

# Aureus Summary

*Management of Information & Technology*

2022/2023



# SUMMARY & LECTURE NOTES

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*Management of information & Technology*

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## Book

### Chapter 1

A **knowledge worker** is typically a professional who is relatively well educated and who creates, modifies or synthesizes knowledge as a fundamental part of their jobs. With the growth in the number of knowledge workers, a **knowledge society** emerges.

Items of value in a knowledge society:

- Knowledge
- Capital
- Labour
- Land

An **E-business** uses information technologies or system to support nearly every part of its business. In this new economy there is a **digital divide**: those with access to information systems have great advantages over those who don't.

**Globalization** is the integration of economies throughout the world enabled by innovation and technological progress.

Issues of globalization:

- Demographic changes
- Urbanization
- Shifts in economic power
- Resource scarcity
- Climate change

Hence, **sustainable development** becomes increasingly important.

**Digital density** is the amount of connected data per unit of activity.

The **internet of things (IoT)** is a network of physical objects who can share data via the internet. The use of these technologies in manufacturing is called the **industrial internet of things**.

**Big data** has high volume, variety and velocity. **APIs (application programming interfaces)** allow software to interact and share data. Knowing how to use computers is called **computer (or information) literacy**.

An **information system (IS)** is the combination of people and information technology that create, collect, process, store and distribute useful data. **Information technology (IT)** includes hardware, software and telecommunications networks.

**Data** are raw symbols like characters and numbers. The quality of data is measured in completeness, accuracy, timeliness, validity and consistency. Raw data is not yet useful.

**Information** is data in context. It represents reality and answers questions about who, what, where and when.

**Knowledge** is the ability to understand information, form opinions and make decisions based on the information.

Good IS personnel possesses the following skills:

- Technical competency
- Business competency
- Systems competency

One of the most important **computer ethics** is **information privacy**. Fair information practice:

- Notice/awareness: let users know what data are gathered, for whom and for what purpose.
- Choice/consent: "yes I accept the cookies"/ "only accept essential cookies"
- Access/participation: allow users to access the data that is gathered about them.
- Integrity/security: make sure you don't have data leaks.
- Enforcement/redress: provide means to enforce these practices, for example with self-regulation and laws

Another part of ethics is **intellectual property (IP)**. It is now very easy to copy music, videos or music without any quality loss.

## Chapter 2

**Business processes** are the activities organizations perform to reach their business goals.

There are three decision-making levels:

- Operational level
  - The routine, day to day business processes such as processing **transactions**: anything that occurs as part of a firm's daily business of which it must keep a record.
  - Information systems mainly used to increase **efficiency**.
  - **Structured decisions**: decisions in which the procedures to follow for a given situation can be specified in advance.
- Managerial/tactical level
  - Functional managers focus on monitoring and controlling operational level activities and providing information to higher levels of the organization.
  - **Semistructured decisions**: some procedures to follow for a given situation can be specified in advance, but not to the extent where a specific recommendation can be made.
  - The managers use **Key performance indicators (KPIs)** to assess progress toward a certain goal.
  - Trying to increase **effectiveness**.
- Executive/strategic level
  - Managers focus on long-term strategic questions.
  - **Unstructured decisions**: few or no procedures for a given situation can be specified in advance.
  - Trying to improve organizational strategy and planning.

**Functional area information systems** are designed to support the unique business processes of a specific functional area.

Automating = doing things faster

Learning = doing things better

Strategy = doing things smarter -> strategic planning = form a vision of where the organization needs to head.

Identifying *where* to compete

-> analyzing competitive forces (porter's 5-forces, first mover advantage).

Identifying *how* to compete

-> choosing a generic strategy (low cost leadership, differentiation strategy, best-cost provider strategy)

-> resources and capabilities (distinctive competencies, value creation)

-> analysing the value chain (inbound/outbound, support systems)

Organizations are trying to maximize **business/IT alignment**. Some investments are necessary even when they do not align with the companies strategy; these are called **strategic necessities**.

A **business model** is a summary of a business's strategic direction that outlines how the objectives will be achieved. It specifies the **value proposition**.

A **revenue model** describes how the firm will earn revenue and generate profits. For example, the **freemium** approach, where the basic service is provided for free, but for extra features, a premium is charged.

On a **platform**, users co-create value. When more users join the same side, there are **same-side network effects**, as more users use something, prices may go up but quality may rise too. When users join the other side, there's **cross-side network effects**. Example: play store. More users if more apps are developed, more app development if there are more users.

In a **sharing economy**, assets or services are shared between individuals (like Car2Go). In a **gig economy**, people are hired for short-term, temporary jobs, like Uber. The downside of this is that the 'employees' are not protected by worker's rights. There are also more service based business models: instead of selling an engine, the buyer buys hours of usage.

**Innovation** involves creating new products, processes or services that return value to the organization. There's incremental innovations and radical innovations.

Downsides of innovation:

- It is often fleeting: advantages gained often have limited life span due to the pace of the world.
- It is often risky
- Innovation choices are often difficult.

With **open innovation**, the creativity of external stakeholders is used.

A **lean startup methodology** enables companies to be very flexible. It has the following steps:

1. Customer discovery: finding a perceived problem and whether there is a market for a solution.
2. Create a **minimum viable product (MVP)**, which is a product containing just the features necessary to demonstrate how the product will fix the problem.
3. Customer validation: see if people actually want to pay for the solution.
4. If they do not, make a **pivot**: changing your direction. Learning from the customer validation is called **validated learning**.
5. Customer creation: test whether it is possible to establish a repeatable business model.
6. Company building: scaling operations.

To gain enough money for investments, one can use **crowdfunding**, where a lot of individuals can inject a small amount of money.

## Chapter 3

An **information systems infrastructure** (or **digital infrastructure**) consists of hardware, software, storage, networking and data centres. These support analytics and decision making, business processes and competitive strategy. The main capabilities supported by digital infrastructure are: processing, storage and transmission of data.

The formal description of an organization's technologies, systems and processes is the **information systems architecture**. **Application software** helps with automating business processes and enables processes that would otherwise not even be possible. Many types of application software interact with **databases**: collections of related data organized in a way that facilitates data searches. These are vital to an organization's operations. They store data and make the data accessible where and when needed. To harness the power of the data contained in the databases, organizations use **database management systems (DBMSs)** which are a type of software that allows organizations to more easily store, retrieve and analyse data.

## Hardware

There are 6 general classes of computers:

1. The **supercomputers**: these are super powerful but also expensive. Only used by science.
2. The **mainframe** computers: these are used primarily as the main, central computing system for major corporations.
3. The **server**: a computer or network that makes access to files or services available to users of the network.
4. The **workstation**: these are computers optimized for visualization and rendering of 3D models. Usually they have fast processors, large memory and advanced video cards.
5. The **personal computer**: these are used for personal computing and small business computing.
6. The **mobile device**: handheld, for personal use.

**Embedded systems** are optimized to perform a well defined set of tasks, like playing MP3 music files. With the Internet of Things (IoT), sensors are able to provide data as input to different processing technologies. Another key IoT technology is **radio frequency identification (RFID)**. This uses electromagnetic energy to transmit data between a reader and a processing device. An **RFID tag** is the "chip" that contains the information. This can range from simple data like the name of the owner of a cat to complex data like the whole necessary manufacturing process of a product.

## System software

System software is the collection of programs that control the basic operations of the computer hardware. The most prominent type is the **operating system** which coordinates the interaction between hardware, **peripherals** (like printers), application software and users. **Device drivers** allow the computer to communicate with various different hardware devices. Examples of operating systems are android, windows and iOS. Tasks they perform are for example: presenting information via the monitor, getting input from keyboard or mouse and reading from / writing to a storage device.

## Storage

Typically, there are 3 kinds of data that are stored:

- Operational data: data used for managing business processes or for data analysis.
- Backup data: short-term copies of organizational data used to recover from system-related disaster.
- Archival data: long-term copies of organizational data, used for compliance and reporting purposes.

**Computer networking** is the sharing of data or services. It requires 3 things:

- A sender (source) and receiver (destination) that have something to share (a message)
- A pathway or transmission medium such as a cable to send the message
- Rules or protocols governing communication between senders and receivers.

**Transmission media** refers to the physical pathway (cables and wireless) used to transmit data.

**Protocols** define the procedures that different computers follow when they transmit and receive data.

Computer communication consists of bits. The **bandwidth** is the transmission capacity of a computer of communications channel measures in bits per second (or multiples thereof).

In a network, a computer can have 3 roles:

- A **client** is a computer that uses the services provided by the server. A **thin-client** is a microcomputer with minimal memory, storage and processing capabilities. These use **desktop virtualization** to provide workers with a virtual desktop environment.
- A **peer** is a computer than can both request and provide services.
- A server (see hardware)

Businesses usually use **client-server networks** in which servers and clients have defined roles. In contrast, **peer-to-peer (P2P) networks** enable any device to provide and request services.

**Types of networks:**

- Personal area network (PAN): wireless communication between devices like Bluetooth, usually under 10m distance.
- Local area network (LAN): sharing of data, software applications of others resources between several users, usually within a building.
- Wide area network (WAN): connect multiple LANs, often with distributed ownership and management, from multiple buildings to worldwide

The **internet** is a large worldwide collaboration of networks that use a common protocol to communicate with each other.

### **World wide web**

The world wide web is a system of interlinked documents on the internet or a graphical user interface on the internet, that provides users with a simple way to access a wide variety of content. A **hypertext/webpage** contains content and **hyperlinks**, references/links to other documents. The standard method of specifying the structure and content of webpages is called **hypertext markup language (HTML)**. The web pages are stored on **web servers**. These process requests for pagers using **Hypertext transfer protocol (HTTP)**. A collection of interlinked web pages is called a **website**.

A **uniform resource locator (URL)** is used to identify and locate a particular web page. The **domain name** is a term that helps people recognize the company or person that the domain name represents. The suffix like “.com” shows what **top-level domain** the domain name belongs to. **IP addresses** serve to identify all the computers or devices on the internet.

The protocol used by the internet is the **transmission control protocol/internet protocol (TCP/IP)**.

The **deep web** refers to the parts of the web that cannot be found using conventional search engines, for example because they are private or behind a paywall.

Many organizations have their own **intranet**. This looks and acts like a publicly accessible website but it is behind the companies firewall, which secures proprietary data. An **extranet** does use the internet but is only accessible to authorized users.

Because businesses use so much data, they need many servers. Therefore, data centres are build. These can store and process the data of multiple businesses.

**Moore’s law:** the number of transistors on a chip would double about every 2 years. Due to the fast changes in hardware, manufactures use **planned obsolescence**, which means that the product is designed to last only for a certain life span.

A challenge for businesses who use computing resources is the fluctuations in demand. Online web shops often face a huge spike in demand during Christmas. The use of many servers to cope with everything also demands a lot of energy.

### **Cloud computing**

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources. In a **utility computing** model, organizations can rent resources such as processing, data storage or networking from an external provider.

Characteristics of cloud computing:

- On-demand self-service
- Rapid elasticity (can be scaled up and down very quickly)
- Broad network access
- Resource pooling
- Measured service: customers only pay for what they use.

Service models

- Infrastructure as a service: only the basic capabilities of processing, storage and networking are provided.
- Platform as a service: customers can run their own applications, which are typically designed using tools provided by the service provider.
- Software as a service: customers only use applications provided via a cloud infrastructure (like g-mail)

There are **public clouds**, like the one from Amazon, which are usually used for applications that need rapid **scalability** (ability to adapt to increases and decreases in demand) and **private clouds** that are internal to an organization.

Issues with public cloud computing:

- Availability/reliability: public clouds are not immune for problems, so the servers can be down and the organization cannot fix it themselves.
- Scalability: not every provider can make their service completely scalable.
- Viability: if the provider stops their business, the company needs to move all their data back to their own servers which they do not have.
- Security/privacy/compliance: not all clouds are equally secure.

These first few issues are usually covered in the **Service-level Agreement (SLA)**.

- Diversity of offerings: not all providers provide all the services and having multiple providers can be difficult.
- Openness: difficult to move data from one provider to another because they use different infrastructures.
- Costs: hiring capacity costs money.

With a **service-oriented architecture**, business processes are broken down into individual computers that are designed to achieve the desired results for the service consumer. To achieve this, services must follow 3 principles:

- Reusability – service should be usable in different applications
- interoperability – service should work with any other service
- componentization – service should be simple and modular

**Grid computing** refers to combining the power of a large number of small, independent, networked computers into a cohesive system to solve problems, so that you do not need a huge, expensive supercomputer. A **dedicated grid** consists of a large number of homogenous computers.

