

# CE29x Team-Project Challenge

## Financial Accounting I: The balance sheet

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with acknowledgements to Keith Primrose and Michael Fairbank

# Acknowledgment

\* This lecture is based on chapter six of:

Bott, F., 2014, "Professional Issues in Information Technology", Second Edition

# Annual Reports

- \* Limited liability companies have to produce an annual report
- \* The Annual Report contains:
  - \* Information about the company
  - \* Its activities during the previous year
  - \* Its financial health

# Annual Reports

- \* The proprietors of limited liability companies are privileged
  - \* Because their liabilities are limited
  - \* In return for this, the law demands that they must produce annual financial reports
  - \* (Companies Consolidation Legislation (1987))
- \* This allows others to decide whether dealing with the company is risky or not.

# Companies Consolidation Legislation 1987

This forces companies to keep accounting records

- \* Failure to do so can result in imprisonment and fines for those held responsible.
- \* Accounting records are now on computer, this presents a security problem and maintaining access to archived records.
- \* Failure to ensure persistence of readable data is the same offence as not keeping records at all.
- \* UK Inland Revenue insists records are kept for 6 years.

# Annual Reports

- \* If the company is public (floated on stock market)
  - \* The Stock Exchange imposes addition requirements regarding disclosure.
- \* Recent scandals have led to:
  - \* Calls for more openness
  - \* More extensive information in annual reports
    - \* Some by regulation
    - \* Some due to becoming regarded as good practice
  - \* E.g. Tesco recently had a £250m accounting “problem”

# Annual Reports

It is good for you to know the how to read an annual report:

1. If you are about to engage business with another company, it's good to be able to know if they are financially viable
  - \* Your company does not want to pay millions for them to deliver you a product, if they are likely to just take your money and then go bust
2. If you run your own company ever then you will have to file annual reports (or pay an accountant to do so)

# Annual Reports

With your own company, you have to submit the accounting report to companies house, every year, e.g.

Report of the Director and  
Financial Statements

for the Period

16 May 1997 to 31 March 1998

for

Fairbank Consulting Limited

# Three Essentials

\* Three financial statements are the most important sections of the annual report

## 1. The Balance Sheet

(A snapshot of what a company owns and owes)

## 2. The Profit & Loss Account

(Shows how much money has come into and out of the company in a given time period)

## 3. The Cash Flow Statement

(Gives details of the cash flows that contributed to the figures in the balance sheet)

\* We will look at each of these in turn

\* Balance sheet (this lecture)

\* P+L and Cash Flow – next lecture

# I. The Balance Sheet

(A snapshot of what a company owns and owes)

## 2. The Profit & Loss Account

(Shows how much money has come into and out of the company in a given time period)

## 3. The Cash Flow Statement

(Gives details of the cash flows that contributed to the figures in the balance sheet)

# The Balance Sheet

- \* The purpose of the balance sheet is to show:
  - \* What the company owns – its assets
  - \* What it owes - its liabilities.
- \* It is a snapshot of the state of the company at a particular point in time.
- \* Normally at the end of the last day of the company's financial year.

# Process

- \* To make things more familiar we will compare these statements:
  - \* For a student
  - \* For a company
- \* This will allow us to draw out key points and also highlight the differences.

# Balance Sheet for a Student

\* We imagine a student, Jemimah Puddleduck

\* Taken from [Balance sheet for a student \(on Moodle\)](#)

Balance sheet for a student		
Jemimah Puddleduck		
Balance Sheet		
As at 31 October 2012		
	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
Total Assets	2,445	2,374
<b>LIABILITIES</b>		
Credit Card Bill	175	100
Student Loan	14,000	7,000
Total Liabilities	14,175	7,100
<b>NET WORTH (or Equity)</b>	<b>(11,730)</b>	<b>(4,726)</b>

What is owned      What is owed      Total

# Balance Sheet for a Student

Balance sheet for a student		
Jemimah Puddleduck		
Balance Sheet		
As at 31 October 2012		
ASSETS	2012	2011
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
Total Assets	2,445	2,374
LIABILITIES		
Credit Card Bill	175	100
Student Loan	14,000	7,000
Total Liabilities	14,175	7,100
NET WORTH (or Equity)	(11,730)	(4,726)

- \* The Balance sheet compares
  - \* The present position (2012)
  - \* To the position one year ago (2011)

# Balance Sheet for a Student

Balance sheet for a student		
Jemimah Puddleduck	2012	2011
<b>Balance Sheet</b>		
<b>As at 31 October 2012</b>		
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
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Credit Card Bill	175	100
Student Loan	14,000	7,000
Total Liabilities	14,175	7,100
<b>NET WORTH (or Equity)</b>	(11,730)	(4,726)

\* Note the accounting convention of showing negative numbers in brackets (rather than using the minus sign).

# Balance Sheet for a Student

Balance sheet for a student		
Jemimah Puddleduck		
Balance Sheet		
As at 31 October 2012		
	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
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Credit Card Bill	175	100
Student Loan	14,000	7,000
Total Liabilities	14,175	7,100
<b>NET WORTH (or Equity)</b>	(11,730)	(4,726)

- \* Let's look at what the student "owns"
- \* This is the "Assets" section...

# Balance Sheet for a Student

	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	500	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
Total Assets	2,445	2,374

- \* Jemimah's most obvious asset is Money
  - \* She has £25 in cash in her purse
  - \* And £700 in the bank

# Balance Sheet for a Student

	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
<b>Total Assets</b>	<b>2,445</b>	<b>2,374</b>

- \* “Prepaid accommodation” is a less obvious “asset”
  - \* Note the date of the statement 31 Oct
  - \* At the start of term Jemimah paid a term's rent up-front
  - \* Some 60% of this has not been 'used'
  - \* And could, in principle, be turned into cash
- \* The debts owed by friends could also be converted to cash
  - \* So that's another +£20 “asset”

# Balance Sheet for a Student

	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
<b>Total Assets</b>	<b>2,445</b>	<b>2,374</b>

- \* The computer and the mobile phone are also considered as assets.
- \* These are examples of “fixed assets”
  - \* assets that she will own and use for some time
- \* The computer was bought for her two years ago for £800
- \* She bought the mobile for £400 in October 2011
- \* Since then, both items have depreciated in value

# Depreciation

- \* The most common way of calculating depreciation is to reduce the value by a uniform amount year on year.
  - \* The computer will probably be obsolete after four years
  - \* Jemimah will need to replace it by a new one then
  - \* So we reduce its value by 25% (of the original price) each year i.e. £200 per year
- \* Sometimes other models are used
  - \* Consider the purchase of a new car.
  - \* It loses at least 30% of its value the day you drive it out of the dealers!
- \* Accountants use the phrase “write down” to show something has decreased in value,
  - \* c.f. “written off”

# Other Assets

	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
<b>Other Assets</b>	<b>400</b>	<b>510</b>
<b>Total Assets</b>	<b>2,445</b>	<b>2,374</b>

- \* The figure given for other assets covers the many small personal items that people own
  - \* Clothes, Books, CDs, etc.
- \* We take an approximate value for these
  - \* The calculations involved in dealing with them precisely would be far more extensive than the value of the item justifies
- \* We depreciate them over a longer period of time

# Valuation

	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
<b>Total Assets</b>	<b>2,445</b>	<b>2,374</b>

- \* So her total current assets are valued at £2445
- \* The valuation of assets can be a contentious issue.
  - \* For now we shall simply accept the figures given in the balance sheet
  - \* But we will need to pay more attention when we come to look at a commercial balance sheet.

# Balance Sheet for a Student

Balance sheet for a student		
Jemimah Puddleduck	2012	2011
<b>Balance Sheet</b>		
<b>As at 31 October 2012</b>		
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
Mobile phone	300	400
Other Assets	400	510
<b>Total Assets</b>	<b>2,445</b>	<b>2,374</b>
<b>LIABILITIES</b>		
Credit Card Bill	175	100
Student Loan	14,000	7,000
<b>Total Liabilities</b>	<b>14,175</b>	<b>7,100</b>
<b>NET WORTH (or Equity)</b>	<b>(11,730)</b>	<b>(4,726)</b>

- \* Next look at what the student “owes”
- \* This is the “Liabilities” section...

# Liabilities

LIABILITIES	
Credit Card Bill	175
Student Loan	14,000
Total Liabilities	14,175

- \* Jemimah's liabilities are more straightforward.
  - \* She owes money on her credit card
  - \* She has a student loan.
- \* These can be categorised as short-term or long-term debts
- \* The credit card debt is an example of a short-term debt
  - \* She is expected to repay it fairly quickly
  - \* She may incur other debts against it (i.e. pay for more things using the card).
- \* The student loan is a long-term debt,
  - \* It does not need to be repaid until she graduates and is earning a reasonable salary.

# Net worth

Balance sheet for a student		
Jemimah Puddleduck		
Balance Sheet		
As at 31 October 2012		
	2012	2011
<b>ASSETS</b>		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
Debts owed by friends	20	0
Computer	400	600
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Other Assets	400	510
Total Assets	2,445	2,374
<b>LIABILITIES</b>		
Credit Card Bill	175	100
Student Loan	14,000	7,000
Total Liabilities	14,175	7,100
<b>NET WORTH (or Equity)</b>	(11,730)	(4,726)

\* How is net worth calculated?

# Net worth

NET WORTH (or Equity)	(11,730)
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- \* It represents the amount of cash which Jemimah would have
  - \* If all her assets were sold
  - \* And all her debts paid off
  - \* In other words, how much, in financial terms, she is 'worth'.
  - \* In Jemimah's case, as with many students, her net worth is negative
- \* Net worth is often labelled 'excess of assets over liabilities', or "equity".

# Balance

- \* A balance sheet must balance
  - \* The total assets and total liabilities should be equal.
- \* Now the balance sheet “balances”,
  - \* i.e. the net worth (-£11730) plus the liabilities (£14175) together equal her total assets (£2445)

Balance Sheet	
As at 31 October 2012	
	2012
<b>ASSETS</b>	
Cash in hand	25
Cash at bank	700
Pre-paid Accommodation	600
Debts owed by friends	20
Computer	400
Mobile phone	300
Other Assets	400
Total Assets	2,445
<b>LIABILITIES</b>	
Credit Card Bill	175
Student Loan	14,000
Total Liabilities	14,175
<b>NET WORTH (or Equity)</b>	(11,730)

# Commercial Balance Sheets

- \* Commercial balance sheets are prepared on precisely the same basis as we have just seen but:
  - \* The assets and liabilities are grouped into various categories
  - \* A single figure is given for each category.

