



INTRO

More and more data, including personal data about people, is generated and analyzed all the time. As the amount of data is increasing rapidly data security is becoming even more important. Responsible data processing protects people and their privacy. At the same time, it ensures responsible data use and utilization.

Potentials:

- Strong regulations about data safety and privacy are needed, as life moves more and more into the digital realm. Well justified, strong regulation is likely to be widely accepted.
- Data ownership could be decentralized to distribute it more widely. Potential for new, more distributed data economy where more people would benefit also exists.
- With adequate education, individuals could be more active in taking care of their own privacy and data security.
- Safe online environments ultimately enable digitalization and new, virtual realities that are emerging.

Risks:

- With data accumulation, huge power is centralizing to few big players. People might not realise what this means for them and possibly can't protect themselves.
- Societies are becoming dependent on a few critical virtual infrastructures, and cyber attacks to those systems could cause enormous harms. Cyber attacks can even be used as a weapon in warfare.
- If code efficiency is not carefully planned for, this could lead to excessive energy use.
- With increasing data available for powerful players, dissident voices may be more and more at risk.

1: Research

• Cyber security and data management form large research fields. As the pace of development is very high, even keeping up with criminals and hackers can sometimes be a challenge. As digital systems are vital to modern societies, cutting-edge research holds enormous importance.

Ecological considerations

- Code efficiency and energy use: cyber security as well as data management are often heavy processes that can use plenty of electricity. When developing the solutions, there is room to influence the amount of energy used by e.g. improving code efficiency.

Societal considerations

- Licensing and openness: Open science usually aids in taking up novel technologies in different sectors and can lead to faster development. However, openness needs to be balanced with security concerns in many cases.
- Safety: Security solutions should be based on the principle that the mechanism is so good that even if it is known to the other party, the counterparty still cannot violate it.

2: Development of concepts and products

• As new breakthroughs are made, they still need to be turned into practical products. Packaging the new solutions in a responsible manner can sometimes be a challenge when talking about data intensive products.

Ecological considerations

- Material reality of digital solutions: Even digital solutions always require a material basis that consists of computers, batteries, wires... As new digital software solutions are developed, their effect on the need for this material basis can be considered through e.g. capacity needed and suitability of software to existing (and old) hardware.

Societal considerations

- Data ownership models: many apps and companies collect data about individuals and sell it further. These models are likely to be restricted in the future as legislation evolves. Models for individual data ownership are still developing, and should be developed in a fair and inclusive way that offers opportunities for real agency for users.
- Anticipatory approach: Developers should move beyond identifying and fixing security vulnerabilities as they are discovered and embrace more proactively a risk modeling approach that identifies and address risks before they can be exploited.

3: Introduction and early implementation

• With digital services and products, the pace of development is fast, and there is always many new things entering the digital markets. Consumers can't always keep up on the newest trends in data management and digital solutions, even when they are directly affected.

Ecological considerations

- Environmental data: As new data intensive solutions are taken up the role and protection of environmental data should be considered along with more human-centric values. Data about the environment should be gathered carefully and the security and truthfulness always ensured.

Societal considerations

- Creating opportunities for autonomy: Data management can often be built in ways that offer people opportunities for agency regarding their own data. Note that asking for consent is often not enough, as this does not usually give users a real chance to choose.
- Privacy legislation: there is already a rather strict data privacy legislation in the EU. When launching anything new to users, it should be double checked the data handling follows these laws and rules, or even goes beyond the mandatory levels.

4: Scaling-up and fine-tuning established technologies

• Digital and data intensive solutions have become essential for daily lives in modern societies. As these solutions are scaled and more people are using them, they start also having different impacts.

Ecological considerations

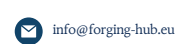
- Energy use: Digitalization consumes a significant portion of all electricity used in current societies, and data handling is often quite intensive in terms of processing power needed. When making decisions of which solutions to take up, efficiency should be used as a criteria.

Societal considerations

- User education: Understanding data use and management is a complex and rapidly evolving field. Users of digital tools and services need easily accessible and understandable education to keep up with the ever-changing field and protect themselves online.
- Strongly protecting important digital infrastructures: Digital spaces often play very important role in satisfying the very basic human needs in daily basis. Important infrastructures need strong protection that is frequently updated and resilient against cyberwarfare threats.
- Understandability: People should have a real chance to give their consent for transferring data. Should be independent of literacy, internationally understandable, e.g. icon based solution that is easy to understand.

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