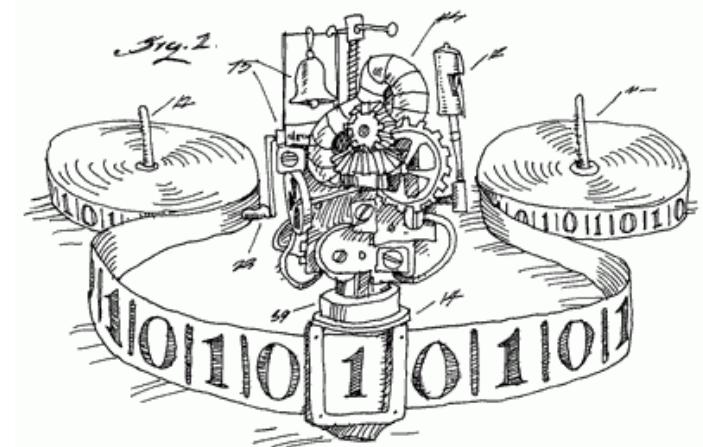


INFO 101 – Introduction to Computing and Security

[2020 - Week 7 / 2]

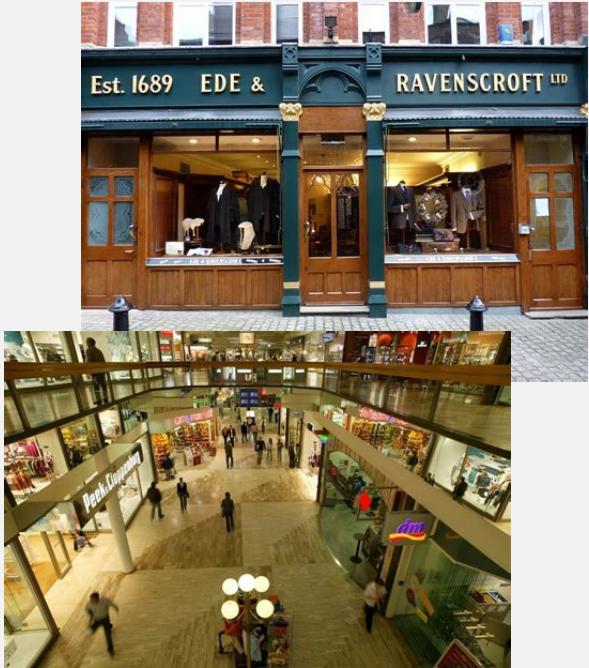
Prof. Dr. Rui Abreu
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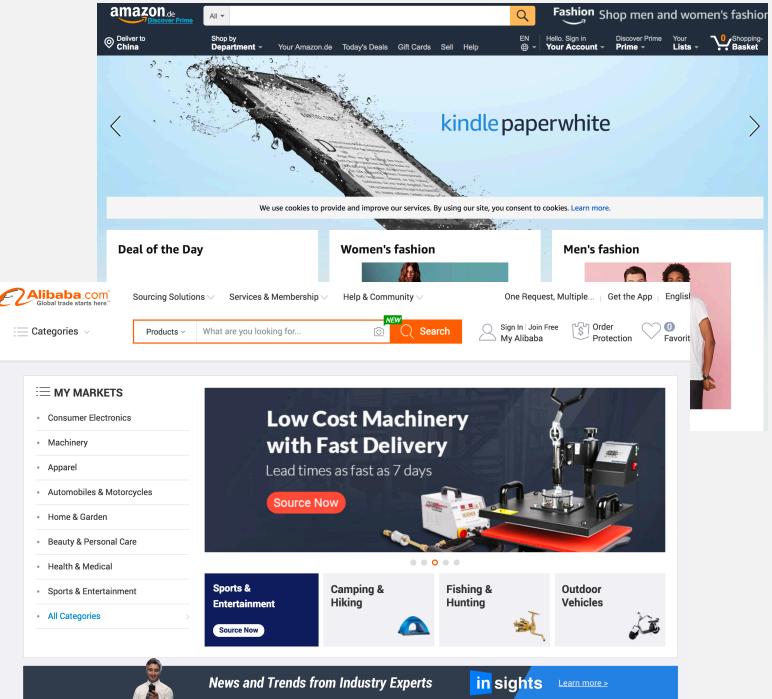
What we are going to discuss...

- Overview on E-Commerce, Mobile and Cloud Computing
- Discussing the impact of computing on society and its future including the decision support systems and AI technology

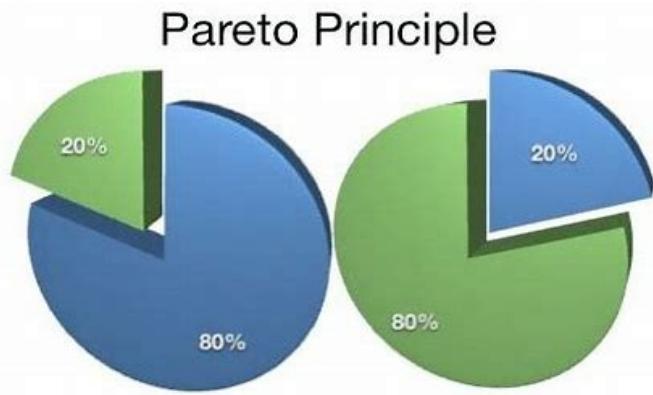


Reasons:

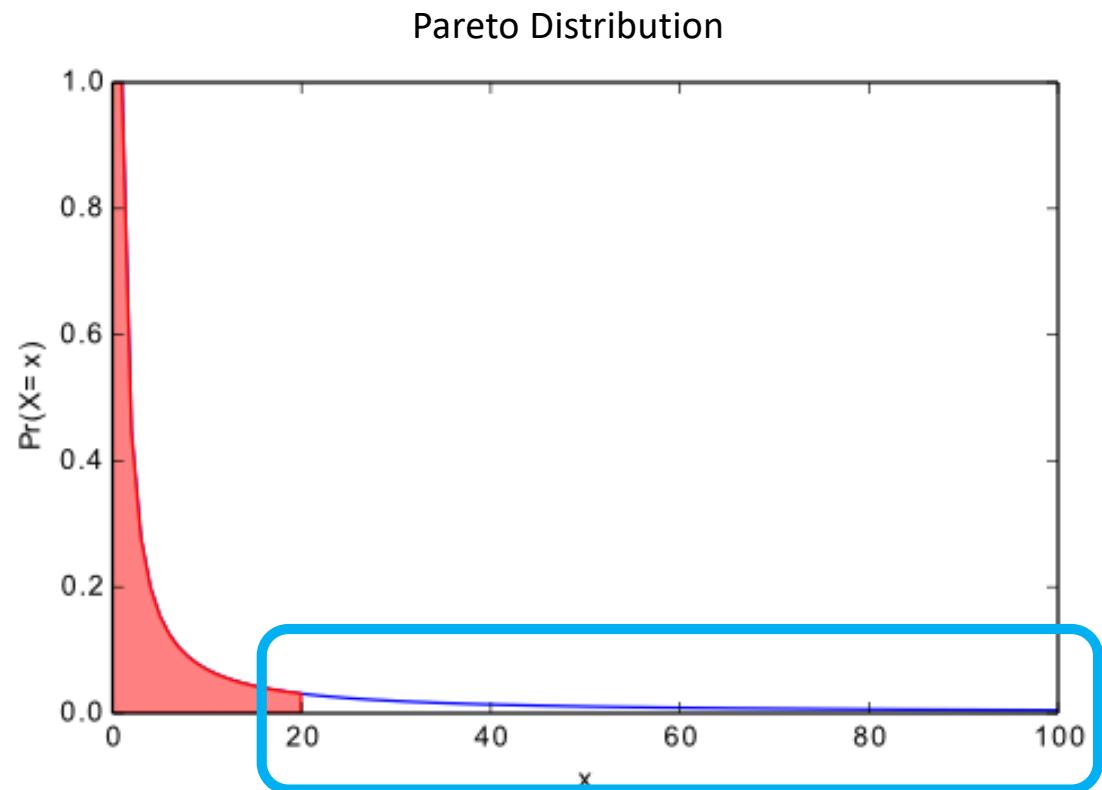
- Scalability
- More goods
- Less costs



Information technology / computing is the enabler!



20% of the input (time, resources, effort)
accounts for 80% of the output (results, rewards)

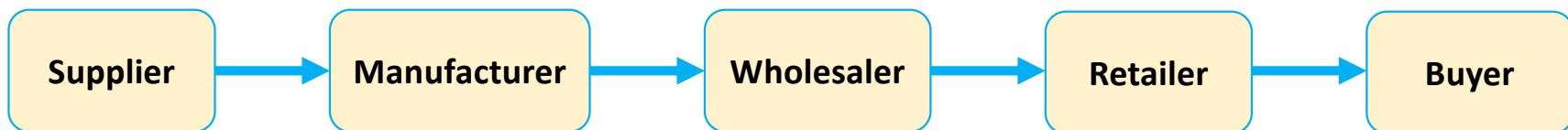


Because of reduced costs, the end of the tail becomes
also of interest!

E-Commerce

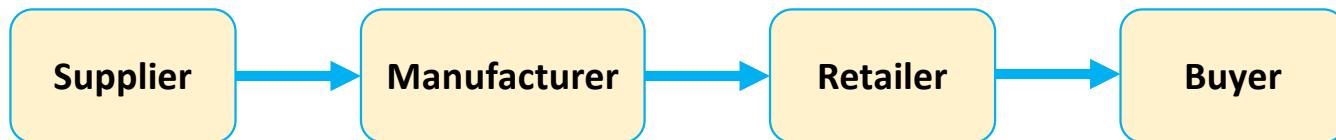
- **Commerce** is the **exchange of goods and services**, usually for money
 - Buyers
 - Sellers
 - Products
- **Supply chain:**

business to consumer (**B2C**) supply chain



E-Commerce

- Reducing prices / increasing profits
 - Cutting out the middleman
 - Going to just-in-time manufacturing



- Or in case of digital products like software:



E-Commerce

- Original meaning of E-Commerce:
 - Facilitate commercial transactions electronically
 - Electronic Funds Transfer (EFT) – payments, electronic banking
 - Electronic Data Interchange (EDI) – insurance claims, purchase orders, ... should replace paper-based transactions
- E-commerce is defined as a **set of activities that support business operations on a network**
- Supports the following relationships
 - Business to Business (B2B)
 - Business to Customer (B2C) – Amazon, ...
 - Customer to Customer (C2C) – e.g. eBay
 - Business to Government (B2G)
 - Government to Citizen (G2C)

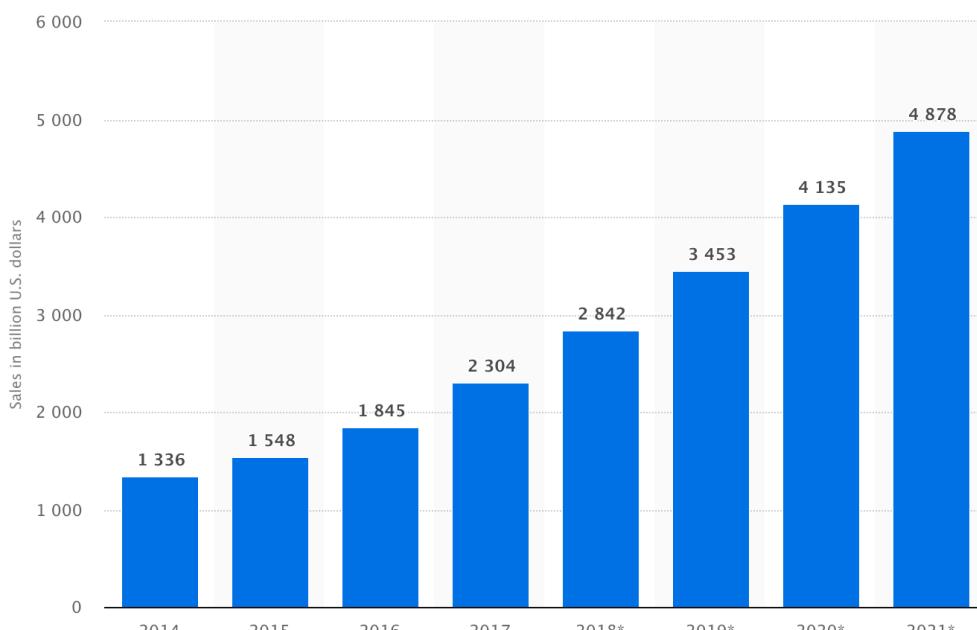
eGovernment (changing home addresses, or making a tax application over the Internet)

E-Commerce

- Expectations:
 - Lower transaction costs
 - Larger purchases per transaction
 - Business cycle integration
 - People shop in different ways (utilized via recommender systems, customized configurations)
 - Larger catalogs (including very special items that are only of interest for a minority)
 - Enhanced customer interaction
 - New business models (e.g. Online-Banking, video on demand, ...)