- \* From example Balance sheet for a services company, on Moodle:

Balance sheet for a software company		
XYZ Software Ltd	2012	2011
	£'000	£'000
<b>Fixed Assets</b>		
Intangible assets	475	-
Tangible assets	960	770
Investments	50	82
<b>Total Fixed Assets</b>	<b>1,485</b>	<b>852</b>
<b>Current Assets</b>		
Work in progress	550	621
Debtors	3,400	2,580
Cash in hand and at bank	2,491	1,663
<b>Total Current Assets</b>	<b>6,441</b>	<b>4,971</b>
<b>Creditors: Amounts falling due within one year</b>	<b>(3,210)</b>	<b>(2,601)</b>
Net Current Assets	3,231	2,370
<b>Total Assets less current liabilities</b>	<b>4,716</b>	<b>3,222</b>
<b>Creditors: Amounts falling due after one year</b>		
Borrowings	(154)	(61)
Provisions for liabilities and charges	(7)	(16)
<b>Net Assets</b>	<b>4,555</b>	<b>3,145</b>
<b>Capital &amp; Reserves</b>		
Called-up share capita	318	308
Share premium reserve	350	145
Profit and loss account	3,887	2,692
<b>Shareholders' funds – equity</b>	<b>4,555</b>	<b>3,145</b>

# Commercial Balance Sheets

Balance sheet for a software company		
XYZ Software Ltd	2012	2011
Balance Sheet	£'000	£'000
As at 31 October 2012		
Fixed Assets		
Intangible assets	475	-
Tangible assets	960	770
Investments	50	82
Total Fixed Assets	1,485	852
Current Assets		
Work in progress	550	621
Debtors	3,400	2,580

- \* Similarities to the balances for a student:
  - \* Year by year comparison
- \* Notice that the figures are now in thousands (“£'000”)

# Commercial Balance Sheets

Balance sheet for a services company

XYZ Software Ltd	
Balance Sheet	
As at 31 October 2012	
	2012
	£'000
<b>Fixed Assets</b>	
Intangible assets	475
Tangible assets	960
Investments	50
<b>Total Fixed Assets</b>	<b>1,485</b>
<b>Current Assets</b>	
Work in progress	550
Debtors	3,400
Cash in hand and at bank	2,491
<b>Total Current Assets</b>	<b>6,441</b>
<b>Creditors: Amounts falling due within one year</b>	<b>(3,210)</b>
<b>Net Current Assets</b>	<b>3,231</b>
<b>Total Assets less current liabilities</b>	<b>4,716</b>
<b>Creditors: Amounts falling due after one year</b>	
Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>

\* First look at the assets...

# Commercial Assets

<b>Fixed Assets</b>
Intangible assets
Tangible assets
Investments
<b>Total Fixed Assets</b>
<b>Current Assets</b>
Work in progress
Debtors
Cash in hand and at bank
<b>Total Current Assets</b>

\* Assets are classified as:

\* Fixed assets.

- \* Contribute to the company's productive capacity
- \* Are held primarily for the purpose of creating wealth,
- \* Further subdivided into
  - \* Tangible assets (assets that have some physical existence)
  - \* Intangible assets (assets such as copyright in software or ownership of brand names. Things that have no physical existence).
  - \* Investments (e.g. shares in other companies),

\* Current assets

- \* Items which are bought and sold in the course of its day to day trading activities

# Subtle differences

Fixed Assets
Intangible assets
Tangible assets
Investments
<b>Total Fixed Assets</b>
Current Assets
Work in progress
Debtors
Cash in hand and at bank
<b>Total Current Assets</b>

- \* In most cases, the difference between fixed assets and current assets is easily perceived.
- \* *But the treatment of the same item may vary from organization to organization or even within the same organization.*
  - \* If a company buys a car to enable one of its salesmen to operate more effectively, this is a fixed asset
  - \* If a car dealer buys a car in order to resell it as part of his business, this is a current asset.

# Valuing Current Assets

- \* The rules of accounting state that current assets are shown on the balance sheet with a value that is the lower of what they cost and what it is expected they could be sold for.
- \* Suppose a company has a stock of 1,000 user manuals for a piece of technology that it sells.
  - \* The manuals sell at £10 each but cost £2 each to produce.
  - \* How much should these be valued at?
    - \*  $1000 \times £10$  or  $1000 \times £2$ ?
- \* On the other hand, a stock of printer paper that cost £5,000 would only be saleable for a lower figure, say £2,000
  - \* How much would these be valued at on a balance sheet?
    - \* £2000 or £5000?

# Valuing Fixed Assets

Fixed Assets
Intangible assets
Tangible assets
Investments
Total Fixed Assets

- \* Fixed assets are not expected to be sold in normal trading operations and their resale value is irrelevant
- \* What is needed is a measure of their value to the company.
- \* This is done by reducing their value each year in accordance with the company's depreciation policy.
- \* The most common way to do this is the straight-line method we have already seen
  - \* Decide how many years the asset will continue to be useful for.
  - \* Divide its initial cost by that number to get the annual depreciation.
  - \* Each year, reduce (or “write down”) the value of the asset by that amount until the value of the asset reaches zero.

# Re-valuation

Fixed Assets
Intangible assets
Tangible assets
Investments
Total Fixed Assets

- \* Assets are generally valued on the basis of historic cost i.e. their original monetary cost.
- \* In times of high inflation, this can be seriously misleading.
- \* The value of certain types of fixed assets, in particular land and buildings, may increase rather than decrease.
- \* Some companies therefore arrange to have their property re-valued from time to time and include this valuation in the balance sheet.

# The Fixed Asset Register

Fixed Assets
Intangible assets
Tangible assets
Investments
Total Fixed Assets

- \* Tangible fixed assets (e.g. large equipment, buildings, land) have to be recorded in the company's fixed asset register
- \* From time to time, their presence will be physically checked.
- \* Each year, depreciation must be calculated
  - \* If a fixed asset is sold for a sum higher than its depreciated value, the company must show the difference as income.
- \* Because of these complicated procedures, it is usual to treat all purchases of less than, say, £1,000 as expenses in the year in which they are incurred.

# Difficulties

Fixed Assets
Intangible assets
Tangible assets
Investments
Total Fixed Assets

- \* Some assets are difficult to classify as “fixed” or “current”.
- \* Software is one example
  - \* E.g. consider a payroll package.
  - \* It could be treated as a “fixed asset”, because it’s like a piece of machinery
    - \* A company buys such a package because to help carry out its day-to-day operations more efficiently.
    - \* So if the expected lifetime is 10 years, it should be depreciated as usual over that timescale.
  - \* But some accounts treat software as a “current expenditure” because software is intangible

# Research and Development

- \* Is “R & D” a fixed or current asset?
- \* Logically, resources spent on developing new products should be regarded as an investment that will produce a fixed asset
  - \* Something that will allow the company to operate more effectively.
- \* But results of R & D are always uncertain and often prove to be worth very little
  - \* To treat all the costs as investment would be misleading.

# Research and Development

- \* In practice, most software companies in the UK treat expenditure on R & D as current expenditure rather than as investment
  - \* The accounting rules allow for more flexible treatment.
- \* In the USA, there are strict rules regarding the capitalization of software that is developed for sale;
  - \* These rules are based on a rather unrealistic model of the product life cycle.

# Intangible Fixed Assets

Fixed Assets
Intangible assets
Tangible assets
Investments
Total Fixed Assets

- \* Reminder: Intangible assets are
  - \* assets such as copyright in software
  - \* or ownership of brand names.
  - \* Things that have no physical existence.
- \* Intangible fixed assets are the source of much discussion in the accounting profession.

Fixed Assets
Intangible assets
Tangible assets

- \* Software is generally regarded as an intangible asset, but it is more tangible than many items, e.g. brand names, which are often shown as intangible assets.

# Intangible Fixed Assets

Fixed Assets
Intangible assets
Tangible assets
Investments
Total Fixed Assets

- \* High “intangible assets” is often a warning sign that a company is potentially having difficulties –
  - \* They are a lot less reliable measures of wealth than tangible assets.
- \* An item that frequently appears under intangible assets on the balance sheets of software product companies is “goodwill”.
  - \* **Goodwill** in accounting is an intangible asset that arises when a buyer pays more to acquires an existing business than its net assets are worth

# Goodwill

- \* E.g. XYZ Ltd purchases another company, PQR Ltd, that owns the rights to a profitable software package
  - \* If, as is likely, the package was not shown as an asset on PQR's balance sheet XYZ would probably pay much more to buy PQR than the value of PQR's net assets.
  - \* The difference between the price paid and the value of PQR's net assets represents XYZ's estimate of the value of the rights in that package (and, possibly, other things such as the value of PQR's name).
  - \* This needs to be shown on XYZ's balance sheet.
  - \* While it would be preferable for the value of the package to be shown explicitly, this is not normal practice.
  - \* The whole of the difference between the purchase price and the value of PQR's net assets is normally shown under the heading of "goodwill".

# Liabilities

Balance sheet for a services company

XYZ Software Ltd	
Balance Sheet	
As at 31 October 2012	
	2012
	£'000
Fixed Assets	
Intangible assets	475
Tangible assets	960
Investments	50
<b>Total Fixed Assets</b>	<b>1,485</b>
Current Assets	
Work in progress	550
Debtors	3,400
Cash in hand and at bank	2,491
<b>Total Current Assets</b>	<b>6,441</b>
Creditors: Amounts falling due within one year	(3,210)
<b>Net Current Assets</b>	<b>3,231</b>
<b>Total Assets less current liabilities</b>	<b>4,716</b>
Creditors: Amounts falling due after one year	
Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>

- \* Next look at liabilities.
- \* These are interspersed with the assets – appearing as negative assets

# Liabilities

Balance sheet for a services company

XYZ Software Ltd	
Balance Sheet	
As at 31 October 2012	
	2012
	£'000
Fixed Assets	
Intangible assets	475
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Creditors: Amounts falling due after one year	
Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>

\* How much total liabilities are shown here?

