Sustainable Development and Compliance

Master Course of Study SRM Module S4

Ethical Technology Development

Dr. Hedda Sander

Salzgitter

Suderburg

Wolfenbüttel & Braunschweig

Wolfsburg

Content

- Introduction

- A Brief History of Sustainable Development

- Ethics: An Ecological Paradigm

- Cultural Views on Science and Sustainability

- The Triangle of Sustainability: Economy, Ecology and Social Aspects

- Politics and Governance in Sustainable Development

- Conservation in Sustainable Development

- Beyond Growth

- Sustainable Societies and Urban Areas

- Tools, Systems and Innovations for Sustainable Development

- The Role of Communication and Learning Authenticity and Change
  Leadership

- Digitalization and Ethical Technology development

Examples of technological development

Ostfalia
University of
Applied Sciences

Mobility: According to the International Energy Agency (IEA), the number of electric vehicles will rise to 130-250 million in 2030 and become the norm by 2050 (estimates by Shell AG).

- By 2030 (Volkswagen), passenger cars will also increasingly be able to communicate with other vehicles in order to find a way to the programmed destination via **autopilot**. In addition to an individual means of transport, they will potentially also fulfil the tasks of an office, for example.

- After 2030 or so, **city centers** are likely to be increasingly **closed to private transport.** Where people do without their own cars, **flexible solutions** such as ride-sharing services, robot taxis or car sharing will become necessary for social participation, which must be taken into account in the further development of the municipal environment. Solutions need to be developed, especially in rural areas.

Examples of technological development

Methods for the **use of renewable energies** (wind and hydropower with tidal use, solar energy, geothermal, biomass).

- According to estimates by the International Energy Agency (IEA), 25% of total global energy consumption will be covered by renewable energies by 2040.

- By 2030, the share of these energies in the EU should be at least 32%.

- In 2022, 26% of the electricity fed into the grid in Germany was generated by wind power, 10.7% by photovoltaic systems and 8.5% by biogas (Federal Statistical Office).

- CO_2 capture and storage (Carbon Capture Storage: CCS) technology will also find its place.
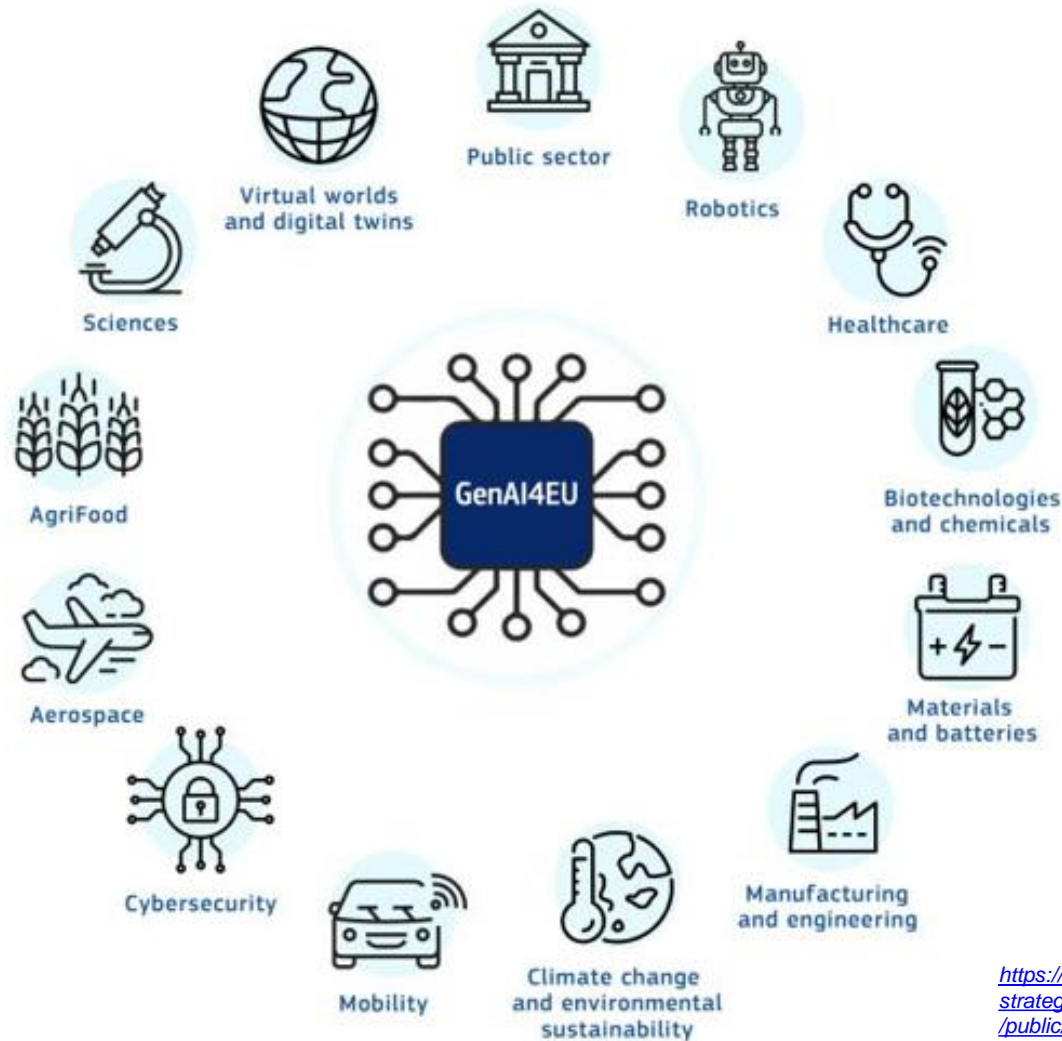
Examples of technological development