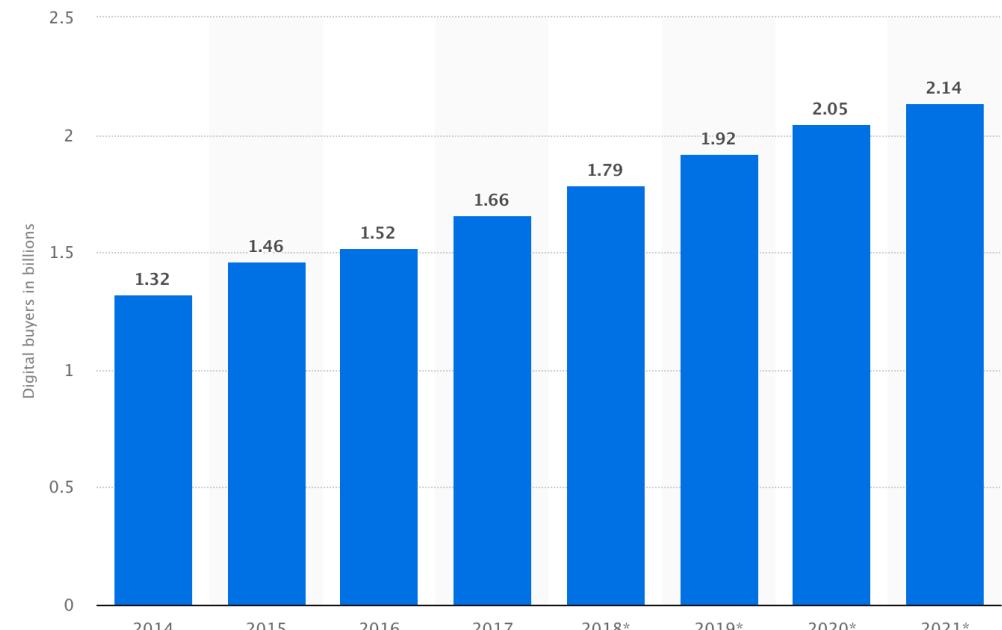
E-Commerce

Retail e-commerce sales worldwide from 2014 to 2021



© Statista 2018 from www.statista.com

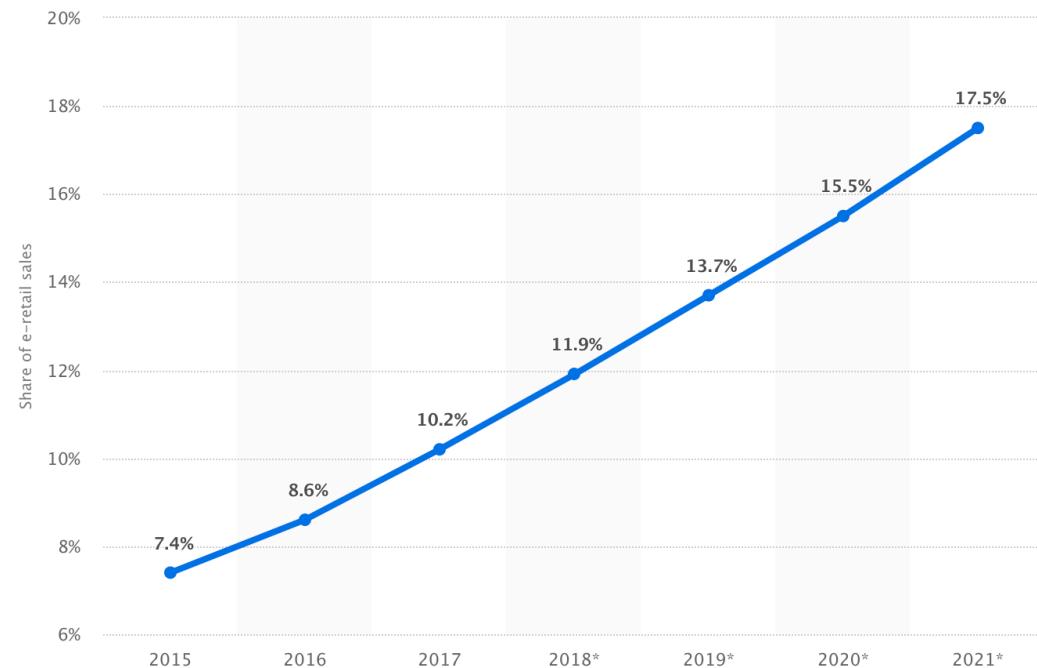
Number of digital buyers worldwide from 2014 to 2021



