - **Supply** resources on the processing of personal data including, policies, processes, and risks. Provide information about *which* personal data, *how* processed, and*why* processed.
  - **Explain** clearly why data needs to be processed.
  - **Notify** users when their data is being processed, shared with third parties, or after a data leak.
- Examples
  - Apple shows an icon whenever location data is being accessed by an app.

Privacy by design — Control

- Definition
  - Provide data subjects adequate control over the processing of their personal data.
- Tactics
  - **Consent.** Ask users for their explicit consent to data processing.
  - **Choose.** Offer users a real choice with basic functionality available to those who opt–out.
  - **Update.** Give users the means to review and update their personal data.
  - **Retract.** Allow users to retract (or delete) their personal information.
- Examples
  - Cookies allow users to consent (cookie pop–up) and delete the cookie (retract).

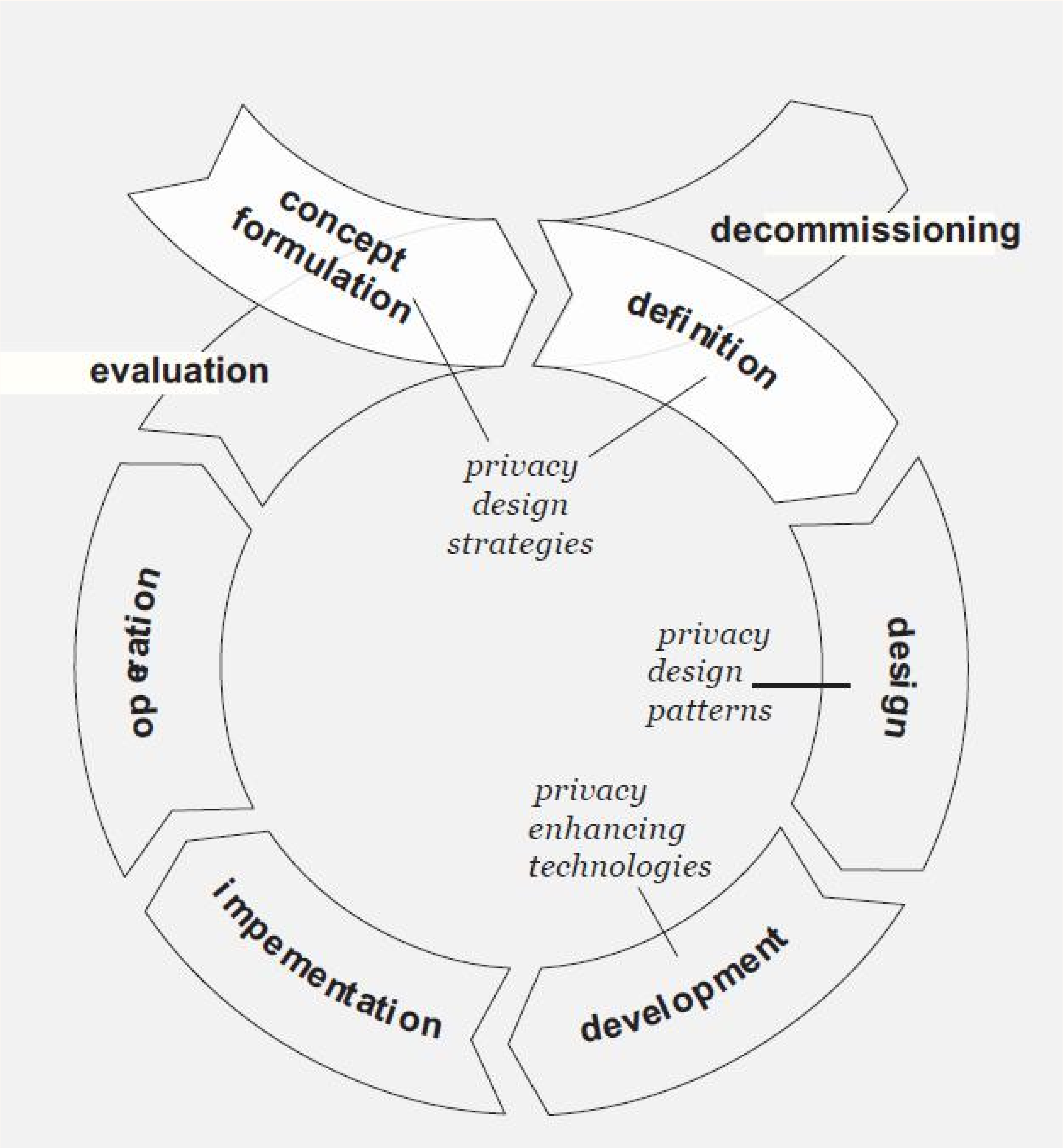
Privacy by design — Enforce

- Definition
- Commit to processing personal data in a privacy–friendly way, and adequately enforce this.
- Tactics
  - **Create.** Make a Privacy Policy, and assign resources to execute
  - **Maintain.** Uphold policy and ensure all technical and org. controls. Applyto3rdparties
  - **Uphold.** Verify policy regularly and adjust implementation when necessary.
- Examples
  - Potential approach is to implement privacy management system like the plan–do–check–act cycle from Information Security Management Standard (ISO 27001)

Privacy by design — Demonstrate

- Definition
  - Demonstrate you are processing personal data in a privacy–friendly way.
- Tactics
  - **Record.** Document all (important steps). Record decisions and motivate them.
  - **Audit.** Regularly audit and review org. processes and how personal data is processed
  - **Report.** Provide results of audits to Data Protection Authority (DPA).
- Examples
  - Certified against internationally recognised standards for privacy friendliness like TRUSTe or EuroPriSe.

