Software development

A

Project managment – production of the software (key aspect of computing)

- process of how the production of software production is managed
- approached with balancing the costs of **development tools**
- consists of 3 stages
    - First stage – Defining the problem
        - **Client/User requirements –** needs to be finialized and documented
            - **Feature creep** – adding on more functionality later
            - **Mockup –** prototype for client review
        - **Design specifications**
        - **System design –** choice of **operating system** or **platform**
    - Second stage – **Production programming**
        - Choosing model for development
        - Allocating resources
        - **Quality assurance**
    - Final stage – Documentation
        - Documenting program
        - Troubleshooting issues

Computing process

- **Input** of data, **Processing** by the computer, **Output** of data
- **Speed of rate of processing** determined by the **system resources**
    - (processor and memory)

Computer software is known as **code** written in **specialized languages** by **programmers**

Specification of the program – documentation of what code should be written

Backend – code behind / database

Frontend – visual part of software

Software developement

B

Models used for developing software

- **Waterfall model**
  - Each stage directly follows other – dependent on previous results
  - Usefull for simple problems
- **Itterative model**
  - Adds functionality in next stage (first stage provides core functionality)
  - Usefull for operating system versions
- **Prototyping model**
  - Clients can see model before its fully developed
  - Usefull for relatively small projects (websites)
- **Spiral model**
  - Combination of waterfall and prototype model
  - Each stage is used to produce prototype software
  - Usefull for large and expensive projects

Schedulling – planning software production

- **Gantt chart** (Henry Gantt) – organization of software development projects
  - **shows** what processes are happening at any one time
  - **rows –** stages **columns –** time

Open/Closed source projects

Efficency of computer systems

Data centre migration – moving and storing operations to a **centralized location**

- **multiple servers clustered together with software to distribute processing**
- **data centres drives down cost of hardware**

Capacity utilization – measure how well is system using its resources

- **actual usage / maximum potentional * 100**
- goal is to **minimize** amount of spare capacity

Virtual machines – virtualization

- locating hardware elements of the system in data centre
- **clustering –** partiton of data into groups
- **masking –** physical components appear as one virtual device
- **hot swapping –** adding or removing components without shutting down system
- **out-of-the-box** – bought directly from manufacturers without modification
    - offer better reliability
- **cooling data centers** – consumes lots of power
    - **impact on global warming**
    - **chillers** – waterbased cooling systems

- **energy proportionalty** – effective use during idle /operating/ full capacity
  - **Uninterruptible power supplies** – refused to be used

Human computer interraction (HCI)

A

Purpose of HCI – optimize performance of humans and computers together

- considering all human aspects when designing user interface

Human sciences - considering all human aspects when designing user interface

- individual interacting with the world in general and computer in particular
  - modelling human **input and output** in computer systems
    - **visual channel** – sense of seeing
    - **aural channel** – sense of hearing
    - **haptic channel** – sense of touch
  - understanding **metaphors**
    - cutting down amount of time to build a mental model of system
- individual interacting with enviroment – **Model Human Processor**

    - **perceptual system –** accepting and sending information to cognitive
    - **cognitive system** – processing information to understand enviroment
    - **motor system –** providing physical reactions
- modelling the limitations of human systems to require minimum processing
    - **grouping options together (7 +- 2 rule) into stages**

Human computer interraction (HCI)

B

Purpose of HCI – optimize performance of humans and computers together

Computer sciences – optimization of input and output within limits of system

- efficency within existing system – best combination of hardware and software
- speed of feedback taking place
    - increase/decrease of resolution
    - altering input devices (Nintendo controller)

- Providing models of an engineering approach to human behaviour
- Modelling human systems as channels
- Consider effect of limitations on available processing

Human computer interraction (HCI)

C

Purpose of HCI – optimize performance of humans and computers together

Effectiveness of the design tools – collects behaviour based data

- methods to test usability
    - human sciences
    - computer sciences

Heuristic evaluation – usability problems in interfaces design (no real life aspects)