© Statista 2018 from www.statista.com

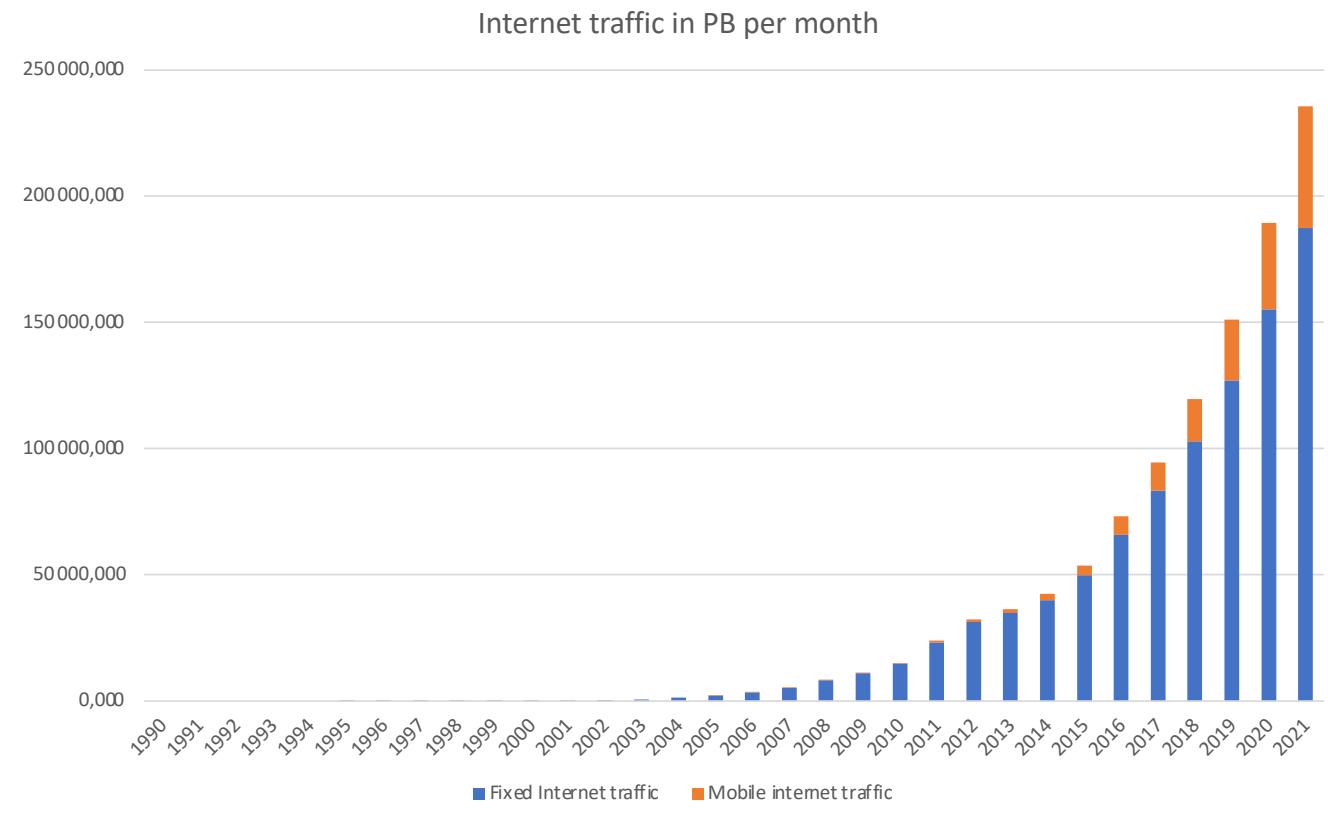
E-Commerce

E-commerce share of total global retail sales from 2015 to 2021



E-Commerce

- E-Commerce is growing
- The corresponding web traffic is also growing



E-Commerce

- Measuring Internet traffic
 - Traffic statistics (from web servers etc.)
 - Tracking applications
 - Toolbars installed on Browsers
 - Packet sniffing
- Collected data
 - Visitors count
 - Page count
 - Popular pages
 - Visit time
 - Time per page
 - Busy times (What time of the day, month, year there is most of the traffic?)
 - Referrers (What page did the visitor arrive at the site from?)

E-Commerce

Success factors

- Market research
- Interface (easy, user friendly,...)
- Documentation
- Security
- Inviting (use a technology that people use)
- Value (provide value for customers)
- Incentive (provide incentives to return back to your Web page)

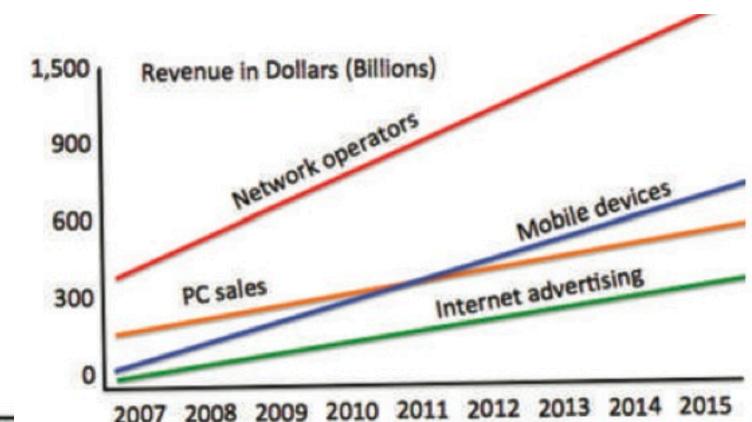
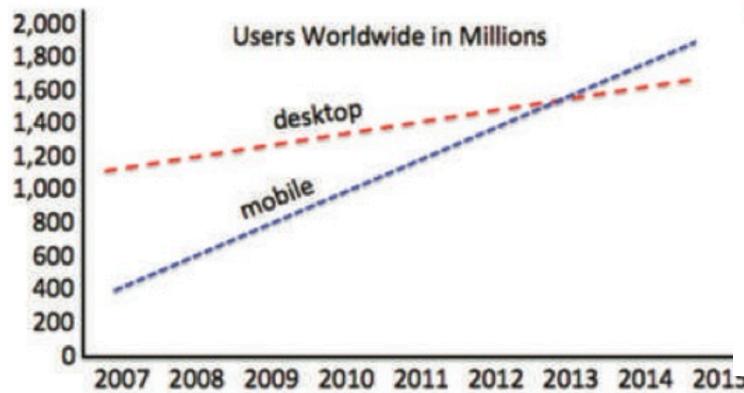
Challenges

- Unfulfilled expectations
- Unsatisfactory Web experience
- Navigation
- Motivation (why visiting your Web page?)
- Awkward process
- Security
- Suitability
- Competitors