The digitalization of society has led to social changes. Home office and mobile working have led to new developments in municipalities (vacancy of office space in city centres, influence on gastronomy, changed traffic flows). These must be taken into account when shaping the future.

- The development of modern computational linguistics has led to rapid advances in **artificial intelligence (AI).** In 2022, 9% of the German companies surveyed (over 20 employees) said they would use AI in their operations (Bitkom survey), and a quarter of those surveyed were planning to get started.

- Robotics will develop into a large-scale industry in the coming years. In addition, the **use of robots in industry,** but also, for example, in **gastronomy** and **service** areas, is on the rise, with 23,800 new robots installed in Germany in 2021 (International Federation of Robotics).

- In the **municipal sector**, concerns will have to be considered when introducing digital processing of forms (**cybersecurity, data protection**).

Examples of technological development

With the help of **genetic engineering methods**, higher production efficiency, but also a healthier diet, can be made possible in **agriculture**, and in the **health** sector, individual medicines will come onto the market in the future.

CRISPR/Cas (Clustered Regularly Interspaced Short Palindromic Repeats) is a molecular biological method for cutting and modifying DNA in a targeted manner (**genome editing**), inserting, removing or switching off genes. Nucleotides in a gene can also be changed. Due to its ease of implementation and low cost, the CRISPR/Cas method is increasingly being used in research.

- **Resistance of agricultural crops** to **pests** (reduced use of herbicides, insecticides)

- Resilience of agricultural crops to **increasing drought** worldwide as a result of climate change and the ability of these crops to **cope better with saline soils**. Such genetically modified crops include soybeans, maize, cotton, rapeseed and rice (dry rice to reduce methane emissions).

- **Therapeutic** benefits?

Technology Assessment

Wolfenbüttel & Braunschweig

- Technology applications and developments serve a specific work goal. They have **side effects on the environment** and thus on the triangle of sustainability (economic, ecological, social), which must be assessed as far as possible before large-scale use.

- **Technology assessment** is intended to identify opportunities and risks of new technology developments at an early stage in order to be able to provide recommendations for action or guidelines for social discussion (discursive technology assessment) and politics (parliamentary technology assessment) (decision theory).

- Predictions are made in a market environment that does not yet exist, so forecasts have to be made (literature research, expert interviews, case studies, computer simulations with scenarios). **Environmental impact assessments** are required for environmental issues.