# Short-term Liabilities

Current Assets	
Work in progress	550
Debtors	3,400
Cash in hand and at bank	2,491
<b>Total Current Assets</b>	<b>6,441</b>
Creditors: Amounts falling due within one year	(3,210)
<b>Net Current Assets</b>	<b>3,231</b>
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Creditors: Amounts falling due after one year	
Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>

- \* “Amounts falling due within one year” refers to debts that the company owes to its “creditors”.
  - \* These will include trade creditors, that is, outstanding invoices that the company has received but has not yet paid,
  - \* They will also include any bank overdraft, as opposed to a long-term loan.
  - \* It is committed to repaying these debts within one year.
  - \* In just the same way that the 'debtors' item refers to invoices that the company has issued but which have not yet been paid.

# Long-term Liabilities

Current Assets	
Work in progress	550
Debtors	3,400
Cash in hand and at bank	2,491
<b>Total Current Assets</b>	<b>6,441</b>
Creditors: Amounts falling due within one year	(3,210)
<b>Net Current Assets</b>	<b>3,231</b>
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Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>

- \* 'Creditors: Amounts falling due *after one year*' refers to long-term debts
- \* These may be long-term borrowings or they may be liabilities, that is, sums that the company expects to have to pay at some time in the future

# Net Current Assets (Working Capital)

Current Assets	
Work in progress	550
Debtors	3,400
Cash in hand and at bank	2,491
<b>Total Current Assets</b>	<b>6,441</b>
Creditors: Amounts falling due within one year	(3,210)
<b>Net Current Assets</b>	<b>3,231</b>
<b>Total Assets less current liabilities</b>	<b>4,716</b>
Creditors: Amounts falling due after one year	
Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>

- \* 'Net Current assets' in the Balance sheet is also known as the Working Capital.
- \* It represents the amount of money invested in the day-to-day operations of the company, as opposed to its infrastructure.

# Net Assets

Current Assets	
Work in progress	550
Debtors	3,400
Cash in hand and at bank	2,491
<b>Total Current Assets</b>	<b>6,441</b>
Creditors: Amounts falling due within one year	(3,210)
<b>Net Current Assets</b>	<b>3,231</b>
<b>Total Assets less current liabilities</b>	<b>4,716</b>
Creditors: Amounts falling due after one year	
Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>

- \* Net Assets (as opposed to net “current” assets) includes:
  - \* the total assets (fixed and current)
  - \* minus the total liabilities (falling both in the current year and after one year)
- \* This is a snapshot of what the company currently has (total £4555k)

**Balance Sheet**  
As at 31 October 2012

	2012 £'000
<b>Fixed Assets</b>	
Intangible assets	475
Tangible assets	960
Investments	50
<b>Total Fixed Assets</b>	<b>1,485</b>
<b>Current Assets</b>	
Work in progress	550
Debtors	3,400
Cash in hand and at bank	2,491
<b>Total Current Assets</b>	<b>6,441</b>
Creditors: Amounts falling due within one year	(3,210)
<b>Net Current Assets</b>	<b>3,231</b>
<b>Total Assets less current liabilities</b>	<b>4,716</b>
 <b>Creditors: Amounts falling due after one year</b>	
Borrowings	(154)
Provisions for liabilities and charges	(7)
<b>Net Assets</b>	<b>4,555</b>
 <b>Capital &amp; Reserves</b>	
Called-up share capital	318
Share premium reserve	350
Profit and loss account	3,887
 <b>Shareholders' funds – equity</b>	<b>4,555</b>

\* Next look at the value of the company to its shareholders

\* “Capital & Reserves”

# Shareholders Funds

- \* The total under the heading of 'Capital and reserves' is known by different names:
  - \* Shareholders' equity
  - \* Owners' equity
  - \* Owners' claim.
- \* It notionally represents the value of the company to its shareholders

Capital & Reserves	
Called-up share capital	318
Share premium reserve	350
Profit and loss account	3,887
<b>Shareholders' funds – equity</b>	<b>4,555</b>

Balance Sheet As at 31 October 2012		2012 £'000
<b>Fixed Assets</b>		
Intangible assets		475
Tangible assets		960
Investments		50
<b>Total Fixed Assets</b>		<b>1,485</b>
<b>Current Assets</b>		
Work in progress		550
Debtors		3,400
Cash in hand and at bank		2,491
<b>Total Current Assets</b>		<b>6,441</b>
Creditors: Amounts falling due within one year		(3,210)
<b>Net Current Assets</b>		<b>3,231</b>
<b>Total Assets less current liabilities</b>		<b>4,716</b>
 <b>Creditors: Amounts falling due after one year</b>		
Borrowings		(154)
Provisions for liabilities and charges		(7)
<b>Net Assets</b>		<b>4,555</b>
 <b>Capital &amp; Reserves</b>		
Called-up share capital		318
Share premium reserve		350
Profit and loss account		3,887
 <b>Shareholders' funds – equity</b>		<b>4,555</b>

\* The value to the shareholders must “balance” the net assets

# Net Assets

- \* The Capital and Reserves section must balance the net assets, as capital and reserves show where the money for the above assets has come from.

<b>Net Assets</b>	4,555
<hr/>	
<b>Capital &amp; Reserves</b>	
Called-up share capital	318
Share premium reserve	350
Profit and loss account	3,887
<hr/>	
<b>Shareholders' funds – equity</b>	4,555

# Capital Reserves

Capital & Reserves	
Called-up share capital	318
Share premium reserve	350
Profit and loss account	3,887

- \* There are a number of ways in which Capital Reserves may be shown.
- \* Share capital is the portion of a company's equity that has been obtained by trading stock to shareholders for cash.
  - \* Share capital comprises the nominal values of all shares issued (that is, the sum of their par values, as printed on the share certificates).
- \* Called-up share capital is the amount raised from the par value of the shares that the company has issued.

# Capital Reserves

Capital & Reserves	
Called-up share capital	318
Share premium reserve	350
Profit and loss account	3,887

- \* When a successful company decides to issue more shares, these are often sold at more than their par value.
- \* The extra is known as the share premium and the money raised from this is shown under the next heading, as the 'share premium reserve'.

# Capital Reserves

Capital & Reserves	
Called-up share capital	318
Share premium reserve	350
Profit and loss account	3,887

- \* In the example, the remainder is labelled as 'Profit and loss account', indicating that it results from the accumulated surplus on the profit and loss account over the life of the company'

As at 31 October 2012	2012	2011
	£'000	£'000
Profit and loss account	3,887	2,692



This difference of 1195 comes from the P&L account's figure for "retained profits" in 2012 (next lecture)

# Quick Review

Balance Sheet As at 31 October 2012		2012 £'000
<b>Fixed Assets</b>		
Intangible assets		475
Tangible assets		960
Investments		50
<b>Total Fixed Assets</b>		<b>1,485</b>
<b>Current Assets</b>		
Work in progress		550
Debtors		3,400
Cash in hand and at bank		2,491
<b>Total Current Assets</b>		<b>6,441</b>
Creditors: Amounts falling due within one year		(3,210)
<b>Net Current Assets</b>		<b>3,231</b>
<b>Total Assets less current liabilities</b>		<b>4,716</b>
 <b>Creditors: Amounts falling due after one year</b>		
Borrowings		(154)
Provisions for liabilities and charges		(7)
<b>Net Assets</b>		<b>4,555</b>
 <b>Capital &amp; Reserves</b>		
Called-up share capital		318
Share premium reserve		350
Profit and loss account		3,887
 <b>Shareholders' funds – equity</b>		<b>4,555</b>

\* How were the circled figures calculated?

# “Notes” section

- \* Also, there will be several 'notes' to the balance sheet
  - \* Describing the basis of the accounts
  - \* Giving more detail about certain items
  - \* Such items will cross-reference the notes.
- \* For an example, see company accounts filed for 1999

# Summary + Next lecture

Done this lecture:

## I. The Balance Sheet

(A snapshot of what a company owns and owes)

For next lecture:

## I. The Profit & Loss Account

(Shows how much money has come into and out of the company in a given time period)

## 2. The Cash Flow Statement

(Gives details of the cash flows that contributed to the figures in the balance sheet)

\* Summary Quiz on today's lecture in Moodle

# CE29x Team-Project Challenge

## Financial Accounting (2)

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose and Michael Fairbank

# Acknowledgment

\* This lecture is based on chapter six of:

Bott, F., 2005, "Professional Issues in Information Technology", Swindon: BCS.

# Reminder - Three Essentials

\* Three financial statements are the most important sections of the annual report

## 1. The Balance Sheet

(A snapshot of what a company owns and owes)

## 2. The Profit & Loss Account

(Shows how much money has come into and out of the company in a given time period)

## 3. The Cash-Flow Statement

(Gives details of the cash flows that contributed to the figures in the balance sheet)

\* We looked at the balance sheet in the last lecture

\* Today we will consider the others

## I. The Balance Sheet

(A snapshot of what a company owns and owes)

## 2. The Profit & Loss Account

(Shows how much money has come into and out of the company in a given time period)

## 3. The Cash-Flow Statement

(Gives details of the cash flows that contributed to the figures in the balance sheet)

# The Profit & Loss Account

- \* The profit and, loss (P & L) account shows for, a given period,
  - \* How much money has been received
  - \* How much has been spent
- \* It does not include money borrowed or received from the sale of equity
  - \* Because these do not affect the balance sheet's bottom line
- \* It does not include expenditure on acquiring fixed assets
- \* The period is usually the organisation's financial year.