Mobile computing

Mobile computing

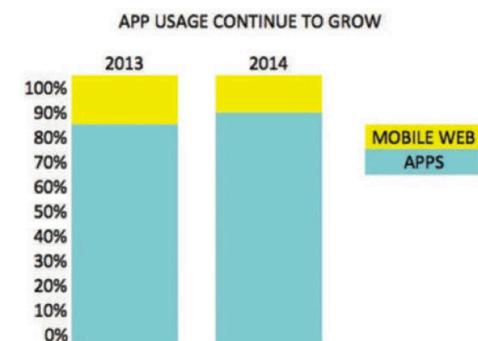
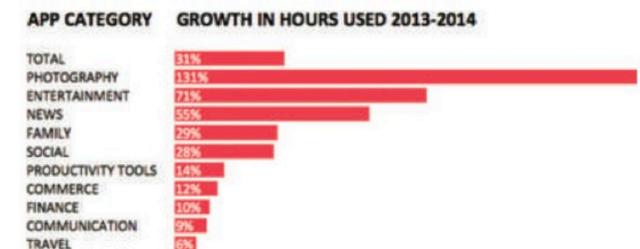
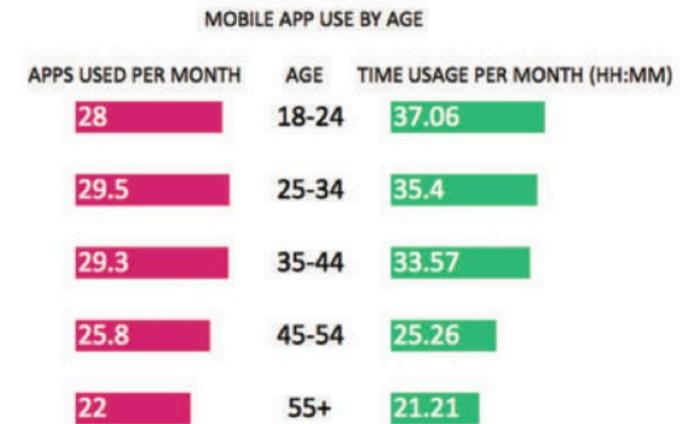
- Mobile computing is the usage of portable computing/communication devices
 - Voice communication
 - Data applications like social networks, data storage, ...
- Becomes more and more important (because of the smartphones)



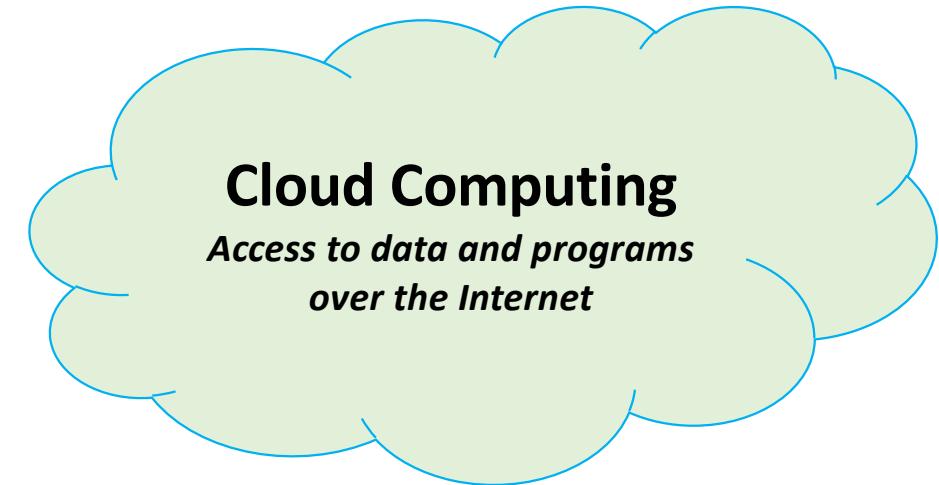
Mobile computing

- Some facts:

- In 2009 Microsoft software was on 90% of PCs. At the end of 2012, it was installed on only 23% of devices sold (considering tablets and smartphones as well)
- One billion smartphones were sold in 2014.
- Two-thirds of American adults connect to the web via a smartphone, tablet, or notebook computer.
- Mobile app projects outnumber PC application projects by 4:1.
- App development is distributed about 80:20 between Android and iOS



Cloud computing



Cloud computing

- Moving computation from a device to the Internet



Cloud computing

- **Software-as-a-Service (SaaS)** – Software is available using cloud access. Examples: Microsoft Office and Adobe Creative Suite.
- **Platform-as-a-Service (PaaS)** – Provide a computing platform over the Internet including programming language support etc. Examples: Google App Engine, Amazon Web Services, and Red Hat Open Shift.
- **Infrastructure-as-a-Service (IaaS)** – Provide infrastructure like storage, servers, or web space over the Internet. Examples: Amazon, Microsoft, Google, and Rackspace.

Cloud computing

- Payment is closely coupled to the degree of service (you pay what you need)
- Cloud services are scalable
 - If more computing power is needed, you can order more servers
- No maintenance needed on side of the customer
- Enabling technology: **virtualization**
 - Programs are running on a server that provide the same functionality as a certain computer running a particular operating system
 - “Virtual machine” (e.g. VMware, VirtualBox, Parallels,...)
- Client-Server architecture

Characteristics of Cloud computing

- **Maintenance** – Easier and less expensive than in-house operations.
- **Centralization of infrastructure** – Software and hardware upgrades and management are centrally located with services available to customers anywhere.
- **Peak-load capacity** – Systems scale automatically to match peak requirements.
- **Productivity** – May be increased when multiple users in different locations can work on the same data simultaneously.
- **Reliability** – Increases with the use of multiple redundant sites assisting with business continuity and disaster recovery.
- **Security** – Can improve because providers are able to devote resources to solving security issues that many customers cannot afford alone.

Impact of computing and its future

The impact of computing

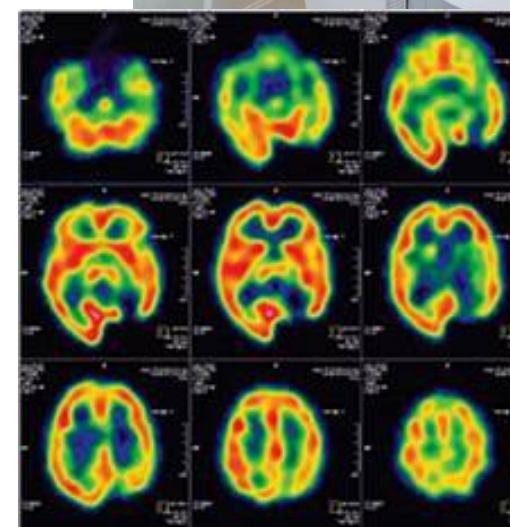
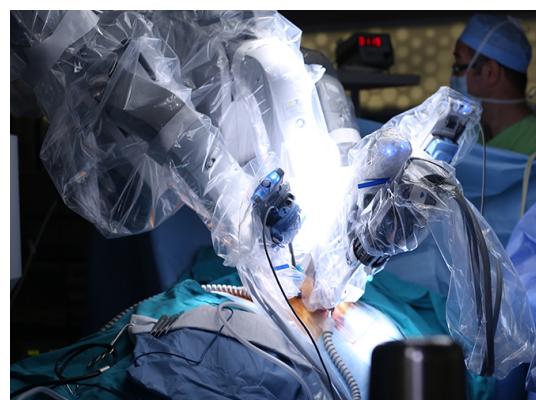
- Computers are almost everywhere!
- There is almost no field where computing is not used and becoming of increased importance
 - **Medicine:** health information systems, diagnostics support, software in devices, robotics ...