System logging – descrpitive information of what happend inside system

- **Video logging** – logging tracked on a video recording

Eye tracking – provide information on user behaviour

Word processing and Desktop publishing

Word processing – involves creation, editing and formatting text documents

- Software – Microsoft Word, Google Docs, Apple pages
- everyday documents
- word processor
    - enable to create and **store** document (in comparison with typewriter)
    - modified by entering **commands**
    - **checks spelling**

Cut – cuts part of text

Copy – copies part of text (not deleting)

Paste – pasting previously cut or copied text on new place

Text formatting

- **Bold text**
- **Underline text**
- **Italicise**
- **Bullet or numbered list**
- **Font**
    - **Type Face** – distinct design of letters and characters
    - **Type Style** – usage of **B** U *I*
    - **Type Size –** size of text in points

Find and replace

Headers and footers

Thesaurus – search of synonyms inside word processor

Desktop publishing – specialized form of document creation involving layout and design

- Software – Adobe InDesign, Scribus, QuarkXPress
- crucial visual presentation – newspapers, newsletters, leaflets..

Frames – documents are **frame based**

WYSIWYG – What you see is what you get

Spreadsheets and modelling

Spreadsheets (worksheet) – computer program displaying data in **rows and columns**

- Used for calculations, data analysis and visualization
- Its table is also called **spreadsheet**

- Connection of row and column is called **cell**
- **Formulas –** mathematical expression that performs operations on values
    - **Arithmetic** (+ - * /)
    - **Summing** (SUM)
    - **Average** (AVG)
    - **Max and Min** (MAX, MIN)
    - **Count** (COUNT, COUNTA) – counts all/non empty cells
    - **Concatenate** (CONCANEATE) – connecting strings
    - **If** (IF) – conditions
    - **Vertical lookup** (VLOOKUP) **–** searches for value in column
    - **Horizontal lookup** (HLOOKUP) – searches for value in row
    - **Index and match** – advanced functions returning range of values
- **Function –** predefined formula that performs certain tasks
- **Graphs** – abillity to quickly trasnform data into graphs – visual presentation

Modelling – spreadsheet can be used as a modelling tool

- Model is controlled by set of rules introduced by formular
- Used to simulate changed data to provide information about outputs
- Constant recalculation of data based on input
- Vital for company income and outgoings

Databases

Database – collection of related data stored in sets of tables

- **Table** – set of similar data
- **Flat file** – database stored in a single file

Database management system DBMS - software to store, organize and retrive data

Relational database – database including relationships (connection of two tables)

Entity – set of data, **record** within a table **(row)**

Attribute / Field – category of information for each entity **(cols)**

Index – identifciation of a unique record (usually numerical or alphabetical)

- **Primary key** – unique identifier for a record
- **Foregin key** – field in table that refeers to primary key in related table
- **Referential integrity** – data in foregin key must exist in primary key

Query – function, that allows you extract information according certain condition

- **Parameter** – used within the criteria for a query

Data types

- **Text** – letters and numbers
- **Number** - numbers
- **Memo** – long text
- **Date/Time** – date or time or its combination
- **AutoNumber** - indexing
- **OLE object** – sounds and pictures
- **Yes/No** – true/false
- **Hyperlink –** link to website

System software and operating system

Software – program which gives instruction to the computer

- Code is passed to hardware in binary format (ones and zeroes)

User interface – communication between user and computer system

System software – programs designed to maintain or operate computer system

- program to operate computer hardware is **operating system**
- program to maintain computer system are known as **utility software**

Application software – software used for specific jobs (word processor..)