- An assessment of the identified risks can be carried out in a participatory manner through processes of **citizen participation**.

Technology Assessment

Technology assessment studies usually contain the following elements:

- Problem Definition

- Technology Description

- Description of Side Effects and Affected Persons

- Forecasting social and other developments

- Impact assessment

- Analysis of policy options

- comprehensible communication of the results

Technology Assessment

- In Germany, the Institute for Technology Assessment and Systems Analysis (**ITAS**) at the Karlsruhe Institute of Technology (**KIT**) has been advising the German Bundestag and the European Parliament (member of the European Technology Assessment Group) since 1995.

- The Association of German Engineers (**VDI**) has also provided a guideline for technology assessment for engineers in the form of VDI Guideline 3780 (Technology Assessment: Terms and Basics, 1991).

- **Technology assessments for municipalities** concern, for example, the expansion of information and communication technology (**ICT**) infrastructure, the digitalization of **critical municipal infrastructures** in **water and waste management** or in the **energy** sector.

Ethical Technology Development: Value Based Engineering

- Accordingly, technical ethics deals **preventively** with ethical, social and political challenges that arise in the development and use of new technologies as well as the disposal of their products at the end of their life cycle.

- The aim is to make it easier to assess questions raised by new technologies in order to make **responsible and justifiable decisions**.

- Regulations and guidelines in the rapidly evolving IT sector are one example, such as **ISO/IEC/IEEE 24748-7000**, a guideline for ethics-based IT development. The guideline was published in **2021** by the Institute of **Electrical and Electronics Engineers (IEEE) as a globally valid standard.**

Ethical Technology Development: IEEE 7000 – 10 Principles

The ISO/IEC/IEEE 24748-7000 guideline is based on 10 principles:

- **Responsibility** for the (technical) ecosystem: Taking responsibility by refraining from partnerships or external services that have no influence or access.

- **Transparent collaboration with stakeholders**: System planning in collaboration with an extended group of direct/indirect stakeholder representatives, including critical representatives.

- **Context-sensitive action**: Innovation teams understand the context of the deployment of their systems and anticipate its impact. In doing so, they imagine what would happen if they had a monopoly.

- **Value identification**: Innovation teams use moral philosophies that encompass utilitarianism, virtue ethics, and duty ethics to determine value, supplemented by a culture-specific philosophical or spiritual framework from the region of the world where a system is deployed.

- **Understanding of values**: These values are not only derived from the concerns of the stakeholders/customers and the context analysis, but are conceptually deepened to better understand how they could have an impact on system implementation.

The ISO/IEC/IEEE 24748-7000 guideline is based on 10 principles:

- **Leadership**: After self-observation, executives of the participating companies support only the core values as future system principles, which they recognize as universally valid and would therefore be willing to publicly support.

- **Respect**: Value-based companies respect applicable laws and agreements of the target markets as anchored ethical principles. These represent the boundary condition for their own actions.

- **Waiver**: Values-based companies actively consider *not* investing in a system if there are ethical reasons to do so.

- **Transparency**: Values-based companies publish an ethical policy statement signed by executives that discloses the organization's value priorities. Accompanied by external auditors, an ethical value register is created, which enables project management and auditors to recapitulate what value effects the system was aiming for and what levels of control were chosen by the engineers to counter possible value threats.

- **Risk-based system design**: Values-based companies derive ethical value quality requirements (EVRs) for all core values they pursue, which help determine the long-term development roadmap. In doing so, they take into account a certain risk mindset.

Ethical Technology:
EU Framework AI Act

Wolfenbüttel & Braunschweig

Ostfalia
University of
Applied Sciences

In 2023, the EU agreed on a set of rules for the use of artificial intelligence, which is intended to reflect the balance between security, innovation and fundamental rights.

- The law puts the EU at the **forefront of AI regulation worldwide**, the first of its kind in a technology that is still in a state of constant change and rapid development.

- As a result, the **so-called basic models** (e.g. Chat-GPT, Chat-GPT 4) - **divided into two risk groups** - are to be given **special obligations**:

  - when **sharing information**,

  - in **risk analysis** and

  - when **documenting AI training data**.