AI Med: Analytics & Algorithms, Big Data, Cloud & Cognitive Computing, and Deep Learning in Medicine



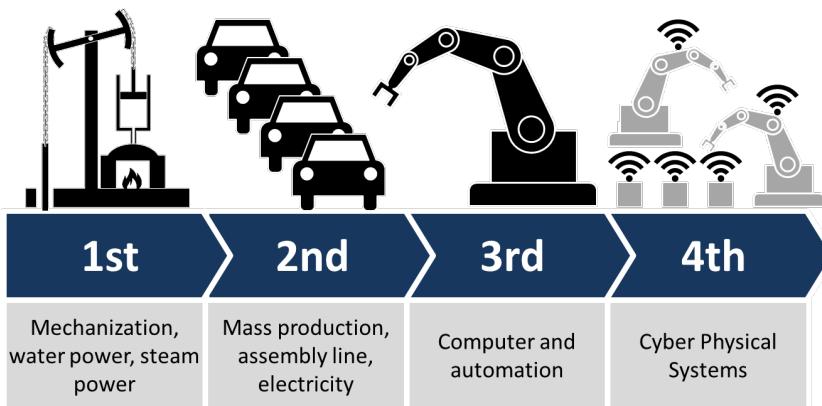
www.Almed-mi3.com

(use code "CATALAZE" for registration discount)

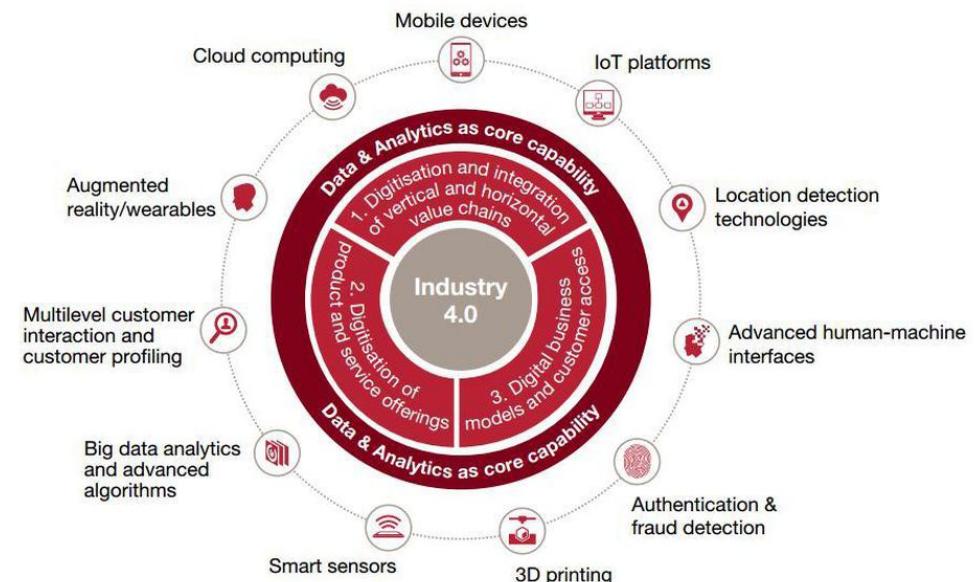


The impact of computing

- **Business and Finance:** Automated manufacturing (mass customization), planning support, tools for finance (accounting (e.g. SAP) and prediction),...

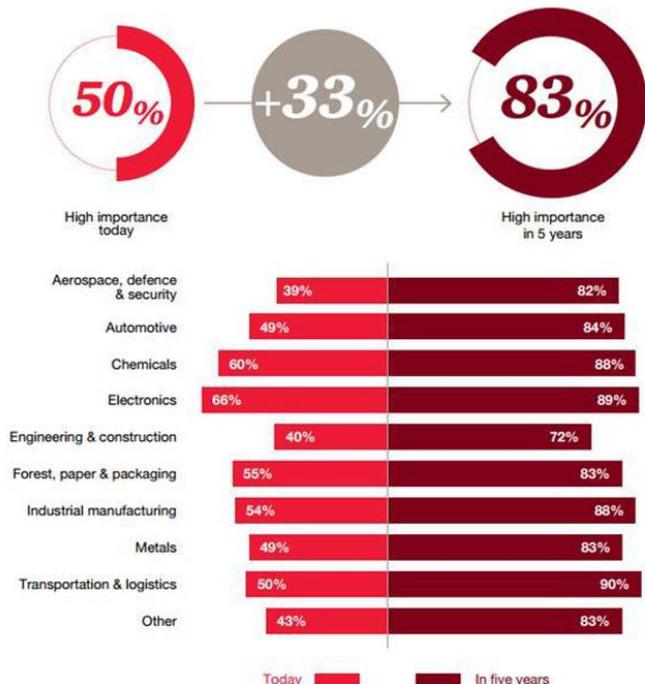


Industry 4.0 framework and contributing digital technologies



Industry 4.0

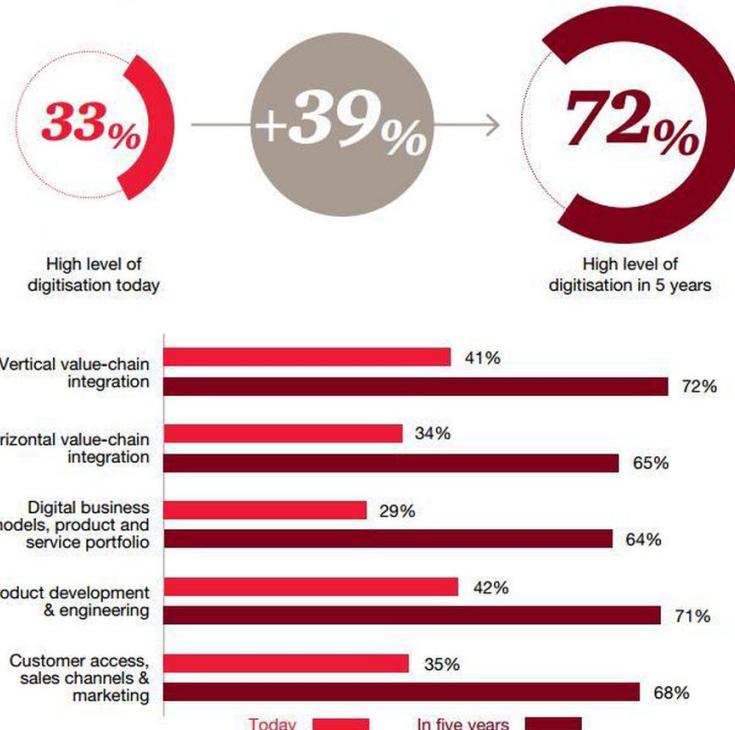
Figure 7: Data and analytics are becoming increasingly important to decision-making.