# Jemimah's P & L

- \* In the case of non-profit-making organizations, the P+L account is usually called an “income and expenditure account”.
- \* This is what we call Jemimah's P+L Account
- \* See: Income and expenditure account for a student (on next slide)

## Income and expenditure account for our example student:

Income and expenditure account for a student

Jemimah Puddleduck

Income and Expenditure Account

Year ending 31 October 2012

	2012	2011
<b>INCOME</b>		
Contribution from parents	2,500	2,200
Income from summer job	2,250	1,750
<b>Total Income</b>	<b>4,750</b>	<b>3,950</b>
<b>Expenditure</b>		
Course Fees	3,465	3,465
Hall Fees	3,000	2,950
Books	75	60
Clothes and personal items	469	520
Transport	275	134
Food	1,990	1,885
Entertainment	2,080	1,675
Depreciation	400	400
<b>Total Expenditure</b>	<b>11,754</b>	<b>11,089</b>
<b>Excess of Income Over Expenditure</b>	<b>(7,004)</b>	<b>(7,139)</b>

# Income

\* The income is self-explanatory

INCOME	
Contribution from parents	2,500
Income from summer job	2,250
<b>Total Income</b>	<b>4,750</b>
Expenditure	
Course Fees	3,465
Hall Fees	3,000
Books	75
Clothes and personal items	469
Transport	275
Food	1,990
Entertainment	2,080
Depreciation	400
<b>Total Expenditure</b>	<b>11,754</b>
<b>Excess of Income Over Expenditure</b>	<b>(7,004)</b>

# Income

- \* However some arbitrary choices made
  - \* Income figures here have been quoted “net” (i.e. after tax)
  - \* Alternatively, could have given them gross, and shown tax + national insurance as a separate expenditure below

INCOME	
Contribution from parents	2,500
Income from summer job	2,250
Total Income	4,750
Expenditure	
Course Fees	3,465
Hall Fees	3,000
Books	75
Clothes and personal items	469
Transport	275
Food	1,990
Entertainment	2,080
Depreciation	400
Total Expenditure	11,754
Excess of Income Over Expenditure	(7,004)

# Expenditures

\* Similarly, the expenditures are self-explanatory:

INCOME	
Contribution from parents	2,500
Income from summer job	2,250
<b>Total Income</b>	<b>4,750</b>
Expenditure	
Course Fees	3,465
Hall Fees	3,000
Books	75
Clothes and personal items	469
Transport	275
Food	1,990
Entertainment	2,080
Depreciation	400
<b>Total Expenditure</b>	<b>11,754</b>
<b>Excess of Income Over Expenditure</b>	<b>(7,004)</b>

# Expenditures

- \* Except for Depreciation:

- \* although it is not an expenditure in the sense that cash is paid out, it does reflect a decline in value,
- \* and is therefore shown as an expenditure.

INCOME	
Contribution from parents	2,500
Income from summer job	2,250
Total Income	4,750
Expenditure	
Course Fees	3,465
Hall Fees	3,000
Books	75
Clothes and personal items	469
Transport	275
Food	1,990
Entertainment	2,080
Depreciation	400
Total Expenditure	11,754
Excess of Income Over Expenditure	(7,004)

# Depreciation

- \* Clearly, a fall in the value of assets tends to make the net P&L worse.
- \* The figure of £400 arises from the depreciation on the computer, mobile phone and other assets.

INCOME	
Contribution from parents	2,500
Income from summer job	2,250
Total Income	4,750
Expenditure	
Course Fees	3,465
Hall Fees	3,000
Books	75
Clothes and personal items	469
Transport	275
Food	1,990
Entertainment	2,080
Depreciation	400
Total Expenditure	11,754
Excess of Income Over Expenditure	(7,004)

# Expenditures

- \* Again, there is a certain arbitrariness about the way in which items have been aggregated.
  - \* We could, for example, have lumped together 'Food' and 'Entertainment' under the heading 'Living expenses'
  - \* Or split 'Transport' into 'Road' and 'Rail'.

INCOME	
Contribution from parents	2,500
Income from summer job	2,250
Total Income	4,750
Expenditure	
Course Fees	3,465
Hall Fees	3,000
Books	75
Clothes and personal items	469
Transport	275
Food	1,990
Entertainment	2,080
Depreciation	400
Total Expenditure	11,754
Excess of Income Over Expenditure	(7,004)

# Net total of Profit & Loss account

- \* The net figure at the bottom of the profit and loss account should reflect the extent to which the organisation / the individual - is better or worse off at the end of the year than at the beginning.
- \* Q: The Net Worth on her balance sheet in 2011 was £-4726. What was it in 2012?

INCOME	
Contribution from parents	2,500
Income from summer job	2,250
<b>Total Income</b>	<b>4,750</b>
Expenditure	
Course Fees	3,465
Hall Fees	3,000
Books	75
Clothes and personal items	469
Transport	275
Food	1,990
Entertainment	2,080
Depreciation	400
<b>Total Expenditure</b>	<b>11,754</b>
<b>Excess of Income Over Expenditure</b>	<b>(7,004)</b>

# Commercial P & L Accounts

- \* The P & L (or income and expenditure) account we have just looked at is typical of the account that might be produced by
  - \* an individual,
  - \* or a small club.
- \* A commercial profit and loss account looks very different
  - \* even though precisely the same ideas underlie it
- \* Example on next slide....

## Profit and loss account for our example services company

Profit and loss account for a software company

<b>XYZ Software Ltd</b>		
Profit and Loss Account	2012	2011
Year ending 31 October 2012	£'000	£'000
<b>TURNOVER</b>		
Continuing operations	14,311	11,001
Acquisitions	407	
<b>Total Turnover</b>	<b>14,718</b>	<b>11,001</b>
Cost of Sales	(11,604)	(8,699)
<b>Gross Profit</b>	<b>3,114</b>	<b>2,302</b>
Other operating expenses	(1,177)	(805)
<b>Operating Profit</b>	<b>1,937</b>	<b>1,497</b>
Interest Payable	(23)	(27)
<b>Profit before Taxation</b>	<b>1,914</b>	<b>1,470</b>
Taxation on profit	(719)	(480)
<b>Retained Profits</b>	<b>1,195</b>	<b>990</b>

Like the student's P+L account, there are

- incomes
- and expenditures

# Commercial P & L Accounts

- \* Just as with the balance sheet, items have been aggregated into very broad categories

<b>XYZ Software Ltd</b>
<b>Profit and Loss Account</b>
<b>Year ending 31 October 2012</b>
<b>TURNOVER</b>
Continuing operations
Acquisitions
<b>Total Turnover</b>
<b>Cost of Sales</b>
<b>Gross Profit</b>
Other operating expenses
<b>Operating Profit</b>
Interest Payable
<b>Profit before Taxation</b>
Taxation on profit
<b>Retained Profits</b>

# Turnover

XYZ Software Ltd	
Profit and Loss Account	
Year ending 31 October 2012	
<b>TURNOVER</b>	<b>2012</b>
Continuing operations	14,311
Acquisitions	407
<b>Total Turnover</b>	<b>14,718</b>
Cost of Sales	(11,604)
<b>Gross Profit</b>	<b>3,114</b>
Other operating expenses	(1,177)
<b>Operating Profit</b>	<b>1,937</b>
Interest Payable	(23)
<b>Profit before Taxation</b>	<b>1,914</b>
Taxation on profit	(719)
<b>Retained Profits</b>	<b>1,195</b>

- \* Turnover is the *income* that a business has from its normal business activities,
- \* usually from the sale of goods and services to customers.

# Turnover from Acquisitions

TURNOVER		
Continuing operations	14,311	11,001
Acquisitions	407	
Total Turnover	14,718	11,001

- \* During 2012, another company was acquired (by XYZ Ltd).
- \* The turnover generated from that acquired company is shown separately from the turnover from continuing operations
  - \* operations that were carried on 2011 and 2012.
- \* This is to facilitate the comparison between the two years.
- \* In the same way, if part of XYZ Ltd had been disposed of in 2011, its turnover would have been shown under the heading, 'discontinued operations'.
- \* Q: Does the £407k mean the company cost that much to buy, or produced that much new turnover to XYZ after it was bought?

# Expenditures

XYZ Software Ltd	
Profit and Loss Account	2012
Year ending 31 October 2012	£'000
<b>TURNOVER</b>	
Continuing operations	14,311
Acquisitions	407
<b>Total Turnover</b>	<b>14,718</b>
Cost of Sales	(11,604)
<b>Gross Profit</b>	<b>3,114</b>
Other operating expenses	(1,177)
<b>Operating Profit</b>	<b>1,937</b>
Interest Payable	(23)
<b>Profit before Taxation</b>	<b>1,914</b>
Taxation on profit	(719)
<b>Retained Profits</b>	<b>1,195</b>

- \* Most expenditures are self-explanatory,
- \* Except for...

# Cost of Sales vs. Expenses

Total Turnover	14,718
Cost of Sales	(11,604)
Gross Profit	3,114
Other operating expenses	(1,177)

- \* Some expenses are classified as “cost of sales”, and some are “operating expenses”.
- \* E.g. For our package software company XYZ, we have
  1. Expenditure on selling, printing documentation, installing software, etc.
  2. Expenditure on the development of new versions of existing packages or on new products

Q: So which are these? “Cost of Sales” or “Other operating expenses?”

# Cost of Sales vs. Expenses

Total Turnover	14,718
Cost of Sales	(11,604)
Gross Profit	3,114
Other operating expenses	(1,177)

- \* However for some companies, the distinction between, 'cost of sales' and 'other operating expenses' can be an uncertain one
  - \* Therefore some companies do not show the items separately.

# 'The Bottom Line'

XYZ Software Ltd	
Profit and Loss Account	2012
Year ending 31 October 2012	£'000
<b>TURNOVER</b>	
Continuing operations	14,311
Acquisitions	407
<b>Total Turnover</b>	<b>14,718</b>
Cost of Sales	(11,604)
<b>Gross Profit</b>	<b>3,114</b>
Other operating expenses	(1,177)
<b>Operating Profit</b>	<b>1,937</b>
Interest Payable	(23)
<b>Profit before Taxation</b>	<b>1,914</b>
Taxation on profit	(719)
<b>Retained Profits</b>	<b>1,195</b>

- \* The bottom line shows the retained profit, i.e. the profit not paid out in tax or dividends to shareholders
- \* This is £1195k

# 'The Bottom Line'

- \* This £1195k bottom line figure is added to the retained profit in the previous year's balance sheet to give the value of the retained profit shown in the new balance sheet.
- \* (Reminder from balance sheet)...

As at 31 October 2012	2012 £'000	2011 £'000
Profit and loss account	3,887	2,692

+£1195k

# P & L Notes

- \* The profit and loss account itself gives very little information about
  - \* Where the company's revenue during the year has come from
  - \* How it has spent its money
- \* These details might be given as additional “notes” in the accounts

# P & L Notes

- \* A software-package company, for example, might show in the notes:
  - \* How much of its income came from sales of software packages,
  - \* how much from training and consultancy,
  - \* and how much from maintenance contracts.