AI Act (Regulation (EU) 2024/1689
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AL_202401689

Ethical Technology:
EU Framework AI Rules

Ostfalia
University of
Applied Sciences

Wolfenbüttel & Braunschweig

In 2023, the EU agreed on a **set of rules** for the use of artificial intelligence, which is intended to reflect the balance between security, innovation and fundamental rights.

- In the future, so-called basic models will be incorporated into a variety of everyday applications – for example, diagnostically and administratively usable software tools for hospitals, law firms and human resources departments, or for chatbots in customer service, but also for use in public spaces, e.g. in law enforcement.

- Certain applications are expressly **prohibited**:
  - "**Social scoring**", i.e. biometric categorization systems that use sensitive characteristics such as sexual orientation or religious beliefs.
  - **Untargeted reading of images** from the **Internet**
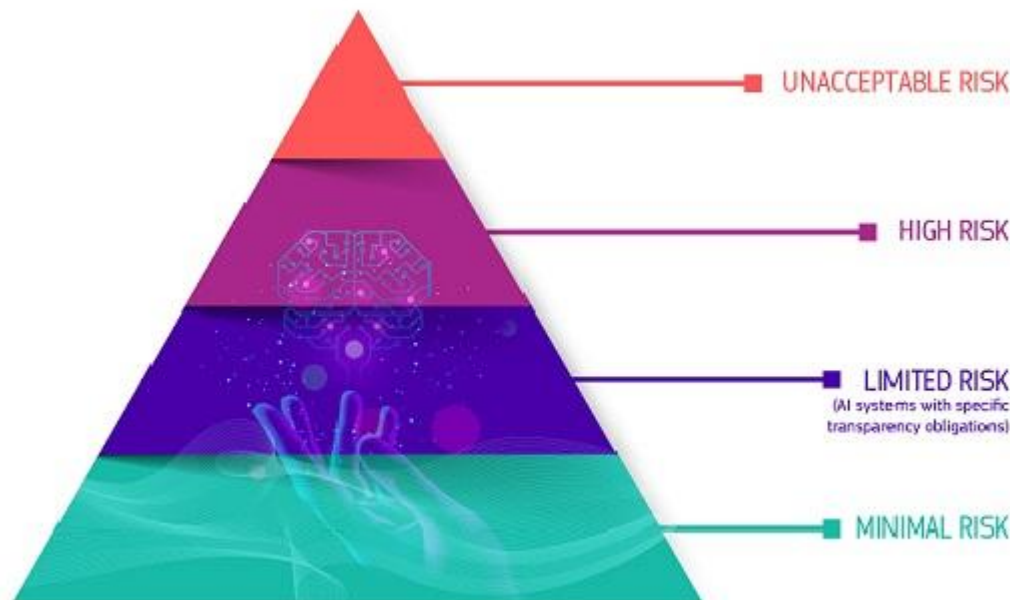 - **Surveillance** Footage for **Facial Recognition** Databases

For monitoring purposes, a **new EU authority (EU AI Office)** is to analyze how AI regulation corresponds globally with the changing challenges of this technology and when the law may need an "update" if conditions change.

Ethical Technology:
EU Framework AI Rules

Limited-risk AI systems should meet **minimal transparency** requirements that allow **users to make informed decisions**.

- After interacting with the applications, the user can then **decide** whether they want to **continue using** them.

- Users should be **made aware when interacting with AI**. This also applies to AI systems that generate or manipulate image, audio or video content (for example, deepfakes).

Ethical Technology: EU Framework AI Risk Classification

Wolfenbüttel & Braunschweig

UNACCEPTABLE RISK

HIGH RISK

LIMITED RISK
(AI systems with specific transparency obligations)

MINIMAL RISK

https://ec.europa.eu/information_society/newsroom/image/document/2021-17/pyramid_7F5843E5-9386-8052-931F5C4E98C6E5F2_75757.jpg

Forbidden.
(Biometric "**Social scoring**",
Untargeted images from the Internet,
Surveillance Footage for **Facial Recognition** Databases)

Regulation (2 classes).
(Product safety; 8 specific areas)

Transparency obligations for human awareness.
(Chat Bots, video/audio content, deep fakes)

Free use.
(Video games, spam filters etc.)