Privacy by design in development cycle



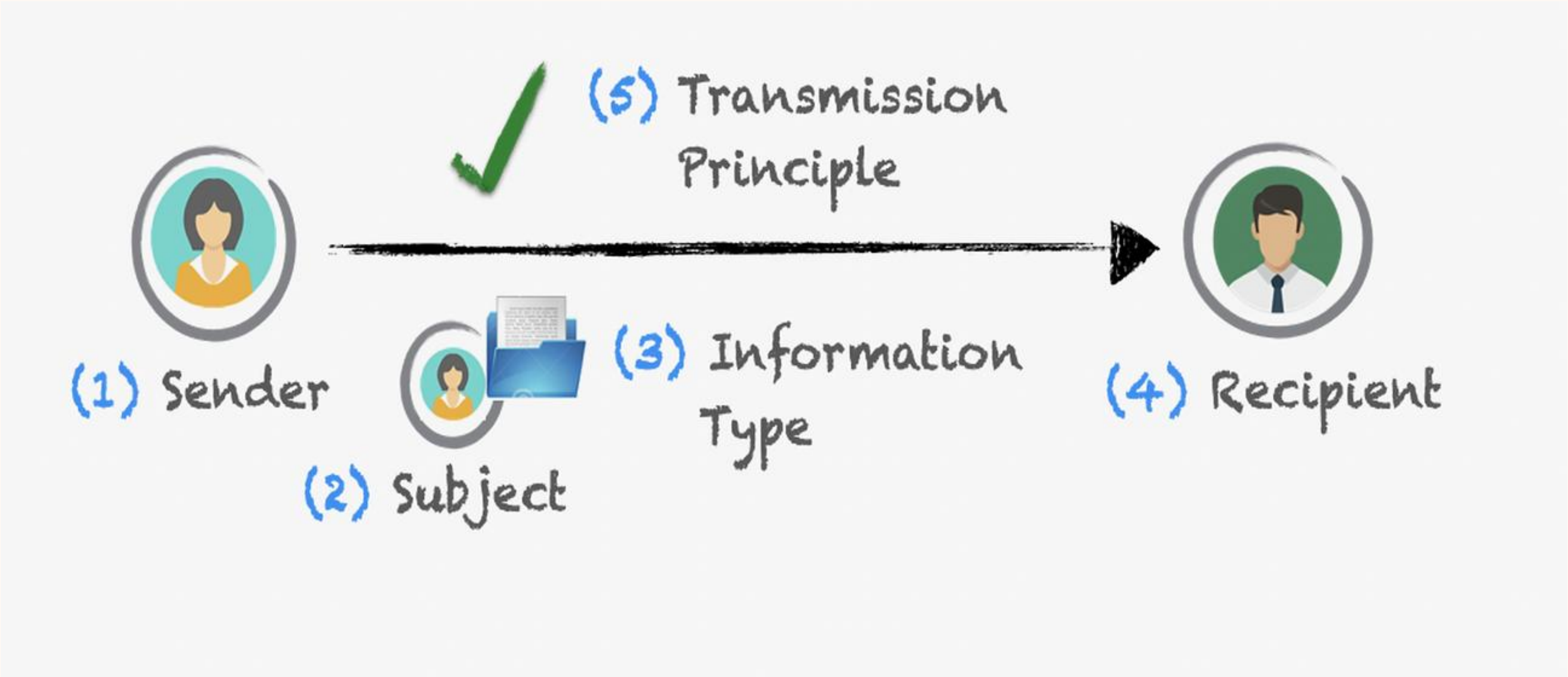
Contextual integrity

Contextual integrity

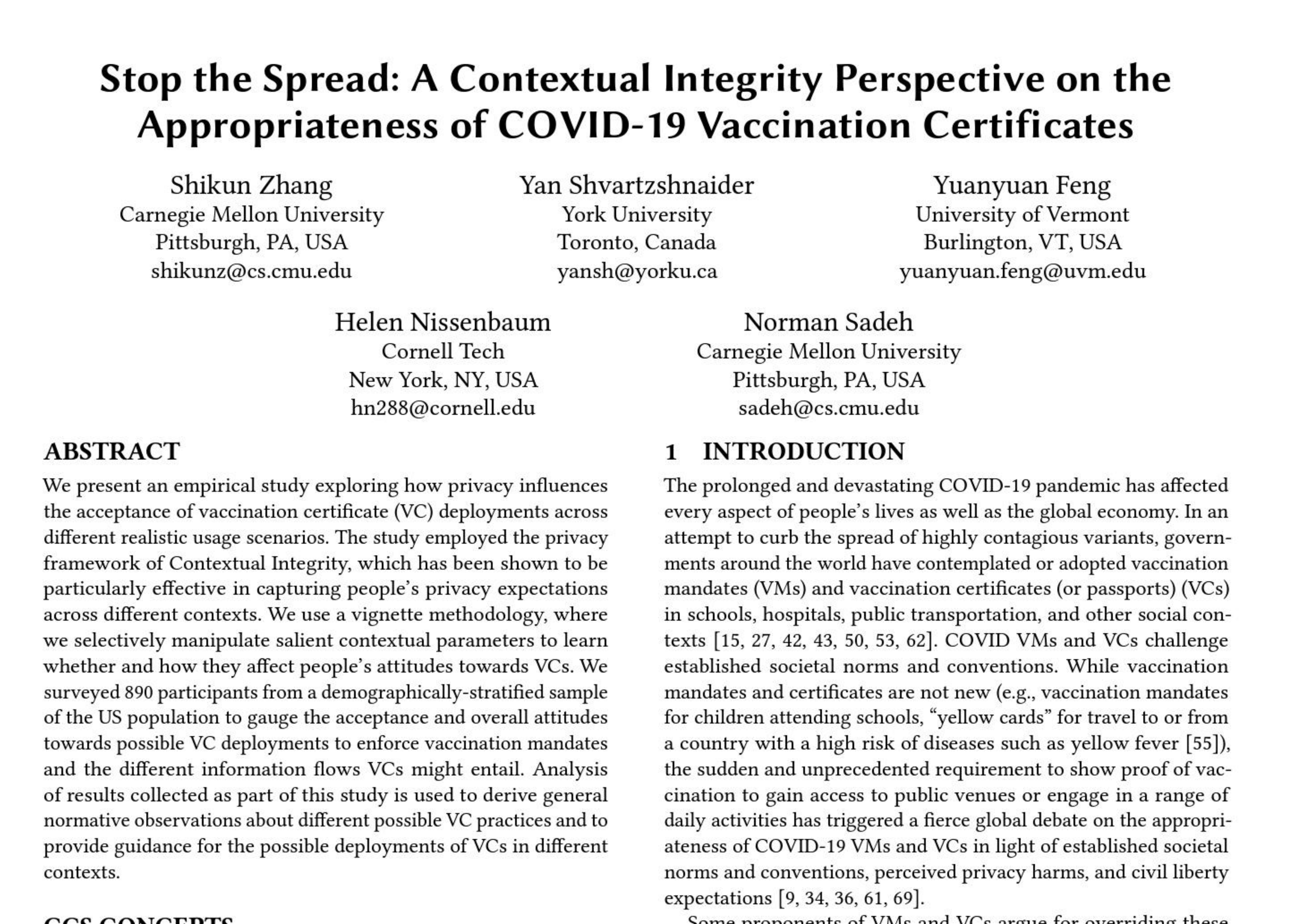
- Privacy is defined by how **information flows**
- Information flow is appropriate when it conforms with **contextual privacy norms**
- A contextual norm can be described by (at least) five parameters
  - data type (what sort of information is being shared)
  - data subject (who/what the information is about)
  - sender (who/what is sharing the data)
  - recipient (who/what is getting the data)
  - transmission principle (the constraints imposed on the flow/how), e.g., with one's consent.
- New norms and flows are evaluated through their context