## I. The Balance Sheet

(What a company owns and owes)

## 2. The Profit & Loss Account

(Shows how much money has come into and out of the company in a given time period)

# 3. The Cash-Flow Statement

(Gives details of the cash flows that

contributed to the figures in the balance sheet)

# Cash-Flow Statements

- \* The cash-flow statement gives greater details of cash that comes into and goes out of a company
- \* Cash is defined as:
  - \* Cash at the bank
  - \* Plus cash in hand
  - \* Plus cash equivalents
  - \* Less bank overdrafts
  - \* Less other borrowings repayable within one year of the accounting date
- \* In other words, cash is immediately accessible capital

# Cash-Flow Statements

- \* The cash-flow statement also describes “capital expenditure”
  - \* Capital expenditure are funds used by a company to acquire or upgrade physical assets such as property, industrial buildings or equipment.
  - \* Capital expenditure affects the balance sheet
    - \* But the details on what was spent where was not given on the Balance Sheet or P&L Account
- \* The link that ties the balance sheet and the profit and loss account to the capital expenditure is the cash flow statement.

# Jemimah's Cash Flow

- \* How much 'Cash' does Jemimah have?
  - \* £700 (the money in her bank account) plus
  - \* £25 (the notes and coins in her possession)
  - \* Less £175 (her credit card debt), that is, £550.
- \* The previous year, the figure was £(234 + 40 - 100) = £174.
- \* One function of the cash flow statement is to explain this difference of £376.

Balance sheet for a student		
Jemimah Puddleduck		
Balance Sheet		
As at 31 October 2012		
	2012	2011
ASSETS		
Cash in hand	25	40
Cash at bank	700	234
Pre-paid Accommodation	600	590
LIABILITIES		
Credit Card Bill	175	100
Student Loan	14,000	7,000

## Cash flow statement for our example student :

Jemimah Puddleduck	2012	2011
Cash Flow Statement		
Year ended 31 October 2012		
<b>Cash Inflow</b>		
Addition to student loan	7,000	7,000
Add back depreciation	400	400
<b>Total cash inflow</b>	<b>7,400</b>	<b>7,400</b>
<b>Cash Outflow</b>		
From income and expenditure account	7,004	7,139
Loans to friends	20	0
<b>Total Cash Outflow</b>	<b>7,024</b>	<b>7,139</b>
<b>Excess of Income Over Expenditure</b>	<b>376</b>	<b>261</b>

The cash-flow statement has

- inflows of cash
- and outflows

The cash-flow statement's bottom line explains the £376 yearly change in cash (from the previous slide)

## Cash flow statement for our example student :

Jemimah Puddleduck		
Cash Flow Statement		
Year ended 31 October 2012		
	2012	2011
<b>Cash Inflow</b>		
Addition to student loan	7,000	7,000
Add back depreciation	400	400
<b>Total cash inflow</b>	<b>7,400</b>	<b>7,400</b>
<b>Cash Outflow</b>		
From income and expenditure account	7,004	7,139
Loans to friends	20	0
<b>Total Cash Outflow</b>	<b>7,024</b>	<b>7,139</b>
<b>Excess of Income Over Expenditure</b>	<b>376</b>	<b>261</b>

- The P+L bottom line appears on the cash flow statement as a single item
- But the cash-flow statement also includes cash items from non-income/expenditures
  - E.g. cash from loans

# Jemimah's outflows of cash

- \* The most obvious source of a change in the cash Jemimah holds is her P & L account (Income and Expenditure Account).
- \* That bottom line was £-7,004
- \* Hence she appears to have spent £7,004 more than she received
- \* This appears on her cash-flow statement as a major cash outflow.:

Cash Outflow	
From income and expenditure account	7,004
Loans to friends	20
Total Cash Outflow	7,024

# Jemimah's outflows of cash

- \* The only other cash outflow is the £20 that she has lent to a friend.
  - \* This is not expenditure, because it is repayable.
  - \* Nevertheless, it represents cash that has been paid out.
- \* If she had bought her mobile phone during the year, its cost would also appear as a cash outflow

Cash Outflow	
From income and expenditure account	7,004
Loans to friends	20
Total Cash Outflow	7,024

Q: Why are there only 2 cash outflows? Where are the details of the spending on food, clothes, travel, etc for this student?

# Inflows of cash

- \* On the balance sheet Jemimah's student loan increased by £7,000 from 2011 to 2012.
  - \* This means that she received £7,000 in cash from that source.
  - \* While it is an inflow of cash, it is not income, because it will have to be repaid;
  - \* Hence it does not appear as income on the income and expenditure (Profit and Loss) account.
  - \* But it does appear here, in the cash-flow statement:

Cash Inflow	
Addition to student loan	7,000
Add back depreciation	400
<b>Total cash inflow</b>	<b>7,400</b>

# Inflows of cash

- \* On her P&L account, the item of £400 for depreciation was a reduction in the value of her capital assets
- \* But this was not a real outflow of cash.
- \* To take this into account, we add the depreciation back in as a cash inflow.

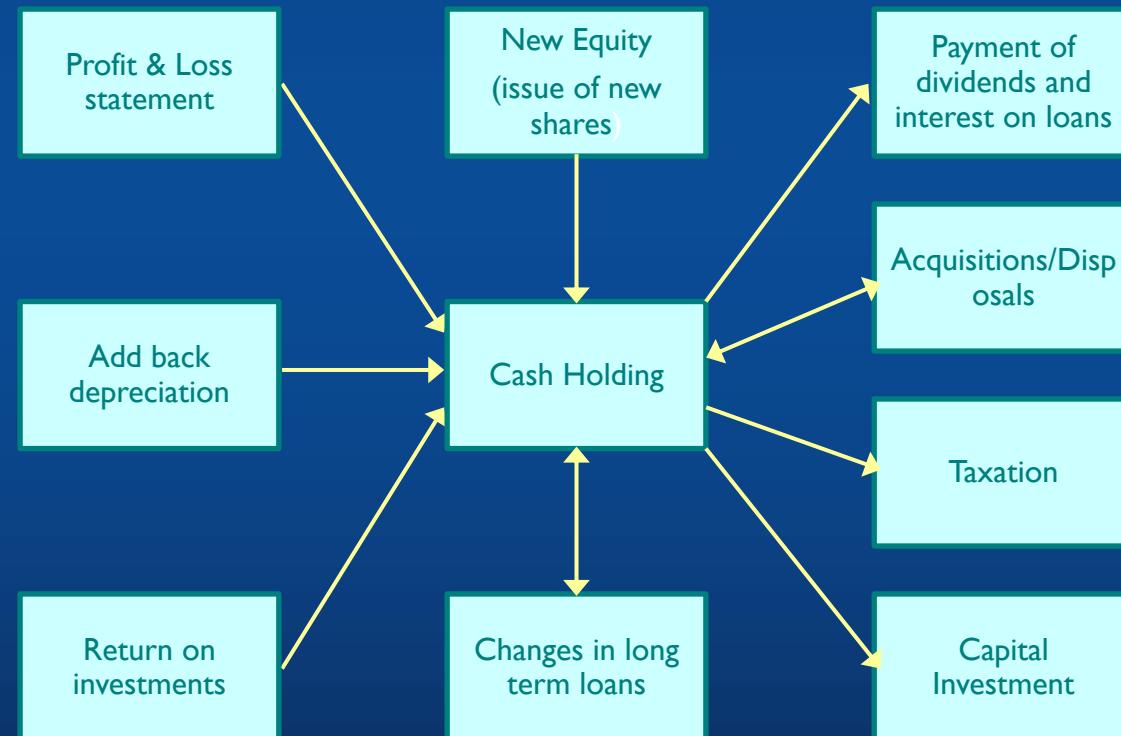
Cash Inflow	
Addition to student loan	7,000
Add back depreciation	400
Total cash inflow	7,400

# Company Cash Flows

\* Next is the cash-flow statement of a company.

# Company Cash Flows

\* For a company, there are more routes for cash to enter/exit:



## Cash-flow statement for our example company:

Cash-flow statement for a software company

XYZ Software Ltd	2012	2011
Cash Flow Statement		
Year ended 31 October 2012	£'000	£'000
Net cash inflow from operating activities	2,105	1,620
Returns on investments and servicing of finance	(23)	(27)
Capital expenditure and financial investment	(320)	(265)
Taxation	(719)	(480)
Acquisitions & disposals	(380)	
Equity dividend paid		
<b>Cash outflow before financing</b>	<b>(1342)</b>	<b>(772)</b>
<b>Net cash inflow before financing</b>	<b>663</b>	<b>848</b>
Financing		
Issue of share capital	215	100
Repayment of long-term loan	(50)	
	165	
<b>Increase in cash in the year</b>	<b>828</b>	<b>948</b>

There are inflows and outflows but they are interspersed together here

# Company Cash: Inflow

- \* The first inflow of cash is the operating profit (before tax)

XYZ Software Ltd	
Cash Flow Statement	2012
Year ended 31 October 2012	£'000
Net cash inflow from operating activities	2,105

- \* This came from the “Operating profit” figure on the P+L statement:

Operating Profit	1,937
------------------	-------

- \* However before appearing on the Cash flow statement, it was adjusted slightly (from £1937k to £2105k)

- \* for certain items which may appear in the P & L but do not involve the movement of money in or out of the company. E.g.

- \* Depreciation.

- \* Entered in the P & L to show the extent to which any of the fixed assets was consumed during the year
    - \* In no way does it reflect the movement of money out of the company, and so it must be added to operating profit.
    - \* This could have been entered separately as “add back depreciation”, like was done for the students cash-flow statement

# Company Cash Outflows

- \* Next, we include items that lead to cash leaving the company for reasons not directly connected with its operations.
  - \* Return on investments and servicing of debt
  - \* Capital expenditure; Investment
  - \* Taxation; Dividends paid on shares

Net cash inflow from operating activities	2,105
Returns on investments and servicing of finance	(23)
Capital expenditure and financial investment	(320)
Taxation	(719)
Acquisitions & disposals	(380)
Equity dividend paid	
Cash outflow before financing	(1342)
Net cash inflow before financing	663
Financing	
Issue of share capital	215
Repayment of long-term loan	(50)
	165
Increase in cash in the year	828

# Acquisitions & Disposals

- \* This shows XYZ bought another company.
- \* This resulted in a cash outflow
- \* The sale of a division or subsidiary might result in a cash inflow.