**Content delivery networks** provide a network of servers in a particular geographic location which store copies of particular websites. This helps users to access the data much faster. With **edge computing**, not only the storage but also the processing is moved away from the central location.

**IP convergence** (=using internet protocol for transporting voice, video, fax and data traffic) allows people to make use of new forms of communication like videocalls. **Voice over IP** refers to the use of internet technologies for placing telephone calls.

**Green computing** is an attempt to use computing resources in a more efficient way to reduce environmental impact.

## Chapter 4

**Electronic commerce** refers to the exchange of goods, services and money supported by communication technologies and the internet. Types of EC:

- business to consumer (B2C)
- business to business (B2B)
- consumer to consumer (C2C)
- consumer to business (C2B)
- Mobile commerce (m-commerce)

**E-government** is the use of IS to provide information about public services and to allow for interaction with the government. Types of e-government:

- Government to citizen (G2C)
- Government to business (G2B)
- Government to government (G2G)

Disintermediation has allowed firms to provide many financial services directly to the end services. Services like **online banking**, **electronic bill pay** and **mobile banking** are services to manage financial transactions digitally. **Online brokerage** is digital stock trading. **Fintech** refers to technologies that support activities in the financial sector.

Having only physical stores is a **brick-and-mortar business strategy**. Selling goods/services online is called **e-tailing**. When a company only uses e-tailing, it has a **click-only business strategy**. They are also called **virtual companies**. Business who have both physical and online stores have a **click-and-mortar business strategy**. There are 3 types of channel strategies companies can use:

- Multichannel retailing: offering different touchpoints (like a store and a website)
- Cross-channel retailing: transactions take place across multiple channels, like ordering online and then picking it up in a physical store.
- Omni-channel: seamless, simultaneous interaction using different channel (using the Appie app in the store)
- Sales beacons: Bluetooth devices that send marketing messages or personalized coupons to the in-store shoppers.

### Opportunities of e-tailing

Companies need less “middle men” to reach customers, this is called **disintermediation**. However, due to the high amount of online sellers, new middle parties have emerged like comparison sites. This phenomenon is called **reintermediation**. The **long tail** refers to catering to niche markets instead of purely selling mainstream products. This is possible because you don't need to have a product in stock to sell it on the website. **Mass customization** is the process of firms tailoring the products specifically to each customer's particular needs on a large scale. When you buy large volumes, you can often get discounts. With the internet, people can group up to do **group buying** to benefit from the discounts. Regular shops use **menu-driven pricing models**. The prices stay the same for long periods of time. E-shops can use a **dynamic pricing model** where prices can be adjusted every second on the most recent information about demand and offer. **Social commerce** is the use of social media to influence shopping behaviour.

### Benefits of e-tailing

Websites can offer an almost unlimited number and variety of products because e-tailing is not limited by physical store and shelf space restrictions. Traditional retailers are bound to physical store locations and open hours. E-tailers are open everywhere all the time. E-tailers can compete on price more effectively as they can turn their inventory more often because of the volume of products and customers who purchase them. They also do not need to rent expensive retail space.

### Drawbacks of e-tailing

Customers trust virtual companies less. In a virtual shop, you cannot hold the product you want to buy. Also, it takes longer before you have the product. In a store you can walk out the door with your product directly after paying. Online, you need to wait until delivery.

Online consumer needs are divided in:

- **Structural firmness:** online customers will not visit/trust a website that does not function properly.
- **Functional convenience:** the website must be easy to use.
- **Representational delight:** the website must be aesthetically pleasing.

In a perfect world, all firms would fulfil all 3 needs equally. However, due to resource scarcity, they need to choose.

### Internet marketing

Many companies integrate **QR codes** into their offline apps to direct customers to their website. Many customers just search for their product on search engines. Hence, **search engine optimization** (SEO) has become very important. To become higher in the ranking, a website can use more keywords on the site, keep the site up to date and provide unique and valuable content. A firm can also use **search advertising**. Here, the firm that pays most will appear on the top of the page. Some search engines offer to elevate a page's position in the organic (= non-advertisements) results after paying a fee (**paid inclusion**). Display ads are just regular ads placed on websites. Ads in online videos are **instream video ads** and are also a form of display ads. Firms can also use email, social media or mobile marketing.

### Pricing models in internet marketing

- **Impression based model:** price based on the number of times the page containing the ad is displayed.
- **Pay-per-click model:** price based on the number of clicks on the ad. However, people can click an ad many times to drive up the costs of the firm and the revenue of the advertising company. This is **click fraud**.

**Content marketing** is a way to attract an audience by providing relevant and valuable content through various channels, for example posting how-to videos.

Analysing web surfer's behaviour to improve website performance is known as **web analytics**. Web analytics can use the following rates:

- **Click-through rate:** number of surfers who click on an ad divided by the number of times it was displayed (impressions)
- **Conversion rate:** percentage of visitors who actually perform the marketer's desired action (like buying a product).
- **Exit rate:** percentage of visitors who leave the website after viewing that page.
- **Bounce rate:** percentage of single-page visits, so where the analysed page is the only one visited before the visitor leaves the website again.

**Location-based services** are highly personalized mobile services based on a user's location. Voice commerce are things like smart voice assistants (Siri).

### C2C e-commerce

**E-auctions** provide a place where sellers can post goods and services for sale and buyers can bid on these goods. Online classifieds are similar, but no transactions take place on the sites. Platform based c2c business models are things like Uber.

One of the most crucial aspects of e-commerce is making sure that online transactions are secure. Many payment services like paypal allow you to only share your credit card details to the payment service instead of to all the websites you wish to buy things from. **Cryptocurrencies** are virtual currencies that are not issued by any central bank and use encryption technologies to secure transactions and to generate new units of the currency. Many of these currencies use **blockchain** technology. One mechanism to authorize transactions is the **card security code**: a three digit code located on the back of the card. This is not stored in the magnetic chip, and thus only known to the person who is in the possession of the physical card.

Fraud indicators:

- Email addresses: illegitimate email addresses usually consist of meaningless character combinations with free email providers.
- Shipping and billing addresses: fraudsters often have the products shipped to foreign, high-risk countries. Thus, many vendors require shipping and billing address to be the same address.
- Transaction patterns: orders may be larger than normal, may consist of multiple items of the same type etc.

Legal issues in EC

- Taxation: according to the **internet tax freedom act**, a company is only required to collect sales tax from customers residing in a state where the business had a substantial presence.
- Other legal considerations: terms of sale or website use. Copyright and trademarks are everywhere.
- Digital rights management: DRM: a technical solution that allows publishers to control their digital media to discourage, limit or prevent illegal copying and distribution. A **digital watermark** is an electronic version of physical watermarks placed on paper currencies to prevent counterfeiting.
- Net neutrality: the principle that all internet data should be treated the same.

## Chapter 5

**Collaboration**, two or more people working together to achieve a common goal, is essential for organizations. To encourage collaboration, organizations use **virtual teams**. The members of these teams usually do not work at the same location but communicate and collaborate using technology. People can communicate **synchronous** (at the same time, like phone calls or chatting) or **asynchronous** (not coordinated in time, like emails). Meetings of virtual teams usually are held as **virtual meetings**. These can be synchronous, with (video) calls, or asynchronous, with discussion boards.

**Collaboration software** has evolved from groupware: software that enables people to work together. Collaboration software is usually distinguished using two dimensions:

1. Whether the software supports synchronous or asynchronous collaboration/communication;
2. Whether the software allows groups working together face-to-face or distributed (same place or different place).

**Discussion forums** are dedicated to specific topics, which allow for discussions between participants. An **electronic meeting system** helps group members solve problems and make decisions through interactive structured processes such as electronic voting.

With **desktop videoconferencing**, people can join meetings remotely. For that, you only need a laptop with a **webcam**, a speaker/microphone, videoconferencing software and an internet connection.

The advantages of intranets:

- Real-time access to information
- Enterprise search (search engines that are designed to search in multiple databases)
- Collaboration
- Employee portals

**Employee portals** allow for **employee self-service** for managing retirement plans or other HR related applications.

**Web 2.0** applications allow people to collaborate and share content online. Users go from passive consumers to content creators. The applications rely on **user-generated content** like youtube does. A **mashup** is an application that uses data from one or more service providers. Think of a site where you can see flight prices and hotel prices for your destination.

Many web 2.0 applications can be classified as **social media/social software** which allows people to communicate, interact and collaborate in various ways.

The **semantic web** is a set of design principles that will allow computers to better index web pages, topics and subjects. This allows computers to understand the content of web pages, whereas now only humans understand them. The search engines encourage **webmasters** (people responsible for creating and maintaining webpages) to integrate microdata in the pages HTML markup to help the engines understand the meaning of the content of the pages. Web 3.0 is envisioned to have semantic web concepts and AI applications.

Social media tools used for communication:

- Blogs: online text diaries about peoples lives or opinions. Blogging is sometimes called the **“amateurization” of journalism** because bloggers can share news faster than traditional journalists because bloggers do not need to check all their sources, making the news less accurate. Blogs can also be in the form of videos (vlogs, YouTube).
- Microblogging: enables people to voice their thoughts. They are usually short “status updates” (think Twitter). People can use a **hashtag** to indicate the topic and relate the tweet to other tweets about the same topic. A phrase or topic that is tagged more than others is **trending**. Microblogs can also be in the form of short videos (tiktok).
- Instant messaging: enables real-time written conversations (whatsapp)
- Webcasts/podcasts: audio or video files for on-demand playback.

**RSS** feeds notify users of updates to content. So instead of having to look at multiple sources for updated content, you can install an RSS reader that checks the sources for updates automatically.

**Metadata** describes data in terms of who, where, when, why, how etc. This can be used to make it easier to classify all the content. **Tag clouds** visualise user-generated tags or content on a site.

**Geotags** are used to add a location to digital media.

**Social bookmarking** allows users to share interesting content and to create categorization systems called **folksonomies**. **Social cataloguing** is the creation of a categorization system by users. An example would be sites where students can manage their citations.

**Cloud based collaboration tools** allow for easy access and easy transfer of files from one person to another. This way, a user always has the latest version of a certain file, no matter what computer they use. A **content management system** allows users to publish, edit, and retrieve digital content. This way, people can edit things on the website without having to ask IT.

The concept of **collective intelligence** is based on the notion that distributed groups of people with a divergent range of information and expertise can outperform the capabilities of individual experts.

**Peer production** is the creation of goods or services by self-organizing communities. A prime example of peer production is open source software (see also the technology briefing).

A **wiki** is a website allowing people to create, edit, or delete content as well as discuss about content or suggested changes with other members of the community. In contrast to a regular website, a wiki is linked to a database with all the previous versions.

**Crowdsourcing** is using everyday people as a cheap labour force by posting very small tasks online.

Social networking sites create **social online communities** where individuals with a broad and diverse set of interests meet, communicate and collaborate. Of course there are negative sides of social media like the creation of filter bubbles (you only see what you want to see) and **clickbait** articles (articles with incomplete or bizarre headlines that encourage users to click on them). **Social search** attempts to increase the relevance of search results by including content from social networks, blogs or microblogging services.

**Viral marketing** is using the network effect to increase brand awareness.

One of the main downsides of using social media as an organisation is the possibility of negative posts about the organisation.

## Chapter 6

**Business intelligence** refers to tools and techniques for analysing and visualizing past data, while **advanced analytics** refers to tools and techniques used to understand why something happened, predict future outcomes and discover hidden patterns. **Business analytics** is an umbrella term for these concepts.

Organizations that make decisions based on verifiable data are **data-driven organizations** and are measurably more productive and profitable.

Big data is of high volume, variety and velocity. Useful data can come in the following forms:

- **Structured data**: data which fit neatly into spreadsheets and databases
- **Semistructured data**: for example clickstreams and sensor data
- **Unstructured data**: for example text, audio and video data.

Successful organizations use a **continuous planning process**. In this process, organizations continuously monitor and analyze data and business processes.

Database terminology:

The thing you collect data about, for example people, is an **entity**. Entities are often placed in **tables**, where each row is a **record** belonging to an entity and each column is an **attribute**. Attributes (name and age) belong to an entity (person) and are gathered on a record.

Traditional databases are called **relational database management systems (RDMSs)**. These attempt to balance efficiency of storage needs, ease of retrieval and other factors by storing data in tables linked via relationships. They are not easily scalable in response to peaks in demand. They are also quite complex, so changes need to be carefully planned and managed. Systems that do not have these downsides are **NoSQL** systems. They can be distributed across multiple machines, which make them very scalable.

