Doctoral Seminar

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ESR 6. Giorgi Parulava

About me

- **Doctoral Student, Stockholm University, Department of Law**
- **Degrees:**
  - *LLM European Business Law - Lund University*
  - *LLB Law - Tbilisi State University*
  - *Exchange – University of Groningen*

Structure of the presentation

1. Activities carried out so far
2. Research:
    1. Introducing Digital Twins
    2. Major considerations from a legal perspective
3. Future work

Activities carried out so far

- **Mandatory courses at SU**

Philosophy of Social Science; Fundamental Concepts of Law.

- **WASP-HS Graduate School –** affiliated doctoral student
- **Training:**
  - *visuAAL training schools: University of Alicante; TU Wien*
  - *Nordic Conference on Law and Information Technology, University of Oslo*
  - *WASP HS Winter Conference*
- **Presentation of doctoral project:**
  - *Doctoral seminar, University of Oslo*
  - *The Swedish Law and Informatics Research Institute, SU.*

Title of the project

- "~~Digital Twins as a way to help ensure legal compliance of video-based AAL technologies~~"
  - *Digital Twins (DT) not necessarily helpful for legal compliance?!*
  - *Problem distinguishing video-based AAL technologies and DT enablers (e.g., 3D camera)*
  - *Personal Data/Privacy problem with Human Digital Twins (HDT)*
  - *Lack of research (legal science) (Books, dissertations, papers etc.)*

- "Legal implications of Human Digital Twin modeling for AAL"

DT Definitions

- Grieves (2002): “DT is a digital copy of one or a set of specific devices that can abstractly represent a real device and can be used as a basis for testing under real or simulated conditions.”
- Quichen Lu, V., et al. (2019): “Digital replica of physical assets, processes and systems. DTs integrate artificial intelligence, machine learning and data analytics to create dynamic digital models that are able to learn and update the status of the physical counterpart from multiple sources.”
- De Meyer and Markoupoulos (2021) DT in healthcare: “refers to idea that we have a digital replica of a human being, that will adapt in real-time to the data that nurtures it. As people accumulate data about themselves in different settings through sensory devices in their home environment, biomarkers delivered by wearable devices and medical data that is digitized in hospitals, deep learning techniques can be used to analyse lifestyle patterns, one can monitor the positive and negative consequences of a certain lifestyle”.

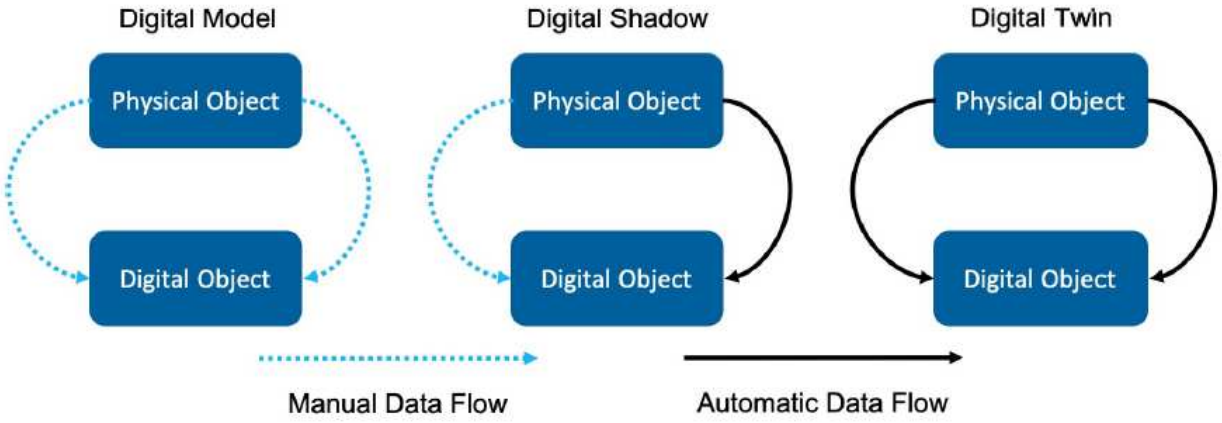
Terminology

- Digital Twin
- Virtual Twin
- Digital Shadow
- Human Digital Twin
- Cyber – Cyber Digital Twin
- Computer Aided Manufacturing (CAM)

Kanta Pal et al (2022) CAD is only a modeling of a physical object representing the vision of the designer for example to test the product, while digital twin also offers the constant update of the twin with the real-time sensory data.

Differences

- Source: Fuller et. al. (2020)



DT Enabler technologies/concepts

- Internet of Things
- Cyber Physical Systems
- Artificial Intelligence
- Cloud Computing/Edge/Fog
- Sensors
- Signals
- Image Possessing
- Big Data analytics

DT use sectors

- Smart cities (Helsinki; Zaragoza; Singapore…)
- Product Manufacturing
- Digital Twin of the Ocean (EU)
- Construction (UK's National Digital Twin Program)
- Healthcare/AAL

Benefits & Challenges

Benefits

- Efficiency
- Reduced costs
- Predictability

Challenges

- Utility
- Data interoperability
- Legal compliance
- Costs
- Ethics

Major considerations from a legal perspective

- Scope of the research

Data Protection; Medical Device Regulation; Cyber Security; Intellectual Property; Consumer Protection Law…

- Method – Traditional legal research method +Law in context method.

- Limitations of the HDT concept - Twin but not identical

Major considerations from a legal perspective

Cyber-human symbiose – double trouble?! (More data jointly? Higher risk in case of the privacy attacks?)

Types of Data

- Personal (Raw data, pseudonymized data)
- Non personal (Person Non identifiable)
- Mixed data sets (The Free Flow of Non-Personal Data Regulation & GDPR)
- Synthetic data

Bellovin (2019) synthetic data + differential privacy

Major considerations from a legal perspective

- Privacy By Design

Bygrave (2021) PbD directed essentially at information systems development, with the aim of ensuring that due account be taken of privacy-related interests throughout the lifecycle of such development. They may be seen as a manifestation of the increased emphasis in the GDPR on making data protection'count' and, concomitantly, on making data controllers more accountable. Article 25 requires that core data protection principles be integrated into the design and development of systems for processing personal data.

Mihailidis & Colonna (2020) – Methodological approach to Privacy By Design.

DT product/design + PbD = Privacy Enhancing Digital Twin?

Future work

- Privacy Enhancing Digital Twins (PEDT)
- HDT use cases for AAL
- Chapters about AAL and GDPR

- Secondment 1 – Alicante University (May-Aug 2022)
- Two elective courses for SU (Autumn 2022 – Spring 2023)
- Upcoming events:
  VisuaAAL Training School, Dublin (June 2022)
  Young Researchers Consortium, Lecco (July, 2022) (Applied)
  WASP-HS Summer Conference, Lund (August, 2022)

Thank you!