Operating system – manages hardware within computer system

- **BIOS (Basic input/output system)** – loads before operating system
- Manages communication between hardware and software
- **Linux, Windows, Mac OS, UNIX, Android**
- Allocating memory to software
- Sending data and instructions to output devices
- Respond to input devices
- Opening and closing files
- Controlling processor
- Sending error and status messages
- Dealing with security and loggons

User Interface

A

Command Line Interface and Graphical User Interface

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Command Line Interface – text based interface using commands to communicate

- User input specific commands into **terminal / command prompt**
- System responds with **text-based** output
- Requires **less** memory
- Recomended for **experienced users** preffering **direct control**
- **Scripting** – automating repeated commands

Graphical User Interface – visual interface using graphical elements

- User interact with **graphical elemnts** – **WIMP**
    - **Window** – area of screen devoted for specific task

    - **Icon** – image used to represent program, file or task
    - **Menu** – words on screen representing list of options
    - **Pointer** – movement from a pointing device on screen (mouse or finger)
- Requires **amount** of memory
- **User-friendly** and **intuitive** experience
- **Point-and-Click** interaction (or touch gestures)
- **Multitasking** – supports execution of multiple tasks

User Interface

B

Dialog Interface and Gesture-Based Interface

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Application software – software used for specific jobs (word processor..)

Dialog interface – **using spoken word** to cummunicate with computer system

- user can **give commands using voice** and computer **responds** by carrying out an **action** or **return information using synthesised voice**
- popular on mobile devices (phones, cars..) **– hands-free**
- suitable for **automation without physical interface**
- issue with **recognizing spoken word** – accents, different voice, background noise

Gesture-based interface – **recognizes human motion** (tracking eye/lips, hand signals..)

- popular in gaming (Nintendo Wii)
- accepting hand gestures as a way of controlling objects on screen
- helps with interaction for disabled users
- issue is **accuracy**

Application software

A

Apps and texts

Software – program which gives instruction to the computer

- Code is passed to hardware in binary format (ones and zeroes)

User interface – communication between user and computer system

System software – programs designed to maintain or operate computer system

- program to operate computer hardware is **operating system**
- program to maintain computer system are known as **utility software**

Application software – software used for specific jobs (word processor..)

Apps – software programs designed specific purpose

- **killer apps** – apps entire system is specifically for
- **business applications**
    - Suites – group of software, each specific for certain purpose
        - Microsoft Office Suite, Apple iWork, OpenOffice
        - Word processing, spreadsheets, presentation software...

- **personal applications** - Communication, Education, Entertainment, Media players

Graphics manipulation software – designed to manipulate graphics (bitmap/vector)

- Drawing shapes, changing canvas size, resizing, adding layers, selecting color
- Bitmap – filling area, moving/resizing/erasing parts of image (pixels)
- Vector – filling shape, moving/resizing group of shapes (equations)

Photo editing software – focused on editing photographs

- cropping, adjusting brightness/contrast, resizing, cloning, applying effects
- require large amount of RAM

Video editing software

- files are known as raw – footage
- capturing/importing, clipping, adding music/narration, speeding, overlay..
- require large amount of RAM and lot of processing time

Application software

B

Other software

Software – program which gives instruction to the computer

- Code is passed to hardware in binary format (ones and zeroes)

User interface – communication between user and computer system

System software – programs designed to maintain or operate computer system

- program to operate computer hardware is **operating system**
- program to maintain computer system are known as **utility software**

Application software – software used for specific jobs (word processor..)

Apps – software programs designed specific purpose

- **killer apps** – apps entire system is specifically for
- **business applications**

    - Suites – group of software, each specific for certain purpose
        - Microsoft Office Suite, Apple iWork, OpenOffice
        - Word processing, spreadsheets, presentation software...
- **personal applications** - Communication, Education, Entertainment, Media players

Communications software

- **Instant messaging** – allows sending text-based msgs instantly (real conversation)
- **Audio conferencing -** speak and listen (VOIP – voice over internet protocol)
    - **Video conferencing** – includes video footage of users
- **Email** – sending text-based msgs with attachments (longer conversations)

Web authoring software – creation and editing of websites

- complex because of vast number of configurations
- navigation bar, preview, adding basic HTML, design template, validation, manage

Control software – controlling devices that are not part of copmuter system

Measuring software - measure values from sensors (pressure, temperature..)