The two key elements of a database are the data and the structure of the data. The structure is usually captured in a **data model**, a map or diagrams that represents entities and their relationships. Each attribute needs to be of a certain type, like text, number or date. This **data type** helps the system organize and sort the data, complete calculations and allocate storage space. The format of the data is documented in a **data dictionary**, a document explaining several pieces of metadata for each attribute such as its name, the type of data expected and valid values. They often include **business rules** which help to prevent illegal or illogical entries from entering the database. **Master data** are the data deemed most important in the operation of a business. **Master data management** is more management than a technology focussed issue, because all business units must come to consensus on the meaning of master data items or on how to deal with duplicates.

Entering and retrieving data:

A **form** has blanks where the user can enter data or make choices, each which represents an attribute within a database record. To retrieve data, we use a **query**. The most common language used to interface with RDMSs is **structured query language (SQL)**

A **report** is a compilation of data from the database that is organized and displayed to the user.

**Report generators** help users to quickly build interactive reports and visualisations to present data in a useful format. Types of reports:

- Scheduled – produced at predefined intervals to support routine decisions
- Drill-down – provide greater detail
- Exception – highlight situations that are out of the normal range
- Key-indicator – provide a summary of critical metrics on a recurring schedule.

**Ad hoc queries** are queries answering unplanned information requests to support a nonroutine decision. Typically not saved to be run again.

The systems used to interact with customers and run a business in real time are called **operational systems**. **Online transaction processing (OLTP)** systems provide automated responses to the requests of the users, they are designed to handle multiple concurrent transactions from customers. **Informational systems** are designed to support decision making based on data. **Data warehouses** integrate multiple large databases and other data sources into a single repository. A crucial process for consolidating data from operational systems with other organisational data is **extraction, transformation and loading**. Data needs to be extracted from various resource systems. Then, the data are being cleansed and manipulated to for the needs of the analysis. **Data cleansing** is detecting, correcting or removing corrupt/inaccurate data. Then the transformed data are loaded into the warehouse. A **data mart** is a warehouse with limited scope. It contains selected data from the warehouse such that each mart is customized for the decision support needs of a particular end-user group.

Business intelligence tools are used by businesses to analyse both structured and unstructured data to obtain an understanding of current and past performance. **Decision support systems** analyse structured data and support decision making. They are designed to be an interactive decision aid that uses **models** to manipulate data. A **what-if analysis** allows users to make hypothetical changes to the data associated with a problem and observe how these changes influence the results.

**Online analytical processing (OLAP)** refers to the process of quickly conducting complex, multidimensional analyses of data stored in a database that is optimized for retrieval. The **OLAP server** understands how data are organized in the database and has special functions for analysing the data. **In-memory computing** is a trend where data are stored in a computer's main memory instead of on slow hard drives.

**Measures (or facts)** are the values the user wants to analyse (for example sales revenues).

**Dimensions** provide a way to summarize the data (for example per region). Dimensions are usually organized as hierarchies so the user can **drill down** from state, to county, to city, to individual store, or **roll up** which is the other way around. An **OLAP cube** is a data structure allowing for multiple dimensions to be added to the traditional two-dimensional table. Analysing the data on subsets of the dimensions is called **slicing and dicing**.

**Visualization** is the display of complex data relationships using a variety of graphical methods, enabling managers to quickly grasp the result of the analyses. **Digital dashboards** are used to visually present key performance indicators and other summary information used by managers. **Visual analytics** is the combination of various analysis techniques and interactive visualizations to solve complex problems. **Data science** is used to describe the advanced analytics field of study and practice.

**Data mining** provides capabilities for discovering “hidden” predictive relationships in the data. An **algorithm** refers to the step-by-step procedures used to make a calculation or perform some type of computer-based process. **Data reduction** reduces the complexity of the data to be analysed. **Association discovery** is a technique used to find associations or correlations among sets of items. **Sequence discovery** is used to discover associations over time. **Clustering** is the process of grouping related records together based on having similar values for attributes, thus finding structure in the data. This is an example of **unsupervised learning**, which is inferring hidden patterns in unlabelled data. **Classification** is used when the groups are known beforehand and records are segmented into these classes. This is an example of **supervised learning**, where an algorithm is trained using known training data.

Analysing unstructured data:

- **Text mining:** extracting information from textual documents.
- **Web content mining:** extracting textual information from web documents. A web crawler gathers web pages and documents that match prespecified criteria.
  - o **Sentiment analysis** can be used to learn about customer’s thoughts
  - o Operating department can learn about product performance
  - o Decision makers can gather **competitive intelligence** by analysing information about competitors’ products
  - o HR department can monitor employee satisfaction
  - o News reporters can find what topics are trending
  - o Investigators can identify possible instances of fraud
- **Web usage mining:** used to determine patterns in customer’s usage data. Analysing the **clickstream data**, the recording of a customer’s path through the website, can help assessing a page’s **stickiness**, the ability to attract and keep visitors.

**Machine learning** is a branch of artificial intelligence that allows systems to learn by identifying meaningful patterns when processing massive amounts of data. **Neural networks** are composed of a network or processing elements that work in parallel to complete a task. **Deep learning** uses multiple layers of neurons to extract features from input data. **Fuzzy logic** is used to handle subjective values.

**Predictive modelling** uses analysis, data mining and machine learning to build explanatory models that help understand data. **Artificial intelligence** is the science of enabling information technologies to simulate human intelligence as well as gaining sensing capabilities.

Based on complex machine learning algorithms, **intelligent systems** emulate and enhance human capabilities.

**Intelligent agents (or bots)** are programs that work in the background to provide some service when a specific event occurs. There are multiple types:

- User agents: automatically perform a task for a user like filling out a web form with routine information.
- Buyer agents (shopping bots): search to find the best price for a particular product.
- Monitoring and sensing agents: keep track of key data, notifying the user when conditions change.
- Data mining agents: continuously analyse large data warehouses to detect changes deemed important by a user.
- Web crawlers (also known as web spiders): continuously browse the web for specific information.
- Chatbots: agents that simulate human conversations.
- Destructive agents: designed by spammers and other internet attackers to farm email addresses off websites or deposit spyware on machines.

**Knowledge management** refers to the processes an organization uses to gain the greatest value from its knowledge assets. **Knowledge assets** are all databases, manuals, textbooks etc in which facts and procedures are recorded and stored. **Explicit knowledge assets** reflect knowledge that can be documented, archived and codified. **Tacit knowledge assets** reflect the processes and procedures that are located in a person's mind on how to effectively perform a particular task. A **knowledge management system** is a collection of technology based tools that includes communication technologies as well as information storage and retrieval systems, so that both explicit and tacit knowledge can be shared, stored and managed.

Organizations use **social network analysis**, which maps people's contacts to discover connections or missing links. This way, if you need to solve a problem, it becomes easier to find the person who has already solved that problem earlier. **Knowledge portals** are used to share knowledge with employees, customers, suppliers and the general public.

A **geographic information system** is used for creating, storing, analysing and managing geographically referenced data. It captures characteristics about geographical locations and allows for these characteristics to be coupled with other data to support decision making (also called **location analytics**).

## Chapter 7

### Core business processes

- order-to-cash: this is the process associated with selling a product or service.
- Procure-to-pay: the process associated with buying (procuring) goods from external vendors.
- Make-to-stock: goods are produced based on forecasts and are stocked in a warehouse.
- Make-to-order: raw materials are kept in stock based on forecasts, but manufacturing happens once an order is placed.

The set of business activities that add value to the end product is the value chain.

The **core activities** include inbound logistics (receiving), operations and manufacturing, outbound logistics (shipping), marketing and sales, and customer service.

The **support activities** enable the core activities to take place. They include: administrative activities, infrastructure, human resources, technology development and procurement (purchasing products as inputs to the core activities).

When companies link their value chains, they create a **value system**. An **upstream information flow** consists of information that the organisation receives from another organisation. A **downstream information flow** is the information produced by the organisation and sent to another.

Systems that focus on the needs of individual departments typically do not communicate with other systems and are called **standalone applications**. Systems that are not of use anymore because they are standalones, are called **legacy systems**. Many organisations have found the best system for every task, which are **best-of-breed systems**. However, having one system that contains all data is even better. These systems are known as **enterprise-wide information systems** or enterprise systems. With those, data only needs to be entered once and is available to everyone in the organisation.

**Internally focussed systems** support functional areas, business processes and decision making within an organisation. **Externally focussed systems** help to streamline communications and coordinate business processes with customers, suppliers, business partners and others outside the organisation. They are also known as **interorganizational systems**.

**Packaged software/off-the-shelf software** is written by third-party vendors for the needs of many different users, supporting standardized, repetitive tasks. These can be very cheap. **Custom software** is designed and developed exclusively for specific organizations. This is more expensive but the systems might suit the needs of the organization better.

The version of an enterprise system with only the standard features is called the **vanilla version**.

**Customization** provides either additional software or direct changes to the vanilla application itself. A major hurdle in implementing enterprise systems involves changing business processes to accommodate the manner in which the software works. Most enterprise systems are made to use industry-standard processes called **best practices**.

**Business process management (BPM)** is a systematic, structured improvement approach whereby processes are redesigned to achieve dramatic improvement. The basic steps for this are:

1. Develop a vision for the business objectives.
2. Identify the critical processes that are to be redesigned
3. Understand and measure the existing process as a baseline for improvements
4. Identify ways that information systems can be used to improve processes
5. Design and implement a prototype of the new process.

**Enterprise resource planning (ERP) systems** are the main enterprise systems used. ERP systems help an organizations to implement audit controls and comply with government-imposed regulations.

ERP control is the locus of control over the computing systems and data contained in those systems as well as decision-making authority. Companies have either centralized control or business units are allowed to govern themselves.

ERP business requirements: to meet the requirements, managers choose ERP components. There are core components (internal focus) and extended components (external focus).

The core components support operations such as: financial management, operations management and human resource management. The extended components support: supply chain management and customer relationship management.

Setting up the database is key to the implementation of an ERP system. A big limitation is that ERP forces businesses to change their processes. Also, once it is installed, it is hard to switch to another system. Recommendations for successful implementation of ERP systems:

- Secure executive sponsorship: the top-level management needs to support the implementation.
- Get help from outside experts
- Thoroughly train users
- Take a multidisciplinary approach to implementations: personnel from different levels and departments need to be on the implementation team.
- Evolve the implementation: update the system regularly

## Chapter 8

A **supply chain** is a collection of companies and processes involved in everything of turning raw materials into products and selling them to customers. However, this process is not one line, so it would be better described as a **supply network**. Before the internet was established, B2B e-commerce was done via **Electronic data interchange (EDI)**, which is a form of computer to computer communication. Now, web-based EDI protocols exist. Now, people mainly use **portals** for B2B interaction. Portals are access points through which a business partner can access secured information from another organization. The portals usually lead into the business' extranet. A **supplier portal** is part of an organization's extranet designed to automate business processes that occur between the organization and its suppliers. **Customer portals** are designed to automate business processes that occur between a supplier and its customers.

**B2B marketplaces** are operated by a third party. These marketplaces allow for real-time trading in **vertical markets** (markets composed of firms operating within a certain industry sector).

Managing supply chains:

- Just-in-time (JIT) production: companies place their orders in such a way that they arrive just before the company wants to use them. This allows them to keep less stock.
- Vendor-managed inventory (VMI): suppliers of a manufacturer manage the manufacturer's inventory. This helps to optimize inventory, minimized stockouts. To do this, the supplier needs data, and with this data the supplier can make more accurate forecasts.
- Reducing the bullwhip effect: the **bullwhip effect** is a ripple effect. Businesses usually keep some safety stock, but further up in the chain, forecasts are less and less sure, causing the safety stock to become larger.
- Corporate social responsibility:
  - Product recalls: if there is an error in a product, the seller needs to be able to make a recall for the safety of the customers.
  - Sustainable business practices: organizations must work in a sustainable and responsible way

**Supply chain management systems** are made to improve the coordination in the supply chain.

**Supply chain effectiveness** = the extent to which the supply activities meet the requirements of the external partners.

**Supply chain efficiency** = the extent to which a company optimizes the use of resources in its supply chain activities.

**Supply chain planning** involves the development of various resource plans to support the efficiency and effective production of products. The key processes are:

1. Demand planning and forecasting: demand needs to be forecast and potential fluctuations minimized.
2. Distribution planning: the transportation plan.
3. Production scheduling
4. Inventory and safety stock planning.

**Supply chain execution** is the execution of supply chain planning. It involves the management of 3 elements:

- Product flow: movement of goods from supplier to production to distribution to consumer. An SCM system should also support **reverse logistics**: products send back, collection of used goods for recycling etc.
- Information flow: for example order processing and delivery status updates.
- Financial flow: flow of payments

A key enabler for optimizing information flows is **Extensible markup language (XML)**. This is a standard for exchanging structured data over the web. An **XML tag** is a label that is inserted into an XML document to specify how the data contained in the document should be interpreted or used. Example: <item\_no>...</item\_no> says that the number between the tags is the product's item number. **Extensible business reporting language** is an XML optimized for publishing financial information.