Malkin, N., 2022. Contextual Integrity, Explained: A More Usable Privacy Definition. *IEEE Security & Privacy*, *21*(1), pp.58-65.

Contextual integrity



https://www.dli.tech.cornell.edu/post/privacy-policies-as-contextual-integrity-beyond-rules-compliance



Stop the Spread: A Contextual Integrity Perspective on the Appropriateness of COVID-19 Vaccination Certificates

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ABSTRACT

We present an empirical study exploring how privacy influences the acceptance of vaccination certificate (VC) deployments across different realistic usage scenarios. The study employed the privacy framework of Contextual Integrity, which has been shown to be particularly effective in capturing people's privacy expectations across different contexts. We use a vignette methodology, where we selectively manipulate salient contextual parameters to learn whether and how they affect people's attitudes towards VCs. We surveyed 890 participants from a demographically-stratified sample of the US population to gauge the acceptance and overall attitudes towards possible VC deployments to enforce vaccination mandates and the different information flows VCs might entail. Analysis of results collected as part of this study is used to derive general normative observations about different possible VC practices and to provide guidance for the possible deployments of VCs in different contexts.

CCS CONCEPTS

1 INTRODUCTION

The prolonged and devastating COVID-19 pandemic has affected every aspect of people's lives as well as the global economy. In an attempt to curb the spread of highly contagious variants, governments around the world have contemplated or adopted vaccination mandates (VMs) and vaccination certificates (or passports) (VCs) in schools, hospitals, public transportation, and other social contexts [15, 27, 42, 43, 50, 53, 62]. COVID VMs and VCs challenge established societal norms and conventions. While vaccination mandates and certificates are not new (e.g., vaccination mandates for children attending schools, "yellow cards" for travel to or from a country with a high risk of diseases such as yellow fever [55]), the sudden and unprecedented requirement to show proof of vaccination to gain access to public venues or engage in a range of daily activities has triggered a fierce global debate on the appropriateness of COVID-19 VMs and VCs in light of established societal norms and conventions, perceived privacy harms, and civil liberty expectations [9, 34, 36, 61, 69].

Some proponents of VMs and VCs argue for overriding these

Take–home

- **(Blog)** Bielova, N., Litvine, L., Nguyen, A., Chammat, M., Toubiana, V. and Hary, E., 2024. The effect of design patterns on (present and future) cookie consent decisions. In *33rd USENIX Security Symposium (USENIX Security 24)* (pp. 2813-2830). **(Blog)** BBC – [Apple pulls data protection tool after UK government security row]