



# Sustainability in the Digital Domain – An Overview

Jan Frecè, 13 Sept 2024 – «Transformation of Teaching in Economic Sciences»

# What role does digitization play from the perspective of sustainable development?



- ▶ Digitization is seen as a supportive element.
- ▶ Digitization only has influence on sustainability via other topics.
- ▶ Digitization is digitization and it is advantageous.

# Digitization is often not understood and consequently becomes magical

- ▶ Digital solutions consume resources for the production and maintenance of:
  - The device you use (e.g., cell-phone)
  - The device you are connecting to (e.g., server hosting Instagram)
  - All devices in-between that enable a network connection
  - All devices ensuring that all devices listed above have power.
- ▶ Digital solutions are not better, per se. A well-made analogue solution beats a badly composed digital solution most of the days.

## Student statements found in exams

- ▶ “A book uses wood while a cell-phone does not need any resources but electricity.”
- ▶ “A book can be burnt while the cloud is indestructible.”
- ▶ „If you upload files to Microsoft, they will protect it forever.“

# Comparing dimensions of sustainability

- ▶ **Economic Dimension**

Long-term economic growth and stability, efficient resource use, innovation and equitable opportunities for all communities.

- ▶ **Ecologic Dimension**

Preserving natural resources and ecosystems, promoting biodiversity, maintain ecological balance for future generations.

- ▶ **Social Dimension**

Social equity, community well-being, and cultural integrity, inclusive practices, empowering individuals and foster cohesive societies.

- ▶ **Sustainability of IT**

Impact of the resources and emissions needed to develop, build, run, maintain and dispose of devices needed for IT services.

- ▶ **Sustainability through IT**

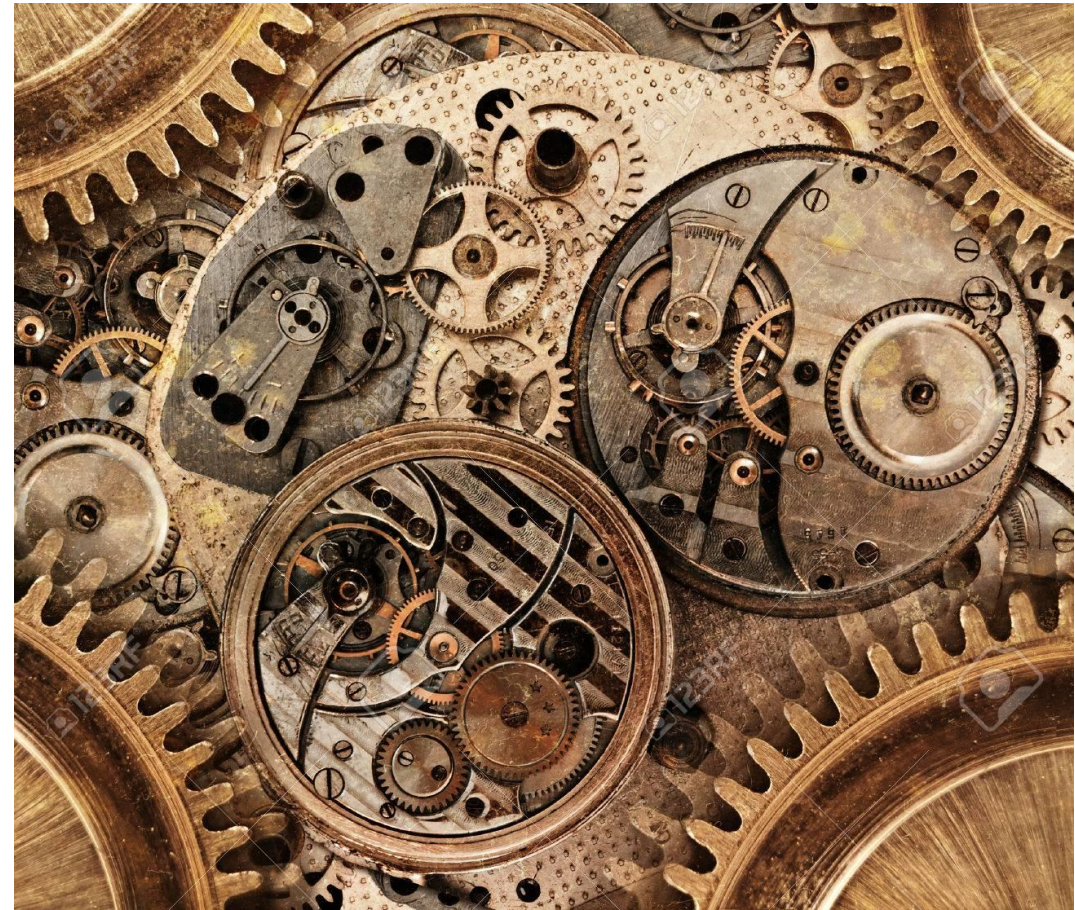
Impact of IT-based services on improving sustainability.

- ▶ **Sustainability of digital artifacts**

Impact of the manner in which software (& hardware) is developed, build, upgraded, operated, and documented.