**Supply chain visibility** refers to the ability to track products and also the ability to foresee external events. **Supply chain analytics** refers to the use of key performance indicators to monitor performance of the entire supply chain.

Blockchain is very secure, efficient and transparent.

**Customer relationship management (CRM) systems** become more and more necessary because customers have more complex needs and there are more platforms to manage relationships on.

Developing a CRM strategy:

- Policies and business processes need to reflect a customer-focussed culture
- Customer service
- Employee training: employees from all areas must have a focus on customer satisfaction
- Data collection, analysis and sharing.

Components of a CRM system:

- Operational CRM: this includes the systems used to enable customer interaction and service
  - Sales force automation: modules that support day-to-day sales activities.
  - Customer service and support: modules that automate responses to service requests. **Customer engagement centres** use multiple communication channels to support the communication preferences of the customers.
  - Enterprise marketing management: help a company in the execution of the CRM strategy by improving the management of promotional campaigns.
- Analytical CRM: analyses customer behaviour and perceptions in order to provide the business intelligence necessary to identify new opportunities and to provide superior customer service.
  - Social CRM is the use of social media to quickly react to customers concerns.
  - Social media monitoring: identifying and assessing the volume and sentiment of what is being said about a company or product.
- Collaborative CRM: systems for providing effective and efficient communication with the customer from the entire organization.
  - Greater customer focus: everyone in the organization knows what the customer needs.
  - Lower communication barriers: more information of a customer = better service.
  - Increased information integration: customers can get status updates from any organizational touch point.

Ethical concerns: CRM systems creating customer profiles and collecting data can be seen as an invasion of privacy.

## Chapter 9

**Making the business case** refers to the process of identifying, quantifying and presenting the value provided by a system. It is easy to calculate the costs of a system, but the productivity gains can be less clear. The **productivity paradox** is mainly caused by 4 factors:

1. measurement problems: many businesses measure efficiency, while increased effectiveness had the largest influence on productivity.
2. Time lags: there can be significant time lags between investment and observable impacts.
3. Redistribution: new systems can be useful only for certain companies and not the whole industry, causing the market shares to shift but not the overall productivity.
4. Mismanagement: some systems work very well but are implemented and managed badly.

Arguments for a business case:

- Faith: arguments based on beliefs about advantages.
- Fear: arguments based on the notion that if a system is not implemented, the firm will lose out to the competition.
- Facts: arguments based on data, quantitative analysis.

The **total cost of ownership (TCO)** is based on the costs of acquisition but also the costs of use and maintenance. Costs can be split in non-recurring costs and recurring costs. Non recurring costs such as buying an asset is usually referred to as **capital expenditure**. Recurring costs, such as maintenance costs, are usually referred to **non-capital expenditure/operational expenditure**. The specific costs mentioned are all **tangible costs**. However, the costs can also be **intangible** like the cost of lost customers if the website doesn't work as good as the competition's website.

The benefits of systems can also be **tangible** and **intangible**.

**Cost-benefit analyses:**

- **Net present value analysis** (using cash flows and the **discount rate**)
- Making a **break-even analysis**

To compare investments, one can use a **weighted multicriteria analysis**, where multiple criteria are evaluated and given an "importance" so that more important criteria have more influence on the outcome.

The **total economic impact** contains the impact on IT (project costs), impact on business (benefits), future options created (future flexibility), associated risks or uncertainties.

The process of designing, building and maintaining information systems is called **system analysis and design**. The person who performs this task is a **systems analyst**.

Custom software:

- Customizability: software can be tailored to meet unique organizational requirements
- Problem specificity: only having and thus paying for features you need

Off-the-shelf software: not customizable and no problem specificity, usually cheaper and less risky than custom software.

With **open source software**, the program's source code is freely available for use and/or modification (for example the programme R we used at statistics).

Linking different computing systems and software applications together is called **systems integration**.

A systems analyst is usually also the **project manager** and is responsible for the success of a project. **Software bugs** are errors or flaws in a computer program/system. **Systems development controls** should ensure that security features are implemented and proper change management processes are followed.

The **systems development life cycle (SDLC)** consists of 4 primary phases:

1. Systems planning and selection: consists of identifying, planning and selecting a development project from all possible projects.
2. Systems analysis
  - **Requirement collection:** gathering and organizing information from users, managers, etc to understand how a proposed information system should function. This can be done through: Interviews, questionnaires, observations, document analysis, joint application design (= group meeting based process)
  - Modelling data
  - Modelling process and logic: **data flows** represent the movement of data within an information system. **Processing logic** represents the way in which data are transformed. It is often expressed in **pseudocode**, a representation of the program's internal functioning, independent of the actual programming language used.
3. Systems design: should include:
  - Processing and logic
  - Databases and files
  - Human-computer interface: point of contact between a system and the users.

4. Systems implementation and operation
  - To implement, tests are conducted first: developmental testing, alpha testing and beta testing.
  - **System conversion** is the process of decommissioning the current way of doing things and installing the new system in the organization.

After this cycle, the system is in the **systems maintenance** phase. There are 4 types of maintenance:

- Corrective maintenance = repairing flaws.
- Adaptive maintenance = changing to accommodate changing needs.
- Preventive maintenance = making changes to reduce chances of future failure.
- Perfective maintenance = making enhancements to improve usability that are not necessarily required.

**Change request management** is a formal process in which the changes in the system basically follow the SDLC (see above). Vendors of off-the-shelf software packages incorporate **patch management systems** to facilitate the different forms of systems maintenance for the user. These systems use the internet to check the software vendor's website for available updates and install the update automatically.

Other approaches:

- **Prototyping:** using a trial-and-error approach for discovering how a system should operate.
- **Agile methodologies:** utilizing an evolutionary systems development approach that focusses on small, client-approved parts of the system as the project progresses rather than delivering one large application at the end of the project. These are highly recommended if:
  - Requirements are unpredictable or dynamic
  - Developers are responsible and motivated
  - Customers understand the process and are willing to get involved.

Acquiring information systems:

- **External acquisition:** purchasing an existing system from an outside vendor. A **request for proposal** is a document that is used to tell vendors what your requirements are and to invite them to provide information about how they might be able to meet those requirements. One of the methods used to evaluate a proposed system is **systems benchmarking**. Here you use standardized performance tests to facilitate comparison between systems.
  - Shrink-wrap licences:** contract is activated as soon as the wrap on the packaging has been removed
  - Click-wrap licences:** contract is activated as soon as users click "I accept" on the licence agreement before installing the software.
  - Enterprise/volume licence:** Are usually negotiated, they usually also contain disclaimers so the vendor cannot be sued if the software does not operate as expected.
  - Software asset management** helps organizations to match licences to software and such.
- **Outsourcing systems development:** the responsibility for the development of information systems is turned over to an outside firm. This can be cheaper or result in higher quality than in-house development. It also helps the business to focus on their processes if they do not need to worry about IS development.

## Chapter 10

**Computer crime** is defined as the use of a computer to commit an illegal act. This includes the following:

- Targeting a computer to commit an offense.
- Using a computer to commit an offense.

- Using computers to support a criminal activity even though computers are not actually targeted.

Gaining access to computer systems without authorization is known as **hacking**. There are “white hat hackers”, people who hack computers with good intentions and “black-hat hackers”, people who hack computers with the intention of doing some sort of harm. The latter are also known as **crackers** (while the white hats are still known as hackers). Hackers that break into systems to promote political or ideological goals are **hacktivists**.

There are many types of computer crimes. One of them is **industrial espionage** where things like theft of trade secrets, bribery, blackmail and technological surveillance are used to gain advantage over rivals.

This is the top 4 of types of computer criminals:

1. Current or former employees who are able to steal or otherwise do damage to employers.
2. People with technical knowledge who commit business or information sabotage for personal gain.
3. Career criminals who use computers to assist in crimes (using a computer to log your drugs sales).
4. Outside crackers simply snooping to find data of value, most of these do not cause any damage.

Software used by computer criminals:

- Vulnerability scanners: test targeted systems for weaknesses;
- Packet sniffers: analyse network traffic and capture unencrypted passwords;
- Keyloggers: capture every keystroke and can therefore gather email addresses, passwords and credit card numbers

Other methods used:

- Phishing
- Social engineering: acting like someone else to trick others into revealing information;
- Shoulder surfing: looking over someone’s shoulder when they are entering their access credentials;
- Dumpster diving: looking in bins for potentially useful information.

**Unauthorized access** occurs whenever people who are not authorized to see, manipulate or handle data search systems still do so. **Insider threats** are people within an organization with malicious intentions. There are different things insiders can do/use:

- **Wikileaks**: this is a site that frequently publishes information obtained from insiders.
- **Backdoors**: hidden access points allowing for unauthorized access installed by the insider. An unintended backdoor due to bad programming is a zero-day vulnerability.
- **Zero-day**: a zero-day is an undisclosed hardware or software vulnerability that crackers can exploit (so this one is not specific to insiders).

**Unauthorized data modification** occurs when someone accesses data and then changes it in some way while they are not authorized to do so.

Many data leaks are caused by improper safeguarding of information because people keep access codes in plain sight, do not update their antivirus software or carelessly share information with outsiders. With the use of mobile devices, there are some more threats like this: losing the phone and not being able to remotely wipe data, using unsecure wireless networks and **jailbreaking**. Jailbreaking is modifying the operating system to remove manufacturer restrictions to run applications other than those from the official app store.

**Denial-of-service (DoS) attacks** occur when electronic intruders use up all the resources of a system so that the service is not available to the legitimate users. This is often done using **zombie computers**. These computers are infected with viruses or worms . Without the user’s knowledge, the computer can be used to perform a DoS attack. **Distributed denial-of-service (DDoS) attacks** are

similar to DoS attacks but with a larger amount of zombie computers. They are difficult to counter because it is impossible to see which user is legitimate and which is a zombie.

**Malware** is malicious software. There are many forms:

- **Virus:** a destructive program that disrupts the normal functioning of information systems. It only spreads if infected files are shared.
- **Worms:** a virus that uses networks to spread itself.
- **Trojan horses:** look like legitimate programs but carry a destructive payload. They cannot really spread.
- **Logic/time bombs:** type of trojan horse, wait until a user performs a triggering operation. Logic bombs are set off by specific actions such as entering a specific password or adding or deleting data from certain databases. Time bombs go off on a certain date.
- **Ransomware:** locks the files and documents of a computer until the user pays the cracker.
- **Spyware:** any software that gathers data about users through an internet connection without the user's knowledge. It can be carried by **adware** – free software paid for by advertisements appearing during the use of the software – to collect surfing behaviour to customize website banner advertisements.
- **Spam:** junk mail or postings to advertise a product/service. It takes up a lot of storage space and bandwidth. To stop spam, many organizations use **spam** filters. Another method to catch spam bots is using a **CAPTCHA**. This is a distorted image displaying a combination of letters and numbers that a user has to put into a form before submitting it. They can also be used to prevent crackers from using a **brute force approach:** having a bot submit millions of possible passwords until the correct password is found. Spam can be used to circulate **internet hoaxes**, which are false messages that encourage the receiver to send it to others as well. It can also be used for **phishing:** trying to trick someone into giving away their authentication credentials. **Spear phishing** is a more sophisticated form of phishing as it targets a specific person or organization by personalizing the message.
- **Cookies:** a cookie is a small text file passed to a web browser on a user's computer by a web server. The browser then stores the message and it is sent back to the server each time the user's browser requests a page from the server.

**Botnets** are collections of zombie computers connected via the internet. They are the standard operation method for professional cybercriminals.

One of the fastest growing cybercrimes is **identity theft**. This is the stealing of someone's personal data to use their money to buy stuff.

There are more forms of misuse of computers:

- **Cyberharassment:** using a computer to communicate obscene content about a person with the internet with the intent of harming or harassing that person.
- **Cyberstalking:** following, threatening and/or intimidating someone using electronic means.
- **Cyberbullying:** deliberately causing emotional distress in the victim.

These three can be done in many ways, one of which is **doxing:** researching and broadcasting personally identifiable information about the victim. **Online predators** typically target vulnerable people for sexual or financial purposes.

**Software piracy** is the illegal copying of software. Software is usually protected under **copyright** while processes or machines are protected using **patents**. To prevent software piracy, many vendors require the users to enter a license key or verify the key before allowing the customer to register or update the software. To discover and understand the protection mechanisms, cyber criminals disassemble the software, called **reverse engineering**. Once they know how it works, they can build a **key generator** that can be used to generate fake license keys.

**Cybersquatting** is registering a domain name and then trying to sell the name to the person/company most likely to want it for a lot of money.