Net cash inflow from operating activities	2,105
Returns on investments and servicing of finance	(23)
Capital expenditure and financial investment	(320)
Taxation	(719)
Acquisitions & disposals	(380)
Equity dividend paid	
Cash outflow before financing	(1342)
Net cash inflow before financing	663
Financing	
Issue of share capital	215
Repayment of long-term loan	(50)
	165
Increase in cash in the year	828

# Net Cash Inflow

\* “Net cash inflow”

=Total figure for the inflow or outflow of cash into or out of the company (before taking into account any changes in the financing of the company):

Net cash inflow from operating activities	2,105
Returns on investments and servicing of finance	(23)
Capital expenditure and financial investment	(320)
Taxation	(719)
Acquisitions & disposals	(380)
Equity dividend paid	
<b>Cash outflow before financing</b>	<b>(1342)</b>
<b>Net cash inflow before financing</b>	<b>663</b>
<b>Financing</b>	
Issue of share capital	215
Repayment of long-term loan	(50)
	165
<b>Increase in cash in the year</b>	<b>828</b>

# Financing

- \* The final section of the cash flow statement shows the effect of changes in the financing of the company on the cash position.

Net cash inflow from operating activities	2,105
Returns on investments and servicing of finance	(23)
Capital expenditure and financial investment	(320)
Taxation	(719)
Acquisitions & disposals	(380)
Equity dividend paid	
Cash outflow before financing	(1342)
Net cash inflow before financing	663
<b>Financing</b>	
Issue of share capital	215
Repayment of long-term loan	(50)
	165
<b>Increase in cash in the year</b>	<b>828</b>

# Financing

- \* The company has issued new shares and raised £215,000 through this
- \* It has also paid off £50,000 of long-term debt.

Net cash inflow from operating activities	2,105
Returns on investments and servicing of finance	(23)
Capital expenditure and financial investment	(320)
Taxation	(719)
Acquisitions & disposals	(380)
Equity dividend paid	
Cash outflow before financing	(1342)
Net cash inflow before financing	663
<b>Financing</b>	
Issue of share capital	215
Repayment of long-term loan	(50)
	165
<b>Increase in cash in the year</b>	<b>828</b>

# Financing

- \* Both financing items affect the company's cash position
- \* The bottom line gives the overall change in the company's cash position over the year.

Net cash inflow from operating activities	2,105
Returns on investments and servicing of finance	(23)
Capital expenditure and financial investment	(320)
Taxation	(719)
Acquisitions & disposals	(380)
Equity dividend paid	
<b>Cash outflow before financing</b>	<b>(1342)</b>
<b>Net cash inflow before financing</b>	<b>663</b>
<b>Financing</b>	
Issue of share capital	215
Repayment of long-term loan	(50)
	165
<b>Increase in cash in the year</b>	<b>828</b>

# Financing

- \* The £828 figure represents the change in the company's cash + bank balance from 2011 to 2012 (which changed from £1663 to £2491)

Net cash inflow from operating activities	2,105
Returns on investments and servicing of finance	(23)
Capital expenditure and financial investment	(320)
Taxation	(719)
Acquisitions & disposals	(380)
Equity dividend paid	
Cash outflow before financing	(1342)
Net cash inflow before financing	663
<b>Financing</b>	
Issue of share capital	215
Repayment of long-term loan	(50)
	165
<b>Increase in cash in the year</b>	<b>828</b>

# Paying Attention?

- \* XYZ's balance sheet showed that, despite the fact that a loan of £50,000 has been paid off, the long-term debt has increased from £61,000 to £154,000

Balance sheet for XYZ (reminder)...

- \* There is nothing
- \* What's happening?
- \* It's probably to do with the acquisition made (i.e. the company XYZ bought)....

Creditors: Amounts falling due after one year		
Borrowings	(154)	(61)

# How is company XYZ doing?

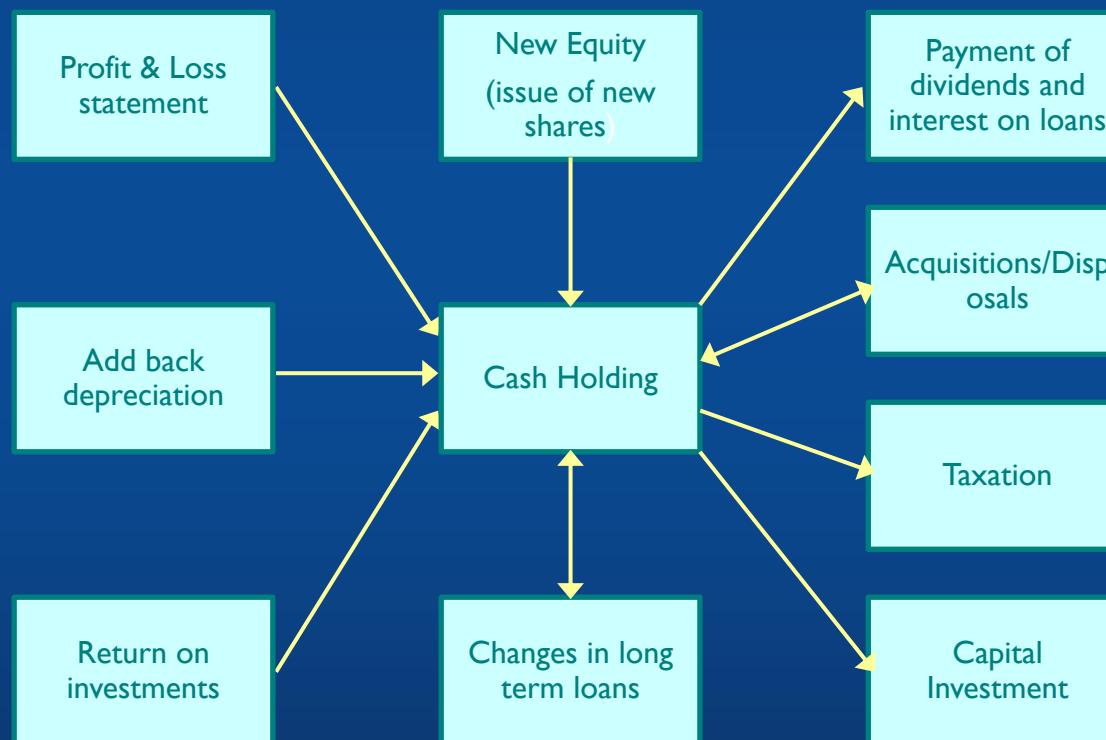
- \* The cash-flow statement shows that £380 was spent on “acquisitions & disposals”
- \* Also the P+L account shows £407k of turnover was contributed from “acquisitions”
- \* The likelihood is that the company bought had substantial debts, which were taken over by XYZ as part of the deal.
- \* That accounts for the increase in debt XYZ now has.
- \* This would be explained in the notes to the accounts.

# How is company XYZ doing?

- \* Hence the accounts show XYZ to be a vigorous company
  - \* Growing rapidly
  - \* Probably in an expanding market

# Summary of Company Cash Flows

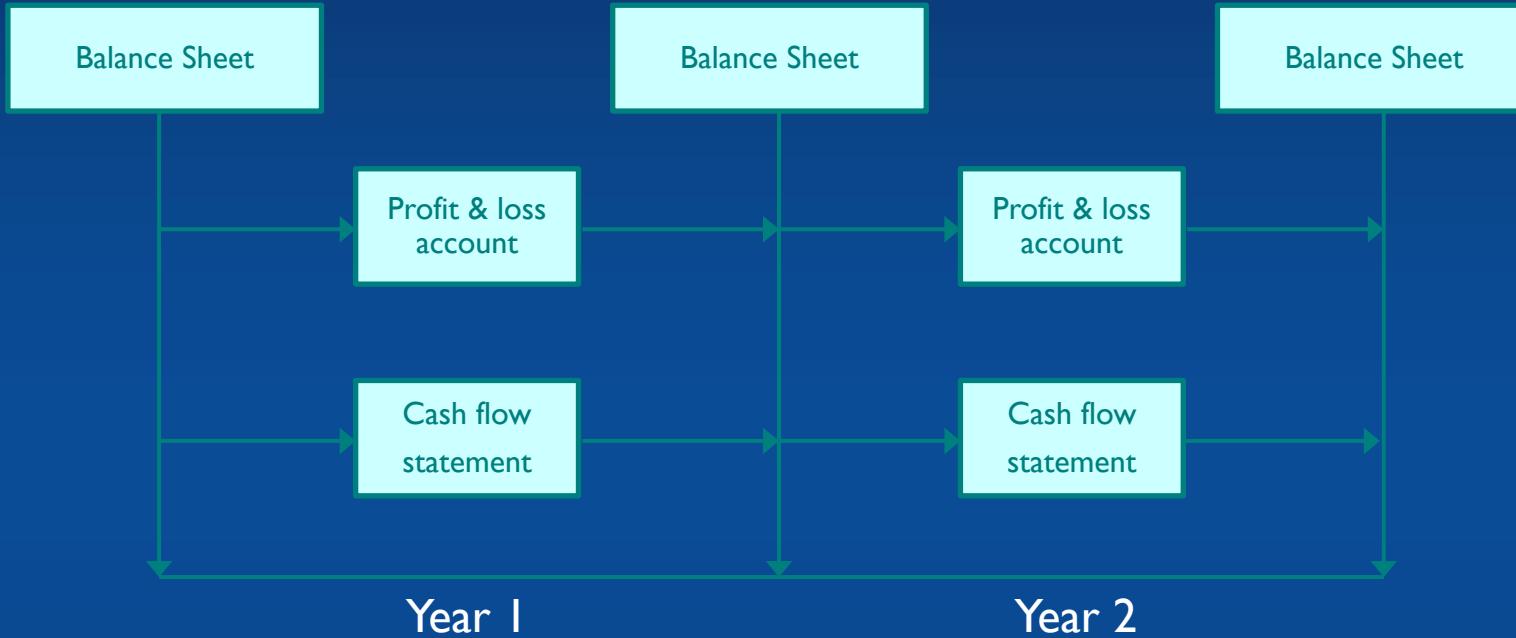
\* The arrows show the normal direction for a profitable co.



# The Overall Picture

- \* Balance sheet, P & L and cash flow cannot be read in isolation
- \* We must understand the relationship between them
- \* They must be read together in order to assess the financial state of a company...