# Sustainability of IT

- ▶ Using IT means **using devices, nothing is ultimately virtual.**
- ▶ IT devices are devices **like all other devices**; they need to be produced, maintained, operated, updated, and disposed of.
- ▶ Using IT means using resources. **Efficient hardware and software design and operation** is the main way to take influence.
- ▶ Influence on **economic and ecological levels**



# Sustainability through IT (I)

- ▶ IT allows operations on a new degree of **precision and capacity**. These new possibilities can be used to make **systems more sustainable, e.g.:**
- ▶ Supply Chain Management Software: Enhances logistics by optimizing routes and inventory levels, reducing carbon emissions and waste.
- ▶ Building Management Systems (BMS): Monitors and controls energy usage in buildings, optimizing heating, cooling, and lighting to minimize energy consumption and reduce operational costs.



# Sustainability through IT (II)

- ▶ **Telemedicine Platforms:** Provide remote access to healthcare services, e.g., in underserved areas to consult with healthcare professionals, enhancing access to care, reducing travel needs, and promoting health equity.
- ▶ **Aircraft steering and monitoring:** Pilots are unable to monitor and control a modern airliner without support of IT, nor fly it efficiently without all IT-based weather-models.
- ▶ Influence on **economic, ecological** and **social** levels



# Sustainability of digital artifacts (I)

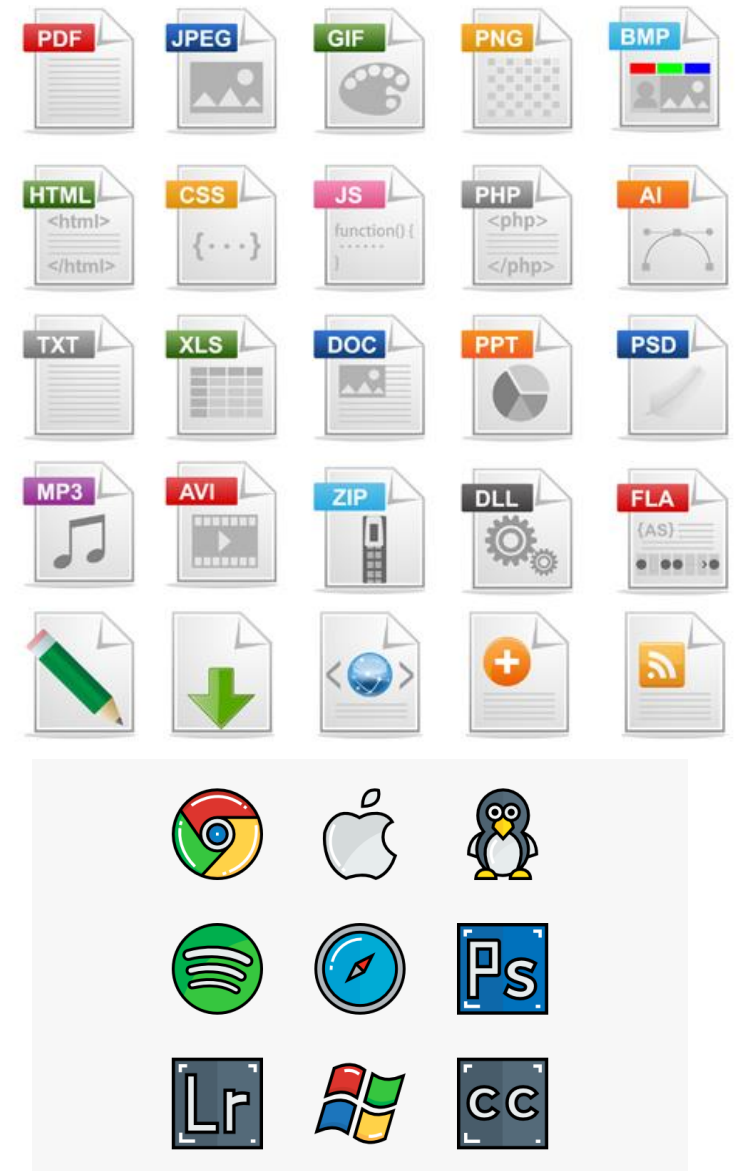
## ► What is a digital artifact?

Everything that is **digital** and was created **intentionally**: every picture, audio file, text document, calc sheet, office software, operating system, software controlling the beamer temperature, etc.

## ► Why are digital artifacts relevant?

They control countless processes in our lives, analyze some (unknown) information, and decide what options are open to us:

- Who will get the **rental contract**?
- When are **landing flaps** extended?
- When are **exhaustion gases** cleaned?





# Sustainability of digital artifacts (II)

▶ The 10 dimensions of digital artifact sustainability (Stürmer 2017):

- 1) Elaborateness
  - 2) Transparent Structures
  - 3) Semantic Data
  - 4) Distributed Location
  - 5) Open Licensing Regime
  - 6) Shared Tacit Knowledge
  - 7) Participatory Culture
  - 8) Good Governance
  - 9) Diversified Funding
  - 10) Contributing to sustainable development
- ▶ Influence on **economic, ecological and social** levels

# Possible questions to discuss

- ▶ Since IT shapes society, what kind of IT do we want/need?
- ▶ How much control by private players can a society endure?
- ▶ Controlling digital artifacts means controlling large parts of corporate and societal options. How much self-determination is needed?
- ▶ How to prevent blind trust due to ignorance (choosing IT = choosing your faith)?