Ethical Technology: EU Framework AI Risk Classification

High-risk systems in two classes are evaluated before they are placed on the market and throughout their life cycle.

- AI systems used in products covered by EU **product safety** legislation. These include **toys, aviation, vehicles, medical equipment** and **elevators**.

- AI systems that fall into **eight specific areas**. They must be registered in an EU database:

  - **Biometric identification** and categorization of natural persons
  - Management and operation of **critical infrastructures**
  - **Education** and training
  - **Employment**, management of workers and access to self-employment
  - Access to and use of essential private and public services and benefits
  - **Criminal prosecution**
  - Management of **migration**, asylum and border controls
  - Assistance in the interpretation and **application of laws**

Ethical Technology: EU Framework
AI Risk Regulation

Ostfalia
University of
Applied Sciences

Wolfenbüttel & Braunschweig
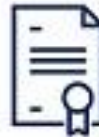
STEP1

A high-risk AI system is developed.

STEP2

It needs to undergo the conformity assessment and comply with AI requirements.*

*For some systems a notified body is involved too.

STEP3

Registration of stand-alone AI systems in an EU database.

STEP4

A declaration of conformity needs to be signed and the AI system should bear the CE marking. **The system can be placed on the market.**

If substantial changes happen in the AI system's lifecycle

GO BACK TO STEP 2

https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai

European AI Office, established Febr. 2024, oversees the AI Act's enforcement and implementation with the member states. Aims are:

- Creation of an environment where AI technologies respect human dignity, rights, and trust.

- Fostering collaboration, innovation, and research in AI among various stakeholders.

- Engagement in international dialogue and cooperation on AI issues, acknowledging the need for global alignment on AI governance.

European AI Office strives to position Europe as a leader in the ethical and sustainable development of AI technologies.

Ethical Technology: EU Framework
EU AI Office Structure

European AI Office consists of 5 units and 2 advisors, reflecting its mandate. These include:

- "Excellence in AI and Robotics" unit
- "Regulation and Compliance" unit
- "AI Safety" unit
- "AI Innovation and Policy Coordination" unit
- "AI for Societal Good" unit

- Lead Scientific Advisor
- Advisor for International Affairs

140 Staff: Technology Specialists, Administrative Assistants, Lawyers, Policy Specialists, and Economists.

Generative models such as ChatGPT must meet **additional transparency** requirements:

- **Disclosure** that the content was generated by AI

- Design to **prevent the model from generating illegal content**

- **Publication** of **summaries of copyrighted data used for training**

EU Digital Markets Act: Gatekeepers

DMA ((EU) 2022/1925) is about the risk of digital market control and aims at preventing large companies (**gatekeepers**) from **abusing their market power** and to allow smaller and new players to enter the market.

- The term gatekeeper refers to the ability of intermediary platforms to act as the main "**bottleneck**" to a large number of market participants, that are not reachable elsewhere.

- Gatekeepers are large digital platforms providing so called **core platform services** (online search engines, app stores, messenger services).