# Three Financial Statements



- \* The balance sheet is a snapshot at the end of a reporting period (typically the financial year end)
- \* The P & L and the Cash Flow Statement describe what has happened during that period
  - \* They explain the relationship between successive balance sheets

# Next lecture...

- \* These financial statements are important reporting tools
- \* But they are not enough to inform managers day to day
  - \* For that we need to understand management accounts
  - \* The subject of the next lecture.
- \* Quiz on this lecture on Moodle.

# CE29x Team-Project Challenge

## Management Accounting

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose and Michael Fairbank

# Acknowledgment

\* This lecture is based on chapter seven of:

Bott, F., 2014, "Professional Issues in Information Technology", 2<sup>nd</sup> Ed

# Introduction

- \* The previous two lectures looked at
  - \* The financial state of a company as a whole
  - \* The way this has to be presented to satisfy the requirements of the law and of stock exchanges.
- \* Such information is intended primarily for potential investors and trading partners.
- \* It is not very useful in the day-to-day running of the company.
- \* It is concerned with the past
- \* Managers need to know what is likely to happen in the future
  - \* Hence “Management Accounting”

# Introduction (2)

- \* “Management Accounting”:
  - \* i.e. how the managers of a company need to receive information about their company’s financial performance.
  - \* So then can know what is likely to happen in the future
- \* This lecture is useful for you if you have ambitions to move into management at any point in your career
  - \* Or to run your own business, and plan your cash-flow correctly...
  - \* ...so that you don’t unexpectedly run out of money and go bankrupt

# Introduction (3)

- \* Note that unlike financial accounts which are published to the public, management accounts are only visible within the company,
  - \* typically to the board and first-line managers.
  - \* They are used to monitor and control departments and to inform tactics.

E.g. The sales manager might produce a sales forecast for the year ahead in conjunction with the marketing manager (maybe on a rolling basis).

- \* The sales manager would also produce a more detailed forecast for the next month/quarter.

# Budget and Cash-Flow Forecast

- \* In this lecture we study
  - 1. Budget statements
  - 2. Cash-Flow forecasts
- \* Everything in these statements are *forecasts*
  - \* They are about the future
  - \* They may not come exactly true

# I. Budget statement

## 2. Cash-Flow forecasts

As a simple example, we consider a company that assembles and sells computers.

An Example Budget	
<b>(Forecast) Costs</b>	
Overhead Expenditure	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
Operating Costs	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>
<b>(Forecast) Income</b>	
Sales Income	
Basic model (250 @ £595)	148,750
Advanced model (100 @ £795)	79,500
Professional model (50@ £895)	44,750
<b>Total Sales</b>	<b>273,000</b>
<b>Profit</b>	<b>27,750</b>

Total:

## First look at costs....

An Example Budget	
<b>Overhead Expenditure</b>	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
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<b>Total Sales</b>	<b>273,000</b>
<b>Profit</b>	<b>27,750</b>

# Costs

<b>Overhead Expenditure</b>	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
 <b>Operating Costs</b>	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>

# Fixed and Variable Costs

Fixed overheads	Overhead Expenditure	
	Owners Payroll Costs	52,000
	Secretary's payroll cost (part time)	10,000
	Costs of van (including fuel, insurance and depreciation)	7,500
	Internet connection, telephone, postage etc.	1000
	Advertising	2,500
	Premises (heating lighting, rent, rates)	6,000
	Professional fees	1,500
	Insurance	750
	Total overheads	81,250
Operating costs	Operating Costs	
	Technicians' payroll costs	74,000
	Bought-in components	90,000
	Total Operating Costs	164,000
	Total Costs	245,250

- \* Some costs will be incurred regardless of the level of business conducted.
  - \* These are called Fixed Overheads (e.g. premises, professional fees, secretary's payroll costs, etc.)
- \* Some costs will vary as the level of business varies.
  - \* These are often called Operating Costs
- \* Together they make up the overall projected cost of running the business.<sup>11</sup>

# Owner's payroll Costs

Overhead Expenditure	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
Operating Costs	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>

- \* Assume the company is run by its owner:
  - \* For many reasons: tax; social security etc, owners should treat themselves as employees
  - \* Pay themselves a salary (rather than attempt to live on the company's profits).
  - \* This accounts for the item labelled 'Owner's payroll costs'.

# Other overhead costs

Overhead Expenditure	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
Operating Costs	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>

- \* Most of the other overhead costs are obvious...

# Professional fees

Overhead Expenditure	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
Operating Costs	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>

- \* The services of an accountant will be necessary
  - \* To help prepare the annual accounts
  - \* Possibly to give advice from time to time
- \* The advice of a lawyer may also be necessary from time to time.

# Insurance

Overhead Expenditure	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
Operating Costs	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>

- \* Employers are legally required to carry insurance
  - \* To cover any claim against them for injuries suffered by employees during the course of their employment
  - \* Other insurance, e.g. against theft from the company's premises

# Operating costs

Overhead Expenditure	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
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Insurance	750
<b>Total overheads</b>	<b>81,250</b>
Operating Costs	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>

- \* Reminder: Operating costs vary as the level of business varies.
- \* The cost of components is a variable cost
  - \* It will increase if we sell more computers than expected
  - \* Or decrease if we sell fewer.

# Operating costs

Overhead Expenditure	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
Operating Costs	
Technicians' payroll costs	74,000
Bought-in components	90,000
<b>Total Operating Costs</b>	<b>164,000</b>
<b>Total Costs</b>	<b>245,250</b>

- \* The cost of the technicians can also be adjusted to match the sales volumes, (though less easily),
  - \* By recruiting another technician
  - \* Or making a technician redundant.

Next look at the forecast income (“Sales Income”)....

An Example Budget	
<b>Overhead Expenditure</b>	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
Premises (heating lighting, rent, rates)	6,000
Professional fees	1,500
Insurance	750
<b>Total overheads</b>	<b>81,250</b>
<b>Operating Costs</b>	
Technicians' payroll costs	74,000
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<b>Sales Income</b>	
Basic model (250 @ £595)	148,750
Advanced model (100 @ £795)	79,500
Professional model (50@ £895)	44,750
<b>Total Sales</b>	<b>273,000</b>
<b>Profit</b>	<b>27,750</b>

# Sales Income

Sales Income	
Basic model (250 @ £595)	148,750
Advanced model (100 @ £795)	79,500
Professional model (50 @ £895)	44,750
<b>Total Sales</b>	<b>273,000</b>

- \* The sales income is an estimate
  - \* Based on how many computers we think will be sold and at what price.
  - \* Very difficult to be precise
  - \* Needs monitoring month to month

## The bottom line (“Profit”):

An Example Budget	
<b>Overhead Expenditure</b>	
Owners Payroll Costs	52,000
Secretary's payroll cost (part time)	10,000
Costs of van (including fuel, insurance and depreciation)	7,500
Internet connection, telephone, postage etc.	1000
Advertising	2,500
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<b>Sales Income</b>	
Basic model (250 @ £595)	148,750
Advanced model (100 @ £795)	79,500
Professional model (50@ £895)	44,750
<b>Total Sales</b>	<b>273,000</b>
<b>Profit</b>	<b>27,750</b>

# Monitoring the Budget

- \* Budget forecast is a healthy +£27750 for the year
- \* The budget is used to monitor the company's performance
- \* On a month-by-month basis
- \* At the end of each month management must compare reality against forecast.
- \* If there are exceptions (e.g. where income is less, or expenditure more, than expected.), Management will
  - \* Investigate the reasons
  - \* Take appropriate actions if needed

# Enough?

- \* Let's assume our little company is on track to make its budget
- \* It seems to be headed for a tidy little profit at roughly 10% of Sales after all costs are met
- \* So everything looks good
- \* Or does it?
- \* This company actually risks going bankrupt
  - \* Why?
  - \* Cash flow

I. Budget statement

## 2. Cash-Flow forecasts

# Cash-Flow Forecasts

- \* A company may be very profitable but unable to pay its bills.
- \* For that reason, it may be forced into receivership.
- \* This apparent paradox typically arises because bills have to be met
  - \* In particular staff have to be paid,
  - \* Before the income they generate is received.
- \* In order to avoid this difficulty businesses need to prepare cash-flow forecasts
  - \* Estimates of the amount of money that will flow into and out of the company each month.

## Example cash-flow forecast:

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
Energy costs		425	425	325	225	225
Payroll costs	9,400	11,516	11,516	11,516	11,516	11,516
Communications		83	83	83	83	83
Insurance	750					
Components		4,000	7,000	10,000	10,000	10,000
Advertising		500		250		500
Road tax and insurance (van)	700					
Professional fees			300			
Van operating costs	300	300	300	300	300	300
<b>Monthly cash outflow</b>	<b>11,900</b>	<b>16,824</b>	<b>19,624</b>	<b>23,224</b>	<b>22,124</b>	<b>22,624</b>
<b>Cash inflow</b>						
Income from retail sales	4,000	5,000	6,000	6,000	6,000	6,000
Income from trade sales		5,000	7,500	12,500	15,000	18,000
<b>Monthly cash inflow</b>	<b>4,000</b>	<b>10,000</b>	<b>13,500</b>	<b>18,500</b>	<b>21,000</b>	<b>24,000</b>
<b>Net monthly cash flow</b>	<b>(7,900)</b>	<b>(6,824)</b>	<b>(6,124)</b>	<b>(4,724)</b>	<b>(1,124)</b>	<b>1,376</b>
<b>Cumulative cash flow</b>	<b>(7,900)</b>	<b>(14,724)</b>	<b>(20,848)</b>	<b>(25,575)</b>	<b>(26,696)</b>	<b>(25,320)</b>

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
Energy costs		425	425	325	225	225
Payroll costs	9,400	11,516	11,516	11,516	11,516	11,516
Communications		83	83	83	83	83
Insurance	750					
Components		4,000	7,000	10,000	10,000	10,000
Advertising		500		250		500
Road tax and insurance (van)	700					
Professional fees			300			
Van operating costs	300	300	300	300	300	300
<b>Monthly cash outflow</b>	<b>11,900</b>	<b>16,824</b>	<b>19,624</b>	<b>23,224</b>	<b>22,124</b>	<b>22,624</b>
<b>Cash inflow</b>						
Income from retail sales	4,000	5,000	6,000	6,000	6,000	6,000
Income from trade sales		5,000	7,500	12,500	15,000	18,000
<b>Monthly cash inflow</b>	<b>4,000</b>	<b>10,000</b>	<b>13,500</b>	<b>18,500</b>	<b>21,000</b>	<b>24,000</b>
<b>Net monthly cash flow</b>	<b>(7,900)</b>	<b>(6,824)</b>	<b>(6,124)</b>	<b>(4,724)</b>	<b>(1,124)</b>	<b>1,376</b>

- \* This example only forecasts six months
- \* In practice, companies normally try to forecast twelve months ahead.