**Cyberwar** refers to an organized attempt by a country's military to disrupt or destroy the information and communication systems of another country. Controlling the content and distribution of propaganda and information to an opponent's civilians, troops and government is a key part of a cyberwar strategy. **Web vandalism** can occur by defacing an opponent's websites. Cyberpropaganda and espionage is also used in a cyberwar. Governments accused of cyberwar activities usually blame **patriot hackers**: independent citizens or supporters of a country that perpetrate attacks on perceived or real enemies. A famous example is **Stuxnet**: a worm coming from Belarus, specifically programmed to find and infect a specific type of industrial hardware inside Iranian nuclear plants. Turns out it was made by the USA and Israel, and not Belarus.

**Cyberterrorism** is launched by individuals and organized groups that are not governments (otherwise it's cyberwar).

Information systems are mostly threatened by:

- Natural disasters
- Accidents
- Employees and consultants (insiders)
- Links to outside business contacts (data can be at risk when in travels, especially via public networks such as the internet)
- Outsiders (hackers and crackers).

**Information system security** refers to precautions taken to keep all aspects of information systems safe from destruction, manipulation or unauthorized access. Organizations must consider the following when securing their systems:

- Availability: legitimate users should be able to use.
- Integrity: unauthorized manipulations must be prevented
- Confidentiality: data are protected from unauthorized access
- Accountability: actions should be traceable.

Security is an ongoing process consisting of: assessing risks, developing a security strategy, implementing controls and training, monitoring security.

**Information systems risk assessment** is used to obtain an understanding of risks to the availability, integrity and confidentiality of data. There are **threats** and **vulnerabilities**. Threats are undesirable events that can cause harm. Vulnerabilities are weaknesses in a system or security policies that can be exploited. These both together decide the possible impact of the combinations of threats and vulnerabilities. Organizations can do the following:

- Risk reduction: taking active countermeasures to protect systems
- Risk acceptance: simply absorb all damages that occur. This is possible when the impacts are very small.
- Risk transference: having someone else absorb the risk, when other parties are better equipped to manage the risk.
- Risk avoidance: simply not having any computers makes sure you cannot get hacked.

To reduce risks or their impacts, one uses **information systems controls**. There are 3 types:

- Preventive controls
- Detective controls
- Corrective controls

**Acceptable use policies** are used to secure data even more. They usually have clearly spelled-out penalties for noncompliance.

Disaster planning;

A **business continuity plan** describes how business continues operating after a disaster before normal operations have been restored. A **disaster recovery plan** spells out detailed procedures for recovering from systems-related disasters. Organizations need to keep **backups** of important data. A **cold backup site** is an empty warehouse with all necessary connections for power and communication but nothing else. In the case of a disaster, the company must first set up all necessary equipment before they can access their backup data. This takes time but is cheaper than a **hot backup site** which is already fully equipped. In the case of a disaster all that needs to be done is relocating the employees to the backup site to continue working.

Designing the recovery plan;

**Recovery time objectives** specify the maximum time allowed to recover from a catastrophic event.

**Recovery point objectives** specify how recent the backups must be. When all data is always synchronized on all servers the data is **mirrored** on separate servers. This can be very expensive.

**Identification** is a user's claim or declaration of being someone. **Authentication** is the process of confirming the identity of a user who tries to access a restricted system. **Authorization** is provided by the system based on identification and authentication. It can be granted based on one or more of the following:

- Something you have (key)
- Something you know (password)
- Something you are (fingerprints)

With **biometrics**, people can be identified/authenticated by fingerprints, patterns in the eye, facial features or other unique bodily characteristics. The use of two types of credentials to gain access to a system is **two-factor authentication**. **Access-control software** can allow computer users to only access the files related to their work.

**Drive-by hacking** is where the attacker accesses the network the firm operates on to reach their goal. To prevent this, firms can use **wireless LAN control**, which makes sure only authorized users gain access. A **virtual private network (VPN)** is a network connection that is constructed dynamically within an existing network to connect users.

A **firewall** is a part of a computer system designed to detect intrusion and block unauthorized traffic from entering a private network.

**Encryption** is the process of encoding messages using an encryption key before they enter the network, then decoding them using a matching key at the receiving end. With **end-to-end encryption**, it is impossible for eavesdroppers to gain access to the communication. **Symmetric encryption** is when the sender and receiver have the same key to encrypt and decode. With **asymmetric encryption** there is a **public key**, with which everyone can encrypt a message, and a private key. The private key can decode all the public messages. Encryption cannot really be used when securing data that is currently in use. Hence, **cloud security** is becoming more important.

**Computer forensics** is used to evaluate digital information for juridical review. **Honeypots** are computers or data used to find crackers, mainly used by agencies on the **dark web**. The dark web refers to webcontent that is used for "bad stuff".

## Technology briefing

### Foundational topics in IS hardware

#### Input technologies

Input technologies are used to enter data into a computer like keyboards and mice. **Batch data** are large amounts of routine data. They are usually entered into a computer using scanners. Entering a large amount of data and processing it at a single time is called **batch processing**. Once a document is converted into digital format, **text recognition software** uses **optical character recognition** to convert text into the computer-based characters that form the original letters and words. Other scanning technologies are optical mark recognition devices, bar code readers and magnetic ink character recognition. **Smart cards** are cards containing a chip and can be used for building access, identification or contactless payment.

**Interactive voice response (IVR)** is used for telephone surveys or to guide you through the various menu options when calling a customer service line. **Streaming media** do not need to be completely downloaded before they can be opened.

#### Processing technologies

Processing technologies transform inputs into outputs.

The inside of a computer: a computer has a **motherboard** which holds the **central processing unit (CPU)/microprocessor** and connects it to the power supply, storage and peripherals. The CPU consists of the **arithmetic logic unit (ALU)** and the **control unit**. The first performs calculations, the second fetches and decodes instructions and retrieves and stores data. CPUs with multiple ALUs and control units are called **multi-core processors**.

Data are represented in **bits**. 8 bits are a **byte**. **Binary codes**, like the **American standard code for information interchange (ASCII)** are developed to represent characters or numbers as strings of bits. **Unicode** allows for more than just the Latin alphabet. Translating into binary code is called **digitizing**. And electronic unit generates pulses, which speed sets the pace of processing. This circuit is the **system clock** and one pulse is a **clock tick**. The **clock speed** is measured in Hertz (Hz).

**Primary storage** is located on the motherboard and is used to store the data currently in use. An example of this is **random-access memory (RAM)**. This storage is **volatile** because the data is lost when the power is turned off. **Registers** provide small temporary storage locations where data must stay while being processed or manipulated. A **cache** is memory used by processors to store instructions that are most recently or most often used. **Read-only memory (ROM)** is used to store programs that are automatically loaded when the computer is turned on, such as the **basic input/output system**. This memory is **nonvolatile** because it retains the data when the power is off.

**Secondary storage** are technologies used for permanently storing data such as a **hard drive**.

**Redundant array of independent disks (RAID)** technologies store copies of data on 2 or more hard drives for extra safety. A hard drive consists of multiple disks, and these all have an access arm with two **read/write heads** to inscribe or retrieve data. These do not touch the disks. If they do, it's a **head crash** which leads to a loss of data. Another secondary storage technology is the **solid-state drive (SSD)** which is faster and more reliable but also more expensive than a hard drive.

Removable storage media: **flash memory** is a memory chip-based nonvolatile computer storage. A **flash drive** is a device that includes flash memory with an integrated USB interface. **Optical disks** are written and read using laser beam technologies. An **CD-R (compact disc-recordable)** and a **CD-RW (compact disc-rewritable)** are forms of optical disks. The second one can be written onto multiple times, while the first one cannot. A **digital versatile disc-read-only memory (DVD-ROM)** has more

storage space than a CD due to the use of a shorter wavelength laser beam. **Tapes** are typically only used for archiving data and long term storage. The storage capacity of tapes are expressed as **density** which is the **bytes per inch (BPI)** that can be stored on the tape.

A **port** provides a hardware interface for connecting devices to computers. The **power supply** converts electricity from the wall socket to a lower voltage.

### Output technologies

Output technologies deliver information to you in a usable format or act on the processed data. A **printer** is an output technology, and monitors too. Monitors use either **liquid crystal display (LCD)** or **Cathode ray tubes (CRT)**. The first are lighter and thinner (and newer) than the second. Even newer technologies like **organic light-emitting diodes (OLED)** require even less energy and are lighter than LCD panels. A **touch screen** is a display screen that is also an input device.

## Foundational topics in IS software

### System software

Operating systems are systems like iOS, Windows and Android. Device drivers allow the computer to communicate with hardware devices. **Utilities (Utility programs)** manage computer resources and files.

### Programming languages and development environments

The **source code** is the program written in programming language. It must be translated into object code so the hardware can understand. A **compiler** takes an entire program's source code and converts it into an **executable** which is a program in machine language that can be read and executed directly by the computer. An **interpreter** does both the conversion and the execution.

Programming languages:

- **Object-oriented languages** use common modules (called objects, for example a student) which combine properties (names, dates etc) and behaviours (registering for a course) to define the relevant system components.
- **Visual programming languages** use **graphical user interface (GUI)** for their programming, where with a few clicks of the mouse a button is programmed, instead of having to program every pixel of the button.
- **Web development languages**. The markup language used is HTML. **HTML tags** are used to instruct a web browser on how a document should be presented. Programs for creating web pages are **web page builders/HTML editors**. **Cascading style sheets (CSS)** specify the formatting and layouts of elements on a webpage. Another programming language for web development is **Java**. You can learn the language or use **applets** who provide the content you want on your webpage. **Scripting languages** let you build programs or scripts directly into HTML page code. **JavaScript** is a scripting language but does not resemble Java in any way.
- **AI development**. Many AI applications are also made with certain programming languages (book doesn't name any)

**Computer-aided software engineering (CASE)** is the use of automated software tools by system developers to design and implement information systems.

## Foundational topics in Networking

### Evolution of computer networking

- Centralized computing: large centralized computers (mainframes) were used to process and store data. To enter data, people used **terminals**. These were called “dumb terminals” because they didn’t do any of the processing.
- Distributed computing: separate computers work independently on subsets of tasks and then individual results are pooled by communicating over a network
- Collaborative computing: a synergistic form of distributed computing in which two or more networked computers work together to accomplish a common processing task.
- Network services: computers can share capabilities. There are also computers that manage the network with **authentication services** for verifying the users and **directory services** which are “address books” (repositories) containing information about users and access rights.

### Types of networks

- Private branch exchange (BPX) is a telephone system that serves a particular location
- Local area network (LAN) is a computer network that spans a relatively small area.
- Wide area network (WAN) is a network that spans a relatively large area and are typically used to connect LANs.
  - Campus area network: multiple LANs used by a single organization.
  - Metropolitan area network: computer network of limited geographic scope.
  - Enterprise WAN: WAN connecting disparate local networks of a single organization into a single network.
  - Value added network: private, third-party managed WAN used for B2B communications.
  - Global network: spans multiple countries and may include networks of multiple organizations. Example: the internet
- Personal area network: very small area, devices connected by **Bluetooth**.

To enable rapid transmission of data, most networks use **packet switching**. With this, computers take turns with sending their data, so that if someone has a large “order”, people with smaller orders do not have to wait until the large order is completely delivered.

### Network standards and protocols

Protocols make sure communication between computers is successful

- The **open systems interconnection (OSI)** divides computer-to-computer communications into seven connected layers. The OSI model represents a group of specific tasks as successive layers that enable computers to communicate data:
  1. Physical
  2. Data link
  3. Network
  4. Transport
  5. Session
  6. Presentation
  7. Application
- Transmission control protocol/internet protocol (TCP/IP) is the protocol used by the internet. TCP break down a message into smaller packets, creates a connection between two computers and ensures data are reliably transmitted and arrive in the correct sequence. IP is responsible for addressing and correct routing of packages from source to destination. **Routers** are devices that connect networks and forward the packages. A data packet that conforms to the IP specification is an **IP datagram**.

- **Ethernet** is a set of LAN protocols using packet switching. **Network interface cards** allow computers to connect to an Ethernet.

**Network topology** refers to the shape of a network. There are 4 basic shapes:

- **Star network**: all computers are connected to a central hub
- **Ring network**: all computers are linked to their 2 “neighbour” computers
- **Network bus**: open ended line where each workstation receives the same message simultaneously
- **Mesh networks**: computers are (fully or partially) connected to each other.

**Media access control** is the set of rules that governs how a given workstation gains access to the network. With distributed control, only one workstation at a time is allowed to transmit its data. With random access, any workstation can transmit data by checking whether the medium is available. With **carrier sense multiple access/collision avoidance (CSMA/CA)** each connected device “listens” to traffic on the transmission medium to determine whether a message is being transmitted. If no traffic is detected, the device sends its message. Otherwise, it waits.