Shown: Summarised percentages of companies surveyed reporting high levels of significance

Q: What significance does the gathering, analysis and utilisation of data for decision-making have for your company?

Figure 1: Respondents expect to more than double their level of digitisation by 2020

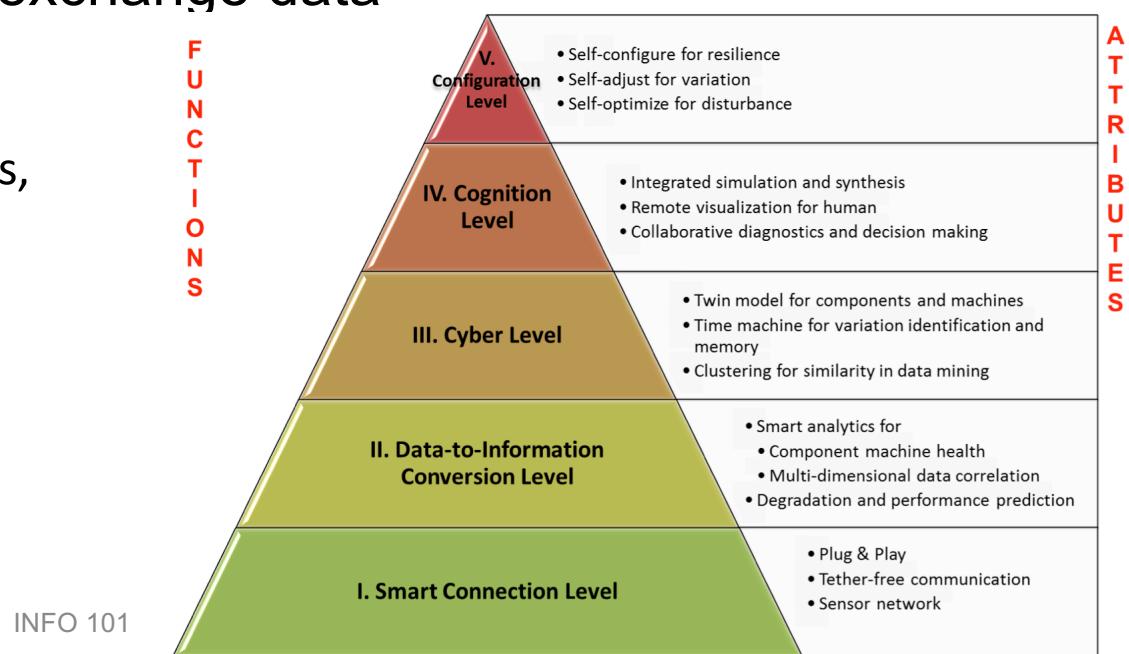
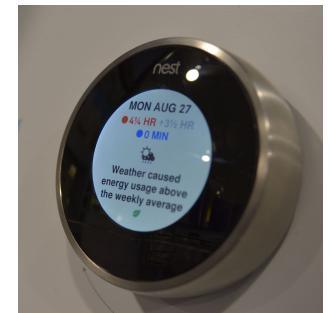


Shown: Percentage of companies surveyed reporting high degrees of digitisation and integration

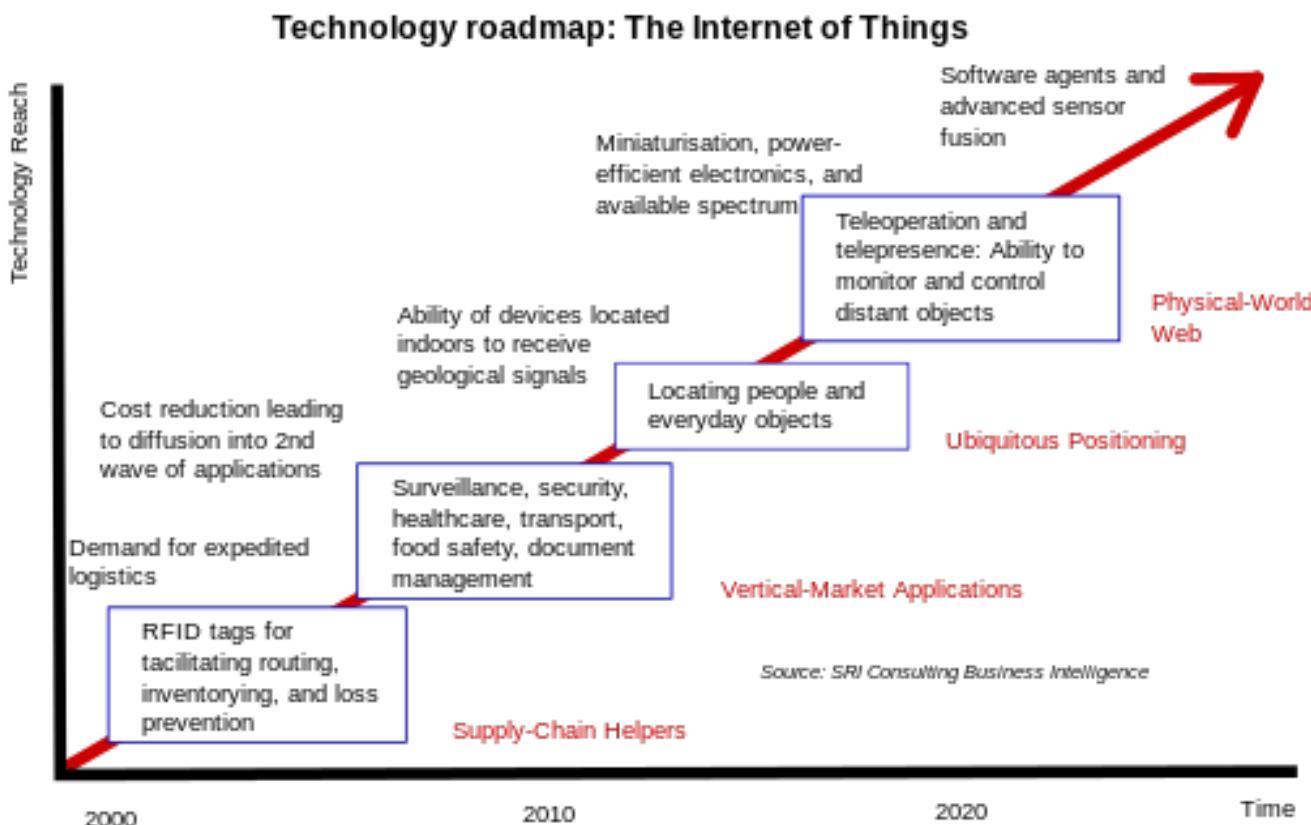
Q: How would you classify the current level of digitisation and integration in the following areas in your company? What levels of digitisation and integration are you expecting in the next five years?

