

# SUSTAINABLE ENGINEERING

## Dematerialization

### FACTORS PROMOTING DEMATERIALIZATION:

#### 1. *Environmental pressures:*

- On procurement side: Need to reduce impact → less extraction → less use
- On use side: Need to reduce energy consumption → process less
- On disposal side: Pressure on landfills → do with less

#### 2. *Technological changes:*

- Better alloys → thinner components → less metal
- Better fibers → longer lasting carpets → less frequent replacement
- Email → less physical mail

#### 3. *Economic factors:*

- Less material → less purchasing → incentive to put less in the product
- Less material → less manufacturing → idem

### FACTORS IMPEDING DEMATERIALIZATION:

#### 1. *Physical limits:*

- Cars, keyboards, chairs must fit the human size
- Safety limits: Less material → weaker product → greater risk of failure

#### 2. *Technological limits:*

- Cannot make microchips smaller than a certain size
- Same for internal combustion engines, batteries, fuel cells, etc.

#### 3. *Technological changes:*

- Printers and photocopiers → more liberal use of paper
- Microwave ovens: smaller but not displacing conventional ovens → net addition
- New tools (fax machines, cell phones) → new accessories → more products

#### 4. *Societal factors:*

- People's preferences (ex. Documents on paper, two ovens at home)
- Dispersion of population → bigger houses, more cars and longer roads
- Lack of environmental awareness (ex. Brown bags)
- Competing motive (ex. SUVs)