- Gatekeepers will have to comply with the do's (i.e. **obligations**) and don'ts (i.e. **prohibitions**) listed in the DMA.
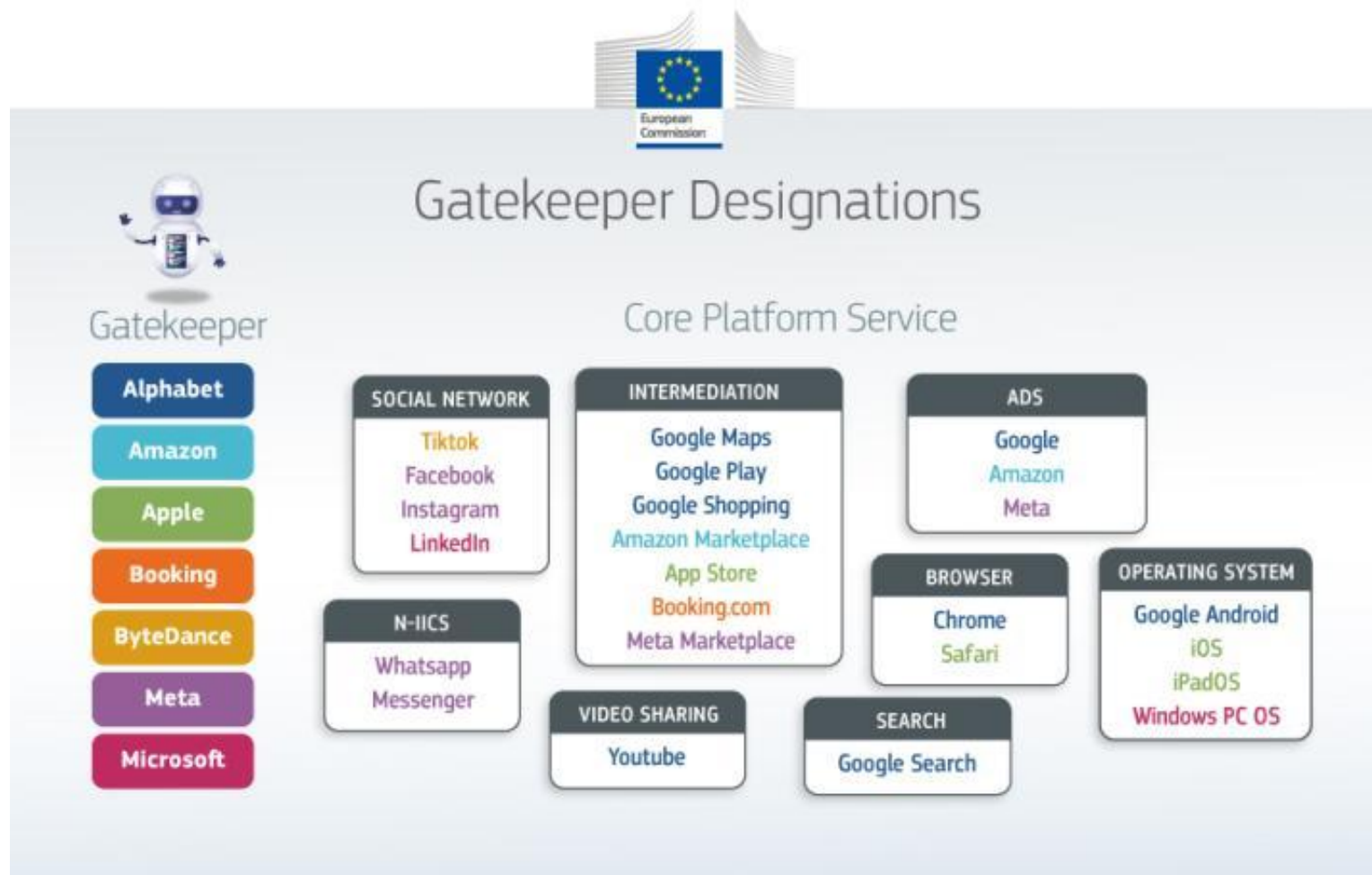
Quantitative Criteria:

- **Company size**:
  - **turnover** of the company of at least 7.5 billion € in the EU for three years or
  - **market capitalization or equivalent** of at least 75 billion €;
- **Access control** of other businesses to final customers:
  - > 45 million monthly active end users in the EU and
  - > 10.000 yearly active business in the EU;

Qualitative Criterion:

- "**An entrenched durable position**": Regulators consider this criterion met if the numbers of active users in the second criterion are met for three years in a row.