The Internet of Things (IoT)

- Network of devices, vehicles, and home appliances that contain electronics, software, actuators, and connectivity which allows these things to connect, interact and exchange data
 - Smart home
 - Elder care
 - Transportation (tracking trucks, ships, or railway)
 - Manufacturing
 - Agriculture
 - Energy management
 - Environmental monitoring



IoT – Technology roadmap



The impact of computing

- **Science and Engineering:** Simulation systems for engineering (chemistry, mechanical & electrical engineering, AI software for optimization of designs, machine learning for data analysis and knowledge discovery,...)
- **Social Sciences:** Information systems, big data analysis,...
- **Government and Law:** Information systems, big data analysis, but also expert systems for supporting judges and lawyers, automated law enforcement, ...
- **Publishing and Communication:** WWW, tools for publishing/printing with reduced costs, but also AI technology for combining data and available information, ...

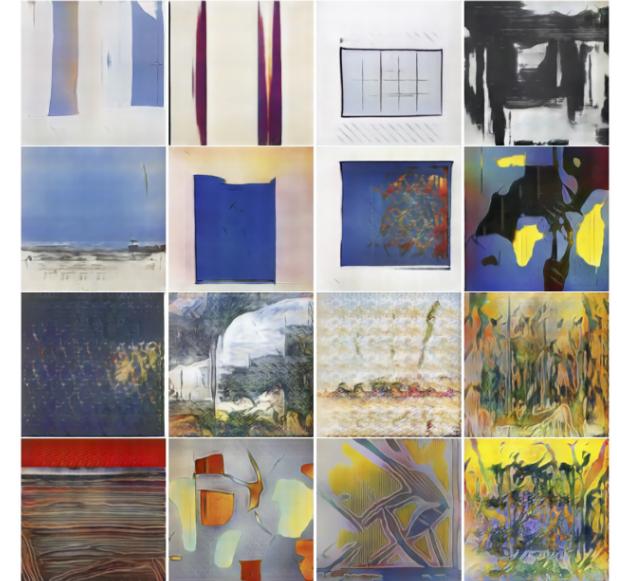
The impact of computing

- **Art and Fine Arts:** Editing tools for videos, pictures, etc. But also AI for generating art (pictures, texts, ...)
- **Education:** Online teaching, Online access to class material, collaboration tools, ...



An AI generated poem inspired by a pastoral landscape:

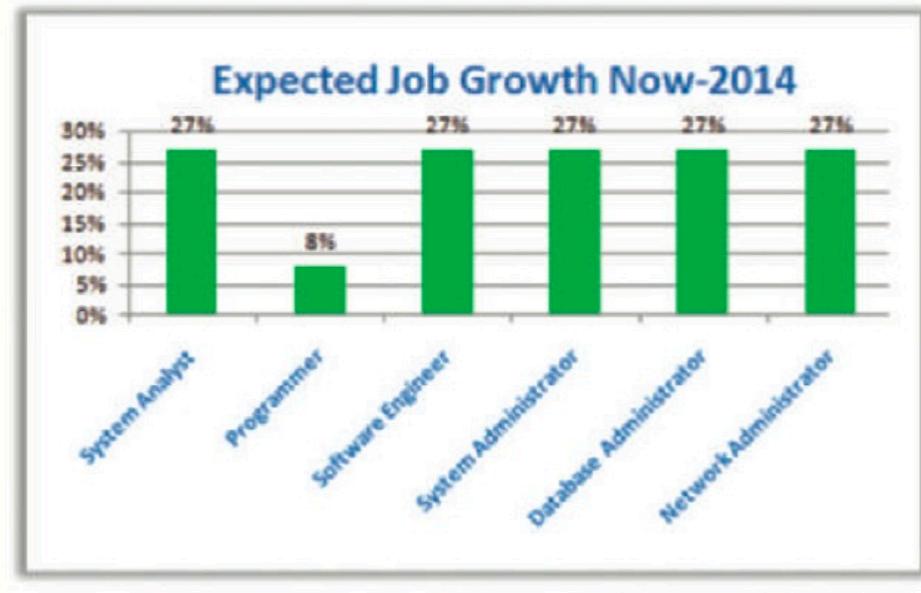
*"the sun is shining
the wind moves
naked trees
you dance"*



Artworks created by Creative Adversarial Networks (CAN) artificial intelligence. Courtesy of the Art and Artificial Intelligence Laboratory, Rutgers University.

The impact on jobs

- Computer profession:



Data Source: U.S. Bureau of Labor Statistics

- **For other disciplines:** There will be loss of jobs in areas where further automation using AI technology can be applied.

Other issues

- There are not only positive effects of computing
 - **Health issues** (from stress to physical problems...)
 - **Child protection**
 - **Computer addiction**
 - **Security issues and computer crime**
 - **Risks of AI and other related areas...**
 - Impact on the environment: **Green Computing** (the energy consumption of the Internet alone is estimated to be around 3% of the total energy consumption).
 - ...

Summary

- Computers are almost everywhere
- They are enablers for businesses
- Computing offers a lot of new possibilities
- The job market for computing professionals is great (and increasing)
- But there are also negative impacts like risks of technology, health issues, or job losses we have to consider