### Network technologies

A **switch** is used to connect multiple devices to create a network. They forward data packets to the correct addressee. A **wireless access point** transmits and receives wireless signals (Wi-Fi). A **wireless controller** manages multiple access points and can be used to manage transmission power and channel allocation to establish desired coverage.

Twisted pair cables are made of two or more pairs of insulated copper wires twisted together. A coaxial/coax cable contains a solid inner copper conductor surrounded by plastic insulation and an outer braided copper or foil shield. Fiber-optic cable is made of a light-conducting glass or plastic core surrounded by more glass and a tough outer sheath. These are used for high speed **backbones**, the central networks to which many smaller networks can be connected.

Wireless media:

- Infrared line of sight: used high frequency light waves
- High-frequency radio: uses radio signals. When you use a **cellular phone**, signals are sent to a **cell** with a low-powered radio receiver. The cell is a small geographic area with an antenna.
- Microwave transmission: uses high-frequency radio signals that are sent through the air using terrestrial or satellite systems. Because of the distance signals must travel, satellite transmissions are delayed (**propagation delay**).

### The internet

The internet started when the US defence agency began to study networks. This results in the advanced research projects agency network. This linked many universities and research centres. It quickly became connected with other networks such as the national science foundation network from the national science foundation. To connect networks, the internet uses routers. The routers can also connect to the wide area backbone, from which the messages are sent to other routers. The Internet Assigned Numbers Authority manages top-level domains and global IP number space assignments. It also provides maintenance of the **Domain Name System (DNS)** root database which is used to associate internet host names with their IP addresses. **InterNIC** manages directory and database services on the internet. This later morphed into the **internet corporation for assigned names and numbers**. **IPv6** is the newest class of IP addresses.

To connect to the internet, most people use an **internet service provider (ISP)**. ISPs connect to each other through **internet exchange points**, which are a key component of the **internet backbone**.

Ways of connecting:

- Dial-up: connecting to the internet through a telephone line. This is the **plain old telephone service (POTS)**. It passes sounds in the form of **analog signals**, which computers use **digital signals**. To convert these, you need a **modem**.
- Integrated services digital network (ISDN): uses existing telephone wires to provide high speed data service. It is completely digital so it doesn't need a modem.

- Digital subscriber line (DSL): used for connections from a telephone to a home or office. It sends digital pulses over existing copper telephone wires. It does require a modem-like device.
- Cable modems: needed to transmit data over cable TV lines.
- Satellite connections: PCs are connected to satellites.
- Wireless broadband: Small dishes on the roofs are pointed at a central antenna. Mainly used in areas with no DSL and cable.
- Mobile wireless access: as long as you are in the coverage area of your internet provider, you have access to the internet.
- Fiber to the home: fiber-optic cables running directly into homes.
- Leased lines: only used by businesses. They lease dedicated **T1 lines** for digital transmissions. **T3 lines** are even faster but also much more expensive.

**Internet hosts** are computers working as servers on the internet.

## Foundational topics in database management

### Relational database management

The **primary key** is a unique identifier for each type of entity, for example a student ID because they might have the same name. When the primary key is made of multiple attributes, it is called a **combination primary key**, for example student ID and course ID. Attributes that are not used as the primary key are **secondary keys** when they are used to identify one or more records within a table that share a common value. (for example using “grade” to find all students with a certain grade).

There are 3 types of **relationships** or **associations** between entities:

- One-to-one: each team has only one home stadium, and each home stadium has only one team
- One-to-many: each player is on only one team but each team has many players
- Many-to-many: each player participates in many games, and each game has many players.

An **entity relationship diagram (ERD)** is used when showing associations between entities. To create one, you draw entities as boxes and draw lines between entities to show relationships. The **relational database model** is the most common DBMS (data base management system) approach. With this approach, entities are presented as two-dimensional tables. **Normalization** is a technique to make complex data relational databases more efficient and more easily handled by the DBMS.

### Advanced database models

Relational databases perform poorly when processing unstructured data. A **computer cluster** consists of a set of computers that work together as a single system. This helps NoSQL databases to process unstructured data, making them more advanced than relational databases.

## Lectures

### Lecture 1

Digitale innovatie: “een product, proces of bedrijfsmodel dat als nieuw wordt ervaren, enkele significante aanpassingen aan de kant van de gebruikers vereist, belichaamd in of mogelijk gemaakt door IT”

Belangrijke kenmerken:

- Digitalisering (fysiek/analooq -> digitaal)
- De wet van Moore (snelle prestatieverbeteringen)
- Netwerkeffecten (meer gebruik = meer innovatie)

Digitale dichtheid = de hoeveelheid verbonden data per eenheid van activiteit.

Informatie technologie:

- Hardware
- Software
- Netwerken

IT = informatie technologie

IS = informatie systemen

IT megatrends:

- Mobiel
- Sociale media
- Internet of things (veel objecten zijn "smart")
- Cloud computing
- Big data

Data heeft geen betekenis van zichzelf. Weinig waarde tot het verwerkt is

Informatie is een weergave van de werkelijkheid die kan helpen vragen te beantwoorden over wie, wat, waar en wanneer.

Kennis is het vermogen om informatie te begrijpen.

Primaire functie IS = data omzetten in informatie.

## Lecture 2

Nieuwe IS strategie: decentralisatie van IT. Five forces model: concurrenten, substituten, macht van leveranciers, macht van afnemers, dreiging van nieuwe toetreders.

Business model:

- Waarde-propositie
- Klantsegmenten
- Kanalen
- Relaties met klanten
- Inkomsten
- Kostenstructuur
- Key activities
- Key partners
- Key resources

Business-model innovatie

- Platform business models: sommige gebruikers creëren en andere gebruikers consumeren.
- Service based business models: diensten ipv producten (scooters huren ipv kopen)
- Data driven business models: data als voornaamste inkomstenbron

IS-strategie: afstemmen van een portfolio van applicaties, 5 fasen:

1. Strategic awareness
  - Proces organiseren, business en IS op een lijn brengen
  - Henderson & venkatraman: interne en externe domeinen, business en IT domeinen
2. Situation analysis
  - SWOT

McFarland's strategic grid:

Y-as = IS impact on operational performance  
 X-as = impact on achieving future strategic processes

High	Factory <ul style="list-style-type: none"> <li>- Critical to existing</li> <li>- Competitive advantage</li> </ul>	Strategic <ul style="list-style-type: none"> <li>- Critical to future business succes</li> </ul>
Low	Support <ul style="list-style-type: none"> <li>- Not critical</li> </ul>	Turnaround <ul style="list-style-type: none"> <li>- Might give future success or competitive advantage</li> </ul>
	Low	High

3. Strategy conception
  - Algemene doelstellingen
4. Strategy formulation
  - Bepalen hoe organisatie en IS-portfolio eruit moeten zien.
5. Strategy Implementation
  - Vaststellen van aanpak

### Lecture 3

Central Processing Unit (CPU) = “brein” van de computer. Bestaat uit control unit (haalt instructies op) en arithmetic logic unit (voert instructies uit).

Een computer heeft twee waarden: 0 en 1, = bit. 8 bits = 1 byte

Wet van Moore: capaciteit van chips verdubbelt elke twee jaar. Een transistor is een onderdeel van een chip die ervoor zorgt dat de nullen en enen komen.

Computernetwerken: systemen om 2 of meer apparaten te verbinden. Guided: kabels, glasvezel.

Unguided: infrarood, wireless.

OSI-model: afspraken voor data-uitwisselingen.

Protocollen voorbeelden:

- Bluetooth
- 3G, 4G, 5G
- Ethernet
- Wifi
- TCP/IP (protocol dat internet definieerd)

TCP zorgt ervoor dat de berichten intact aankomen. IP is het “adres”.

Cloud computing = software en capaciteit gebruiken die niet op je eigen hardware staan.

Modellen voor cloud:

- Infrastructuur als een service: opslag, verwerking, netwerken.
- Platform as a service: eigen apps ontwerpen en runnen.
- Software as a service: apps via de cloud.

Software:

- Kopen: goedkoop, makkelijk, hoge kwaliteit
- Huren: alleen betalen voor wat je gebruikt
- Zelf maken: precies wat je nodig hebt

Software ontwikkeling:

- Waterval
- Agile

## Lecture 4

Enterprise systems zijn systemen die een beetje op de achtergrond werken, met 1 centrale database, waar de processen al in voorgeprogrammeerd in staan. Het bevat dus best practices: gedefinieerde bedrijfsprocessen. Het zorgt voor integratie van data en processen uit afzonderlijke systemen. Het hebben van losse systemen zorgt voor inflexibiliteit en dubbele data.

ERP = enterprise resource planning, voorloper van enterprise systems. Ze worden steeds meer geïntegreerd met externe systemen en meer gebruik van cloud.

Er is een directe relatie tussen deze systemen en de bedrijfsprocessen. Activiteiten en hoe ze elkaar opvolgen staan in zo'n systeem opgeslagen. De bedrijfsprocessen en 'best practices' moeten goed op elkaar afgestemd worden.

Bedrijfsprocessen aanpassen is lastig maar kan wel.

Aanpassen enterprise systems:

- Configuratie: parameters instellen
- Extensie: meer modules aanschaffen
- Customization: aanpassen software

Implementatie manieren:

- Vanilla: weinig tot geen maatwerk, organisatieverandering doorvoeren.
- Chocolate: niet de best practices volgen, huidige processen zijn leidend, software wordt aangepast.

Implementatie manieren:

- Big bang: alles in een keer
- Geleidelijk

Verkoop heeft customer relationship management nodig: (in het boek 'widen, lengthen, deepen')

- Klantenwerving (acquisitie)
- Klantbehoud
- Klant uitbereiding (cross-selling en up-selling, dus iemand extra producten laten kopen en iemand duurdere versies laten kopen)
- Selecteren: klantsegment kiezen

CRM: operational, analytical en collaborative. Bij analytical gaat het voornamelijk over data.

Supply chain management

De waardeketen van Porter gaat over een **individuele** organisatie, NIET over de hele keten. Het waardesysteem wel, die bestaat uit allerlei waardeketens van individuele organisaties.

Primaire keten: fabrikant, groothandelaar, detail-handelaar, consument. Er zijn allerlei stromen tussen de delen van de keten, eigendom bijvoorbeeld, financiering, informatie, producten etc.

Partijen rondom de keten: overheid, stichtingen etc.

SCM strategie:

- Efficiëntie
- Effectiviteit

SCM activiteiten:

- SC planning
- SC execution
- SC visibility en analytics

Belangrijke concepten: JIT (just in time), VMI, RFID (radio frequency identification), XML (extensible markup language)

XML is net zo-iets als HTML. Het voordeel is dat je de inhoud op verschillende dingen kan toepassen.

Het bullwhip effect: een kleine verandering in een deel van de keten kan ervoor zorgen dat er veel veranderd als er een gebrek is aan informatie over de reden van de verandering. De verkoper kan namelijk makkelijk vraag voorspellen maar dat wordt steeds moeilijker als je meer naar achteren gaat in de keten. Met het delen van informatie kunnen de pieken en dalen bij suppliers verminderd worden.

Van geen automatisering zijn we nu naar bijna volledige integratie gegaan. Systemen zijn ook steeds meer web-gebaseerd.

Interorganisationele systemen coördineren processen binnen organisaties en tussen organisaties en klanten. Zelfs hele ketens kunnen worden verbonden.

## Lecture 5

E-commerce varianten:

- C2C (marktplaats)
- B2C (coolblue)
- C2B (shutterstock)
- B2B (google ads)

G2C, G2B en G2G kunnen ook, waarbij G = government.

Strategieën van e-tailing (online verkoop)

- Brick and mortar (fysieke winkels), dus eigenlijk niet heel erg e-tailing, starbucks, toeristenwinkeltjes.
- Click only (winkels die alleen op het internet zijn), netflix, bol.com.
- Click and mortar (fysiek en online) apple, coolblue.

Voordelen e-tailing: (belangrijk voor examens volgens docent)

- “nagenoeg ongelimiteerd” productaanbod omdat je producten op de website kunt hebben staan die je niet in voorraad hebt.
- Altijd in de buurt van de klant. Je hoeft niet in een drukke winkelstraat te staan.
- Goedkoper, je hebt geen dure winkels nodig en kan hogere volumes draaien (schaalvoordelen).

Nadelen:

- Minder basis voor “vertrouwen”. In een winkel kun je veel beter zien waar je heen kan als er iets mis is met je product, bij een fysieke winkel is er iig een winkel (dus minder kans op scam).
- Geen ‘live’ productervaring: je kan niet passen of zien hoe groot iets is.
- Kost tijd: verzending en terugsturen. Als je iets in de winkel koopt heb je het meteen, online moet je wachten tot het geleverd is.