EU DMA: Gatekeepers

https://digital-markets-act.ec.europa.eu/gatekeepers_en

Obligations:

- allow **third parties to inter-operate** with the gatekeeper's own services;

- allow **business users to access the data** that they generate in their use of the gatekeeper's platform;

- **provide companies** advertising on their platform with the tools and **information necessary** to carry out their own verification of their advertisements hosted by the gatekeeper;

- allow **business users to promote their offer** and conclude contracts with customers outside the gatekeeper's platform.

EU DMA: Do's and Dont's for Gatekeepers

Ostfalia
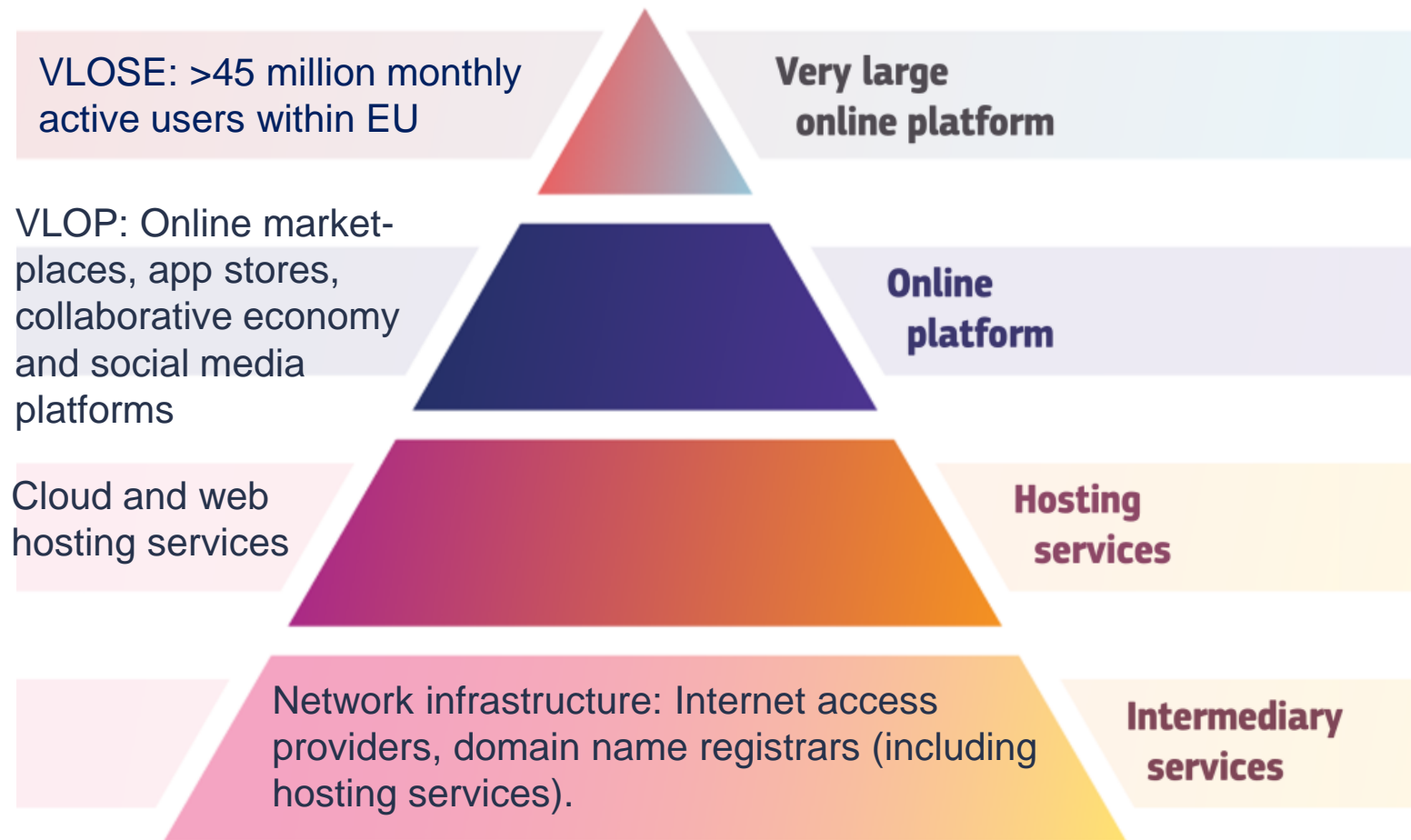University of
Applied Sciences

Prohibitions:

- treat services and **products offered by the gatekeeper itself more favorably** in ranking than similar services or products offered by third parties on the gatekeeper's platform;

- **prevent consumers from linking** up to businesses outside their platforms;

- **prevent users from un-installing** any pre-installed software or app if they wish so;

- **track end users outside of the gatekeepers' core platform service** for the purpose of targeted advertising, without effective consent having been granted.

EU DMA: Sanctions

- **Fines**: of up to 10% of the company's total worldwide annual turnover, or up to 20% in the event of repeated infringements
- **Periodic penalty payments**: of up to 5% of the average daily turnover
- **Remedies**: In case of systematic infringements of the DMA obligations by gatekeepers, additional remedies may be imposed on the gatekeepers after a market investigation.
  - proportionate to the offence committed.
  - Last resort option: Non-financial remedies
    - behavioral and structural measures (divestiture of (parts of) a business).

DSA ((EU) 2022/2065, together with DMA) addresses illegal content, transparent advertising and disinformation.

- DSA aims at '**Very Large Online Platforms (VLOPs)'** and intermediaries (social networks, marketplaces, app stores).

- Key requirements are:

  - **Disclosure** to regulators how their **algorithms** work,

  - **Explanations for content moderation decisions** to users,

  - Implementation of **stricter controls** on targeted advertising.

- Specific rules on '**Very Large Online Search Platforms (VLOSEs)'** and search engines (>45 million monthly active users within EU) [Bing, Google Search].

DSA Provider Classes

VLOSE: >45 million monthly active users within EU

Very large online platform

VLOP: Online market-places, app stores, collaborative economy and social media platforms

Online platform

Cloud and web hosting services

Hosting services

Network infrastructure: Internet access providers, domain name registrars (including hosting services).

Intermediary services

EU DSA Benefits

For Citizens	For Providers
• better **protection of fundamental rights** • more control and choice, **easier reporting of illegal content** • **protection of children** online, (prohibition of targeted advertisement to minors) • more **transparency over content moderation decisions** (DSA transparency database)	• **legal certainty** • a **single set of rules** across the EU • easier to start-up and scale-up in Europe
For Business Users	For Society
• **access** to EU-wide markets through platforms • **level-playing field** against providers of illegal content	• greater **democratic control** and oversight over systemic platforms • mitigation of systemic risks, such as **manipulation** or **disinformation**

Companies that do not comply with the new obligations risk

- fines of up to **6% on their global annual turnover**.

- In addition, the Commission can apply **periodic penalties up to 5% of the average daily worldwide turnover** for each day of delay in complying with remedies, interim measures, and commitments.

- As **a last resort** measure, if the infringement persists and causes serious harm to users and entails criminal offences involving threat to persons' life or safety, the Commission can request the **temporary suspension** of the service.

Reflection

- Is the **Three Gorges Dam** on the Yangtze River in China a blessing or a curse? (Electricity generation, flood risk containment on the one hand positive, earthquake risks, destruction of nature, forced resettlement for one million people on the negative side). What about **CCS** (Carbon Capture Storage) techniques? Are you looking for an example of technology assessment in Lower Saxony – how are the changes from the municipal level to be assessed?

- In **what radius** should **wind turbines** be allowed to be erected in the vicinity of settlements and why? (ecological, non-consuming energy production positive on the one hand, shadows and noises in the environment on the other, visual landscape change on the minus side)

- How should products be offered in retail packaging in the future, **should individual packaging be dispensed with**? (Advantage: hygienic packaging even of small portions, practical to take with you, disadvantage: enormous expenditure of limited resources such as plastic, aluminum, etc.)

- Is the use of **nuclear energy** to be considered **green energy** or is it too harmful to the environment?

- Would a **preventive use of automated facial recognition** software in public places during event events such as Christmas markets in your region be justifiable?

Thank you for your attention