Channels:

- Multichannel: je kan op meerdere kanalen producten kopen (website, app, telefonisch, brick and mortar etc)
- Cross-channel: process via verschillende kanalen, je koopt het op de website, krijgt een track and trace in de mail, en ontvangt het fysiek (anders dan multichannel omdat je eerst het een gebruikt en dan het ander)
- Omni-channel: meerdere kanalen tegelijk gebruiken (AH bonusapp gebruiken terwijl je door de winkel loopt).

Dis-intermediatie: het verdwijnen van een tussenpartij. In plaats van naar een reisbureau te gaan die je tickets bij een vliegmaatschappij koopt, je tickets rechtstreeks kopen bij de vliegmaatschappij.

Re-intermediatie: het ontstaan van een **nieuw type** tussenpartij. Bijvoorbeeld sites die alle prijzen van vliegtickets op een rij leggen. (dus niet dezelfde organisatie terugplaatsen maar echt een nieuw soort!!).

Digitalisering is een belangrijke drijfveer voor re- en dis-intermediatie, maar de tussenpartij hoeft niet digitaal te zijn.

De 'hits' zijn producten waar veel vraag naar is. De 'long tail' bestaat uit de niche producten, die dus niet veel verkopen. Er is wel vraag voor, maar het is niet heel populair. Daarom verkopen brick and mortar winkels dit vaak niet, is geen ruimte voor. Online winkels kunnen dit wel aanbieden (zie voordelen)

Een nadeel van e-commerce was het gebrek aan vertrouwen. Dit wordt (deels) verholpen door ratings en reviews.

Voordelen:

- Basis voor onderling vertrouwen
- Scammers kunnen snel ge-identificeert worden

Nadelen:

- Nieuwkomers hebben nog geen ratings en zijn dus "niet te vertrouwen"
- Beoordelingen zijn 'niet normaal verdeeld'. Mensen geven vaak 1 of 5 sterren, niks ertussenin.
- Het is niet objectief maar ten opzichte van je verwachtingen. Ook de koper wordt beoordeeld (alleen mensen bedienen die sws een 5 gaan geven)

Mass adaptation: heeft iets goede ratings? Dan komen er nog 5 remakes/soortgelijke films van. Er is dan wel weinig variatie.

Dynamische prijzen: digitale prijzen kunnen veranderen van dag tot dag. Omdat de website zoveel data over jou en de vraag en aanbod heeft kan het de prijzen aanpassen.

Voordelen: meer opbrengsten als er schaarste is, meer verkopen door de prijs te verlagen als er minder vraag is (zolang het boven kostprijs is).

Internet marketing:

- Zoekmachine marketing: het is als website essentieel om op de 1<sup>e</sup> pagina te staan als je veel klandizie wilt. Adverteerders bieden op trefwoorden. Hogere bidders krijgen hogere ranking. Je betaald wat degene onder je geboden heeft. Relevantere zoekresultaten komen ook hoger in de ranking. Zoekmachine optimalisatie is basically je website aanpassen aan wat het algoritme 'leuk' vind. Merken kunnen bieden op zoekwoorden van de concurrent om ervoor te zorgen dat zij meer kosten maken. Ook kun je dan klanten stelen die zoeken op de naam van de concurrent als je dan als website bovenaan staat. Het heet competitive poaching.
- Display advertenties: organisaties kunnen bieden om hun producten te laten zien op een website. De advertenties zijn vaak gerelateerd aan de website waar je bent of aan je zoekgeschiedenis. Hier schijnen ook vooroordelen in voor: vrouwen krijgen minder advertenties voor loopbanen in bèta bijvoorbeeld. Dit kwam niet omdat er minder werd geboden op hen, maar dat vrouwen door adverteerders als waardevoller werden gezien waardoor de loopbaanadvertenties overboden werden door ander soort advertenties. Vrouwen hebben namelijk een grotere doorklik ratio.
- Mobiele marketing: (M-commerce) locatiegebaseerde reclame; mensen in de metro doen vaak niets nuttigs en hebben dus meer tijd om naar advertenties te kijken.

## Lecture 6

Implementatie van IS is een technologisch en organisationeel proces.

Artikel Kim & Lee: implementatie strategieën:

- Empirische/rationele strategie
  - Gaat ervan uit dat mensen volledig rationeel zijn.
  - Investeren in opleiding en training
  - Laten weten waarom er dingen gedaan worden.
- Normatieve/re-educatieve strategie
  - Mensen zijn gericht op het bevredigen van behoeften, deze zijn afhankelijk van context
  - Attitudes beïnvloeden (opinieleiders)
- Macht/dwang strategie
  - Gedrag wordt alleen door sancties beïnvloed
  - Identificeer weerstand

Keuze van strategie is heel erg afhankelijk van verschillende factoren zoals organisatie structuur en cultuur.

De organisatiestructuur is hoe een organisatie eruit ziet. Het zijn definities van functies en taken en de relaties daartussen.

Structuren van Mintzberg:

1. Eenvoudige structuur
2. Machinebureaucratie – veel aansluiting bij ES
3. Divisiestructuur - weinig
4. Professionele bureaucratie – weinig aansluiting (maar wel goed voor ondersteunend personeel)
5. Adhocratie – weinig

Door informatiesystemen heb je meer en snellere informatie uitwisseling. Het kan leiden naar meer centralisatie (alle data op 1 plek) maar ook minder centralisatie (Alle medewerkers hebben toegang tot de data, empowerment). Meer control door bedrijfsbreed systeem, meer flexibiliteit door mobiele apparaten.

Control dmv informatie systemen kan een gevaar vormen voor de privacy.

Beslissingsstructuren:

- Cowboys: onafhankelijk, gedecentraliseerd, weinig informatieuitwisseling
- Commanders: Verbonden en gecentraliseerd
- Cyber cowboys: verbonden maar gedecentraliseerd

Structuur beïnvloed en wordt beïnvloed door IS.

Cultuur

Bestaat uit materiele zaken (dingen zoals klompen en haring) en immateriële zaken (taal en gewoonten).

Bestaat ook uit overtuigingen en waarden (onbewust aangeleerd) en praktijken (hoe we dingen doen, bewust aangeleerd). Cultuur is alles wat je niet via je genen erft.

De organisatiecultuur is hoe of wat een organisatie *is*. Het informatiesysteem moet overeenkomen met de heersende cultuur. Welke informatiesystemen geschikt zijn wordt deels bepaald door de verschillende cultuurdimenties van Hofstede.

Leidner & Kayworth zeggen dat mensen pas merken dat ze een cultuur hebben als ze een andere cultuur tegenkomen en dus zien dat het anders kan. Er kunnen conflicten zijn tussen group member values, IT values en Values in een specifiek IS. Group members vs IT waarden = contribution conflict. IT waarden vs specifieke waarden = Vision conflict en specifieke waarden VS group members = system conflict.

Er is een spectrum van hoe flexibel IS gebruikt kunnen worden. Je hebt strikte en flexibele systemen. Mens-computer interactie is een vakgebied.

Socio-technisch ontwerp is een ontwerp dat het technische systeem mixen met het sociale systeem.

## Lecture 7

Business analytics is een overkoepelende term voor business intelligence en geavanceerde analytics. Business intelligence wordt gebruikt om het verleden te analyseren. Geavanceerde analytics wordt gebruikt om de toekomst "te voorspellen".

Data moet up-to-date, accuraat, geïntegreerd en snel bruikbaar zijn.

Data en kennis die daaruit voortkomt is vaak het meest waardevolle bezit van bedrijven. Vroeger hadden verschillende functies hun eigen gegevens (marketing, sales, productie, etc.). Hierdoor is er data redundancy (overtolligheid): zelfde data op verschillende plekken, en er is ook data inconsistentie: data is niet in elke database hetzelfde, en dan weet je niet meer welke klopt.

Een DBMS is software om databases te managen.

Kernbegrippen:

- Data model
  - o Data dictionary (hoe wordt de data genoteerd)
- Entiteit (info waarover). Ook vaak tabellen genoemd
- Attribuut (welke info)
- Record (de info)

Normalisatie is het veranderen van een platte database in een relationele database (overtollige en inconsistentie verhelpen). Je koppelt dan de tabellen waar nodig.

De meeste databases worden door de SQL taal bestuurd. De meeste organisaties gebruiken relationele DBMS. Deze zijn niet geschikt voor analyses (heb je data warehouses voor nodig) en big data (data lakes nodig). Dit komt omdat big data ook ongestructureerde data bevat. Om ervoor te zorgen dat het geen bende word moet je goed omschrijven wat welke data is, deze omschrijvingen zijn meta-data. Blockchain is ook een database.

Big data: een verzameling data sets die zo groot en complex zijn dat ze lastig te verwerken zijn met traditionele databases. Kenmerken van big data:

- Hoog Volume
- Hoge Variëteit (gestructureerd of ongestructureerd, en allerlei varianten zoals audio, video etc)
- Hoge snelheid (veranderd snel, moet snel verwerkt worden)

Big data is iets nieuws omdat er steeds meer data is, het wordt steeds makkelijk om te bewaren en het wordt duidelijker wat we ermee kunnen.

Data mining is het vinden van patronen in data. Er zijn 4 methoden:

- Regressie (supervised)  
Verband tussen verklarende en te verklaren variabelen zoeken, vaak hypothesen zoeken.
- Classificatie (supervised)  
Zoeken naar groepen in de data die wel zijn gedefinieerd.
- Clustering (unsupervised)

- Zoeken naar groepen in de data die nog niet zijn gedefinieerd.
- Reinforcement leren
- Soort van AI

Correlatie: gaan vaak samen (of juist niet). Causatie: de een beïnvloed de ander.

## Lecture 8

Ransomware = virus die al je bestanden versleuteld. Ongeautoriseerde toegang is het toegang tot systemen waar je eigenlijk geen toegang toe zou mogen hebben. Een hacker is iemand die zich ongeoorloofd toegang verschaft tot computersystemen. White-hat hackers zijn de “goeie”, ze worden vaak ingehuurd door bedrijven om hun beveiliging te checken. Black-hat hackers breken in om schade aan te richten. Er kunnen ook bedreigingen van insiders zijn. Soms kwaadwillende medewerkers/partners maar soms ook gewoon fouten en workarounds (niet-veilig versturen kan sneller zijn dan veilig dingen versturen).

Hoe komen hackers binnen:

- Software zoals vulnerability scanners die kijken of er bekende kwetsbaarheden gevonden kunnen worden op sites van bedrijven en key loggers die kunnen zien wat mensen doen (ze kunnen zien wat je typt, dus ook wachtwoorden).
- Menselijke zwakheden (phishing, dumpster diving (papiertjes met wachtwoorden uit de prullenbak vissen en gebruiken))

Met een klein beetje persoonlijke informatie kun je al inloggen op iemands account. Veel info is te vinden op social media. Phishing is het gebruik van berichten om mensen te verleiden hun inloggegevens weg te geven of ze een file met een virus te laten openen. Spear phishing is op een specifiek individu gericht, soms ook namens iemand die je kent. Het doel van phishing is meestal financieel gewin of binnen komen in systemen.

Een brute force attack is gewoon veel wachtwoordcombinaties gebruiken.

Een dictionary attack is hetzelfde maar dan gebaseerd op een lijst van woorden, zoals de namen van de kinderen van het slachtoffer of geboortedata.

Malware zijn slechte software zoals:

- virussen (hebben menselijke actie nodig om te verspreiden)
- worms (verspreiden zich automatisch)
- trojan horses (software die een soort deurtje openzet zodat anderen in je computer kunnen)
- spyware (zien wat iemand doet/microfoon of camera aanzetten)
- ransomware

Bij een DDOS aanval dan vraag je heel veel informatie tegelijk aan waardoor websites crashen.

Meestal gebruik je dan veel computers. Die krijg je door een botnet te gebruiken, een verzameling “zombiecomputers”, waarvan de eigenaar dus niet weet dat de computer de data opvraagt.

Problemen met mobiele apparaten:

Bring Your Own Device; mensen die hun eigen device meenemen hebben deze vaak niet heel goed beveiligd. Er bestaat ook mobile malware, slecht ontworpen apps met beveiligingslekken. Openbare WiFi en hotspots zijn ook niet veilig.

Landen zijn vaak voortdurend bezig met een soort cyber oorlog. Cyber terrorisme is eigenlijk hetzelfde maar dan niet door overheden/regeringen.

Managen van security:

- Vertrouwelijkheid (beschermen tegen ongeoorloofde toegang)
- Integriteit (zorgen dat data niet gemanipuleerd kan worden)
- Beschikbaarheid (iedereen die wel recht hebben op toegang wel gebruik kunnen maken van de data)
- Verantwoording (als er iets misgaat moet je het lek kunnen vinden, acties moeten getraceerd worden)

Controls moeten geïmplementeerd en gemonitord worden. De controls worden gebruikt om de veiligheid te controleren. Deze worden gebaseerd op de risico's die het bedrijf zelf ervaart. Vaak wordt dit gedaan door de CISO: chief information security officer. Het is een issue voor IT en voor de business afdeling.

Bij de risicobeoordeling moet je kijken naar de technische en organisatorische kwetsbaarheid. Je moet de impacts van de dreigingen in combinatie met de zwakheden weten. Hoge impact = hoge prioriteit dus de controls worden ingericht op de zwakheden die een hoge impact kunnen hebben. Er zijn 3 soorten controls:

- Preventief: ervoor zorgen dat er geen incidenten komen
- Detectief: problemen vinden
- Corrigerend: er iets aan doen.

Veel gebruikte controls zijn dingen zoals firewall en encryptie (versleutelen van gegevens).

Audits zijn externe beoordelingen van je security zoals door white-hat hackers. Andere externe monitors zijn gepubliceerde waarschuwingen.

## Lecture 9

Sociale media gaat over het delen en creëren van content. In essentie gaat het over interacties.

Je hebt:

- Sociale network sites
- Microblogging (twitter)
- Blogs
- Image/video sharing/streaming.

Op verschillende platforms worden verschillende vormen gebruikt.

Web 1.0 is eigenlijk "read only". Je kunt iets sturen naar iemand en die kan het lezen (krant).

Web 2.0 is dat er geïnteracteed kan worden. Je kunt lezen en schrijven, je kan reageren, je kunt dingen delen (sociale media). De content is het "artikel" maar ook de discussie eromheen. Dit komt door technologische ontwikkeling maar ook sociaal-culturele ontwikkelingen.

Digital natives zijn mensen die nooit een wereld zonder internet hebben gekend. Veel organisaties vinden het moeilijk om hier mee om te gaan omdat de board members vaak nog geen digital natives zijn.

Omdat mensen zo veel sociale media gebruiken kunnen bedrijven daar hun klanten vinden. Ze moeten dan goed nadenken over wat bij welk platform past. Er kunnen ook dingen over het bedrijf gepost worden die het bedrijf liever niet hebt, daar moet je ook iets mee doen.

Consumenten "betalen" sociale media platforms voor hun diensten met data. Dit verkopen platforms dan weer aan bedrijven. Ze betalen ook in toegang tot gebruikers.

Via sociale media kun je marketing doen, maar ook innoveren door signalen op te pikken, feedback krijgen, klantenservice, en sociale media engagement creëren. Hiermee maken de organisaties een band met de klanten. Je bereikt veel mensen, je komt veel over je volgers te weten en er kan

positieve “word of mouse” zijn: berichten worden gedeeld (word of mouth maar dan digitaal eigenlijk).

Organisaties gebruiken veel analysetools om met sociale media om te gaan.

NLP techniek: welke woorden worden er gebruikt in combinatie met woorden waar je naar opzoek bent (bvb het woord dat je zoek is Bedrijf x en dan kun je woorden vinden zoals goed, slecht, duurzaam etc.). Zo kun je vinden welke mensen je product gebruiken en wat ze er van vinden/wat ze van je bedrijf vinden. Met een sentiment analyse kijk je of er veel positieve of negatieve woorden er gebruikt worden rond je zoekterm.

Negatieve impact van sociale media:

- Negatieve word of mouse: als iemand zegt dat je iets niet moet kopen dan is dat heel sterk.
- Het schept hoge verwachtingen. Als het bedrijf zegt ergens bereikbaar te zijn en ze reageren niet dan is dan vervelend.
- Je kunt controle over conversatie verliezen omdat iedereen kan posten, en dus ook negatieve dingen kunnen posten.
- ‘slacktivism’: het idee dat mensen denken dat ze iets doen voor een goed doel als ze iets liken. Ze zijn dan minder bereid om geld te doneren want ja, ze “hebben al wat gedaan”.
- Privacy issues

Sociale media engagement is de manier waarop mensen zich verbonden voelen met de organisatie en hoe ze zich gedragen naar de organisatie toe. Het is de basis voor het maken van een sociale media strategie.

Je kunt posts gebruiken om puur de band te versterken. Het is dan handig als je iets maakt wat mensen willen delen met anderen.

Je kunt gebruik maken van influencers om reclame te maken.

3 Dingen die je hierover moet onthouden:

- Steeds meer bedrijven zien het nut ervan
- Er wordt steeds meer geld aan uitgegeven
- Niet alle platformen zijn er even geschikt voor.

Verschillen in platform zijn dus belangrijk als voor je keuzes in je strategie. Het gebruik van influencers kan ook gevaarlijk zijn, want als influencers dingen doen waar veel mensen boos over zijn, dan wil je als bedrijf daar niet mee geassocieerd worden.

Met crowdsourcing gebruik je je volgers om voordeel te behalen. Bijvoorbeeld voor ideeën of soms ook voor producten zoals bij Uber.

De seeker heeft een uit te voeren taak en betaald voor uitgevoerde taken. De crowd zijn de potentiële taakuitvoerders en hebben vaak een variëteit aan skills, kennis, ervaringen etc. Hier zit altijd een platform tussen als intermediair.

Internet wordt vaak gebruikt voor crowdfunding/crowdsourcing, maar het is niet noodzakelijk.

Het platform bedrijfsmodel is een vorm van re-intermediatie. Voorbeeld: thuisbezorgd. Deze klopt vragers en aanbieders.

Netwerkeffecten:

Metcalfe’s wet: de waarde van een netwerk is proportioneel met het kwadraat van het aantal gebruikers verbonden. Oftewel: meer gebruikers is meer beter en de waarde is evenredig aan het aantal gebruikers in het kwadraat. Als iedereen op hetzelfde netwerk zit dan is het heel moeilijk om over te stappen op een ander netwerk, vooral als niemand anders het gebruikt. Je kunt wel overstappen van whatsapp naar telegram maar als niemand dat heeft kun je ook geen berichten sturen.

Directe/same-side netwerkeffecten hebben betrekking op het effect dat het aantal “zelfde type” gebruikers heeft op de waarde die het platform voor die gebruikers heeft. Bijvoorbeeld: Als je een man bent, dan zijn andere mannen van “hetzelfde type” gebruiker. Op een datingsite is meer dezelfde gebruikers een flink waardeverlagende factor omdat er dan teveel mannen zijn. Positief effect kan ook: als mensen die like-minded zijn op hetzelfde platform zitten, dan is dat platform aantrekkelijker voor iemand die ook zo denkt.

Je hebt ook cross-side effecten, als er meer ander type gebruikers zijn (mannen vs vrouwen, bedrijven vs consumenten).

De sterkte van netwerkeffecten is afhankelijk van het netwerk dat je hebt:

1. Mate van network clustering: soms is het voordeliger als er meer locale netwerken zijn (zwakker effect)
2. Risico van disintermediatie: Als verschillende zijden direct met elkaar kunnen interacteren zonder het platform erbij betrekken dan verzwakt het netwerkeffect
3. Risico van multi-homing: het gebruik van meerdere platformen voor hetzelfde. Dan kunnen mensen heel gemakkelijk schakelen waardoor het netwerk effect minder sterk is.
4. Netwerk bridging: als verschillende netwerken bij elkaar gebracht kunnen worden dan versterkt het netwerk effect.

Bedrijven werken steeds vaker met platformen waarop ze mensen in kunnen huren. Mensen die via zo'n platform werken hebben vaak minder baanzekerheid en pensioenopbouw. Het levert flexibiliteit maar ook afhankelijkheid aan het platform.

Blockchain:

Systeem waarbij data wordt opgeslagen in zogenaamde blokken en deze worden aan elkaar geknoopt. Zodra iets in de ketting zit kun je niks meer wijzigen. Je bent niet meer afhankelijk van 1 partij die alle data bezit. Als er een oplossing is gevonden dan moet 50% van de computers het bevestigen. Bij proof of work krijgt de computer die het oplost een prijs. Bij proof of stake/identity moet 50% van de computers akkoord gaan en elke heeft 1 stem.

Verandering van data is bijna onmogelijk maar kan toch, data kan foutief in de chain komen en dan kan het niet meer veranderd worden. Ander probleem: hacking

## Samenvatting van samenvatting

You can use this to check if you know what all these terms are and to study them in the lists. Knowing which words belong to what can help figure out answers on MC questions. This isn't based on the lectures though, so do add your own as well! This will really help you on the test. The tech briefing isn't as important IMO, so I won't summarize that one.

Items of value in a knowledge society:

- Knowledge
- Capital
- Labour
- Land

Computer ethics:

- Notice/awareness
- Choice/consent
- Access/participation

- Integrity/security
- Enforcement/redress

Decision-making levels:

- Operational level – structured decisions
- Managerial/tactical level – semistructured decisions
- Executive/strategic level – unstructured decisions

Automating = doing things faster, learning = doing things better, strategy = doing things smarter.

Lean startup methodology:

1. Customer discovery
2. Minimum viable product
3. Customer validation
4. Pivot
5. Customer creation
6. Scaling operations

Classes of computers:

- Supercomputers
- Mainframe
- Server
- Workstation
- Personal computer
- Mobile device

Types of data stored:

- Operational data
- Backup data
- Archival data

Possible roles of computers:

- Client
- Peer
- Server

Networks:

- PAN
- LAN
- WAN

Service-oriented architecture; 3 principles services must follow:

- Reusability
- Interoperability
- Componentization

Types of EC (electronic commerce)

- B2C
- B2B
- C2C
- C2B
- M-commerce

E-government:

- G2C
- G2B
- G2G

Channel strategies:

- Multichannel
- Cross-channel

- Omni-channel (sales beacons)

Online consumer needs:

- Structural firmness
- Functional convenience
- Representational delight

Rates used by web analytics:

- Click-through rate
- Conversion rate:
- Exit rate
- Bounce rate

Synchronous vs asynchronous communication.

Social media tools used for communication:

- Blogs
- Microblogging
- Instant messaging
- Webcasts/podcasts

Useful data can come in these forms:

- Structured data
- Semistructured data
- Unstructured data

Types of reports:

- Scheduled
- Drill-down
- Exception
- Key-indicator

Analysing unstructured data:

- Text mining
- Web content mining
- Web usage mining

Types of agents/bots:

- User agents
- Buyer agents
- Monitoring and sensing agents
- Data mining agents
- Web crawlers
- Chatbots
- Destructive agents

Explicit vs tacit knowledge assets

Core business processes:

- Order-to-cash
- Procure-to-pay
- Make-to-stock
- Make-to-order

Business process management basic steps:

1. Develop vision
2. Identify critical processes
3. Understand and measure existing process
4. Identify ways to improve processes with IS
5. Design and implement prototype.

Managing supply chains:

- Just-in-time
- Vendor-managed inventory
- Reducing bullwhip effect
- Corporate social responsibility (recalls and sustainable practices)

Supply chain planning:

1. Demand planning and forecasting
2. Distribution planning
3. Production scheduling
4. Inventory and safety stock planning.

Supply chain execution involves 3 elements:

- Product flow
- Information flow
- Financial flow

Components of a CRM system:

- Operational CRM
- Analytical CRM
- Collaborative CRM

4 factors that cause the productivity paradox:

- Measurement problems
- Time lags
- Redistribution
- Mismanagement

Arguments for business case:

- Faith
- Fear
- Facts

System development life cycle

1. Systems planning and selection
2. Systems analysis
3. Systems design
4. Systems implementation and operation

Types of maintenance:

- Corrective maintenance
- Adaptive maintenance
- Preventive maintenance
- Perfective maintenance

Licences:

- Click-wrap licences
- Enterprise/volume licences

Types of computer criminals:

- Current or former employees
- People with technical knowledge who commit crime for personal gains
- Career criminals who use computers to assist in crimes
- Outside crackers that snoop

Software & methods used by cybercriminals:

- Vulnerability scanners
- Packet sniffers
- Keyloggers
- Phishing
- Social engineering

- Shoulder surfing
- Dumpster diving

Insiders can do/use:

- Wikileaks
- Backdoors
- Zero-day

Forms of malware:

- Virus
- Worm
- Trojan horse
- Logic/time bombs
- Ransomware
- Spyware
- Spam
- cookies

risk management:

- risk reduction
- risk acceptance
- risk transference
- risk avoidance

Controls:

- preventive controls
- detective controls
- corrective controls

Authorization can be granted based on:

- something you have
- something you know
- something you are