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
Energy costs		425	425	325	225	225
Payroll costs	9,400	11,516	11,516	11,516	11,516	11,516
Communications		83	83	83	83	83
Insurance	750					
Components		4,000	7,000	10,000	10,000	10,000
Advertising		500		250		500
Road tax and insurance (van)	700					
Professional fees			300			
Van operating costs	300	300	300	300	300	300
<b>Monthly cash outflow</b>	<b>11,900</b>	<b>16,824</b>	<b>19,624</b>	<b>23,224</b>	<b>22,124</b>	<b>22,624</b>
<b>Cash inflow</b>						
Income from retail sales	4,000	5,000	6,000	6,000	6,000	6,000
Income from trade sales		5,000	7,500	12,500	15,000	18,000
<b>Monthly cash inflow</b>	<b>4,000</b>	<b>10,000</b>	<b>13,500</b>	<b>18,500</b>	<b>21,000</b>	<b>24,000</b>
<b>Net monthly cash flow</b>	<b>(7,900)</b>	<b>(6,824)</b>	<b>(6,124)</b>	<b>(4,724)</b>	<b>(1,124)</b>	<b>1,376</b>

- \* In this example, we will (unrealistically) assume:
  - \* the company is starting operations on 1<sup>st</sup> January.
  - \* the company is launching into its operations at full stretch from day 1

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
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Rent and property taxes	750			750		
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<b>Cash inflow</b>						
Income from retail sales	4,000	5,000	6,000	6,000	6,000	6,000
Income from website	5,000	7,500	12,500	15,000	18,000	

- \* The figures in each cell show the amount of cash entering or leaving the company during that month
- \* E.g. The highlighted £750 figure:
  - \* Means that an insurance premium of £750 will be paid sometime in January.

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
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\* The highlighted figure of £7,500

\* Means that £7,500 will enter the company's bank account in March as a result of trade customers paying invoices.

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
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Rent and property taxes	750			750		
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- \* The timing of the payments is important
- \* It depends on commercial practice
  - \* e.g. Rents are normally paid quarterly, in advance
  - \* i.e. The rent payment will be made at the beginning of January and the beginning of April.

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
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Rent and property taxes	750			750		
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- \* Components will probably be bought against credit accounts
  - \* Under such arrangements, invoices for components delivered in one month will be issued at the end of that month
  - \* Customers will be expected to pay the invoice within 28 days of its being issued.
  - \* Hence there is no forecast payment for components in January

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
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- \* Similar arrangements will probably apply to energy costs
  - \* Payments start a month late
  - \* But these will reduce as we move from the cold winter months into the warmer season.

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
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Rent and property taxes	750			750		
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- \* We have assumed that retail sales are paid for immediately
  - \* And that these start at £4,000 rising to a steady level of £6,000 per month throughout the period.

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
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Payroll costs	9,400	11,516	11,516	11,516	11,516	11,516
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- \* Trade sales are typically paid for in the month following delivery.
- \* We expect these sales to increase steadily during the period.

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
Energy costs		425	425	325	225	225
Payroll						
Comms						
Insurance						
Components		4,000	7,000	10,000	10,000	10,000
Advertising		500		250		500
Road tax and insurance (van)	700					
Professional fees			300			
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- \* How were the figures £91k and £111k calculated?
- \* The total cash received for the six-month period is estimated to be £91,000.
- \* Since trade sales made in month 6 will not appear in this figure, it looks as though the sales for the period are estimated to be around £111,000.

# Seasonality

- \* So we forecast an income of £111,000 in the first 6 months.
- \* The budget forecast total sales of £273,000,
  - \* Leaving £162,000 to be earned in the second six months.
  - \* This is not unreasonable. Demand both from consumers and from businesses is traditionally at its highest in September, October and November

Budget (reminder):

Sales Income	
Basic model (250 @ £595)	148,750
Advanced model (100 @ £795)	79,500
Professional model (50 @ £895)	44,750
<b>Total Sales</b>	<b>273,000</b>

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
Energy costs		425	425	325	225	225
Payroll						
Commission						
Insurance	750					
Components		4,000	7,000	10,000	10,000	10,000
Advertising		500		250		500
Road tax and insurance (van)	700					
Professional fees			300			
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<b>Net monthly cash flow</b>	<b>(7,900)</b>	<b>(6,824)</b>	<b>(6,124)</b>	<b>(4,724)</b>	<b>(1,124)</b>	<b>1,376</b>
<b>Cumulative cash flow</b>	<b>(7,900)</b>	<b>(14,724)</b>	<b>(20,848)</b>	<b>(25,575)</b>	<b>(26,696)</b>	<b>(25,320)</b>

\* How is the net monthly cash flow calculated?

# Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
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<b>Cumulative cash flow</b>	<b>(7,900)</b>	<b>(14,724)</b>	<b>(20,848)</b>	<b>(25,575)</b>	<b>(26,696)</b>	<b>(25,320)</b>

\* How much initial cash in the bank does this company need to survive the first 6 months of trading?

\* How is cumulative cash flow calculated?

# The Issue

- \* Assuming that the estimates are realistic
  - \* Forecast shows that, at no time during the period, will the cash received come close to balancing the cash paid out.
  - \* At the worst point, at the end of month 5, the cash paid out will be £26,696 more than the cash received.

<b>Monthly cash outflow</b>	11,900	16,824	19,624	23,224	22,124	22,624
<b>Cash inflow</b>						
Income from retail sales	4,000	5,000	6,000	6,000	6,000	6,000
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<b>Net monthly cash flow</b>	(7,900)	(6,824)	(6,124)	(4,724)	(1,124)	1,376
<b>Cumulative cash flow</b>	(7,900)	(14,724)	(20,848)	(25,575)	(26,696)	(25,320)

# The Issue

Cumulative cash flow	(7,900)	(14,724)	(20,848)	(25,575)	(26,696)	(25,320)
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- \* This has nothing to do with the company's profitability
  - \* It could well be that the company is on track to meet the budget (shown earlier) and make a respectable profit.
    - \* Remember £27,750 profit was forecast for the year
  - \* Nevertheless, the company will need to have at least £26,696 available in cash if it is to keep operating through this period.
  - \* Prudence suggests that it should plan on requiring £35,000 to allow for things going wrong.

# Cash Requirement

- \* The amount of cash required to allow the company to continue to operate over a period is called its **cash requirement**.
- \* Also often referred to as **working capital**
  - \* As we saw in 'The Balance Sheet' when considering financial accounting, "working capital" meant "Net Current Assets"
  - \* = the difference between current assets and current liabilities
  - \* The two concepts are related but they are not identical
- \* The traditional way of funding a company's cash requirement is through a bank overdraft,
  - \* But banks are not always eager to lend to small companies and loans from other sources may be necessary.

# Rolling Cash-Flow Forecast

- \* An initial cash-flow forecast is an essential part of a business plan
- \* A well-run company will maintain a rolling 12-month cash-flow forecast.
  - \* i.e. Each month it will produce a new cash-flow forecast for the next 12 months
- \* Such forecasts will provide early warning of any prospective cash shortage

# Rolling Cash-Flow Forecast

- \* Banks traditionally respond well to a request for an increase in overdraft facilities
  - \* That is made well in advance
  - \* Based on detailed cash-flow predictions.

# Summary

- \* Cash-flow forecasts and budgets may seem very much the same thing
- \* It is important to understand the difference
- \* Cash-flow forecasts deal with the flow of cash or its equivalents in and out of the company, on a month-by-month basis
- \* Budgets deal with income and expenditure, typically for a year at a time

# Summary

- \* Assume our company delivers computers worth £100,000 to a large customer today and sends it an invoice:
  - \* This will immediately appear as income when we are monitoring the budget
  - \* However, it could be three or four months before the invoice is paid and the corresponding payment appears as cash
  - \* The difference can be crucial

# Summary

- \* Lecture quiz will be released on Moodle.

- \* Next lecture:

- \* Marketing

# CE29x Team-Project Challenge

## Marketing

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose and Michael Fairbank

# Lecture outline

1. Introduction and definitions of Marketing
2. Successful Marketing
3. Creating a Marketing Plan
4. Conclusions

# Basis of Lecture

- \* Primarily based on ideas from “Business Plan for a Startup Business”
  - \* freely available on the web from a number of sources
  - \* You can download it from our Moodle page.
    - \* 31 pages long
  - \* The document gives you a template for the major activities you need to consider when launching your own business.
- \* Today we will concentrate on Marketing & Finance
  - \* but other topics are covered in the document in more detail.

# I. Introduction + Definitions of Marketing

# Thought Experiment:

- \* Imagine you have written a new piece of software
  - \* - it might be a new game you hope to release on an appstore.
  - \* - or it might be a new website for helping people solve a common problem easily.
- \* You want some payback for your efforts
- \* Otherwise you'll have to go out and get a real 9-5 job, and that would be the last cool piece of software you have time to build
- \* So how are you going to cash in?
- \* You need a marketing strategy of some kind.
- \* Do it quick before your idea is copied by someone else.

# What is Marketing (I)?

"Marketing is the management process responsible for identifying, anticipating, and satisfying customer requirements, profitably."

*(Chartered Institute of Marketing)*

## Goals:

1. Attract new customers by promising superior value.
2. Keep and grow current customers by continually delivering satisfaction.

# What is Marketing (2)?

Marketing is a social and managerial process by which individuals and groups obtain what they want and need through creating, offering and exchanging products of value with others.

(Philip Kotler, Kellogg School of Management at Northwestern University)

Professor Kotler's book, Marketing Management (ebook link), is the one of the world's most widely used textbook in marketing teaching.

# What is Marketing (3)?

Slightly more informally:

The right product,  
in the right place,  
at the right time,  
and at the right price.

*(Dennis Adcock, Coventry Business School)*

# What is Marketing (4)?

- \* Marketing is the activity, set of instructions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large.

## OLD view of marketing:

*Making a sale –  
“telling and selling”*

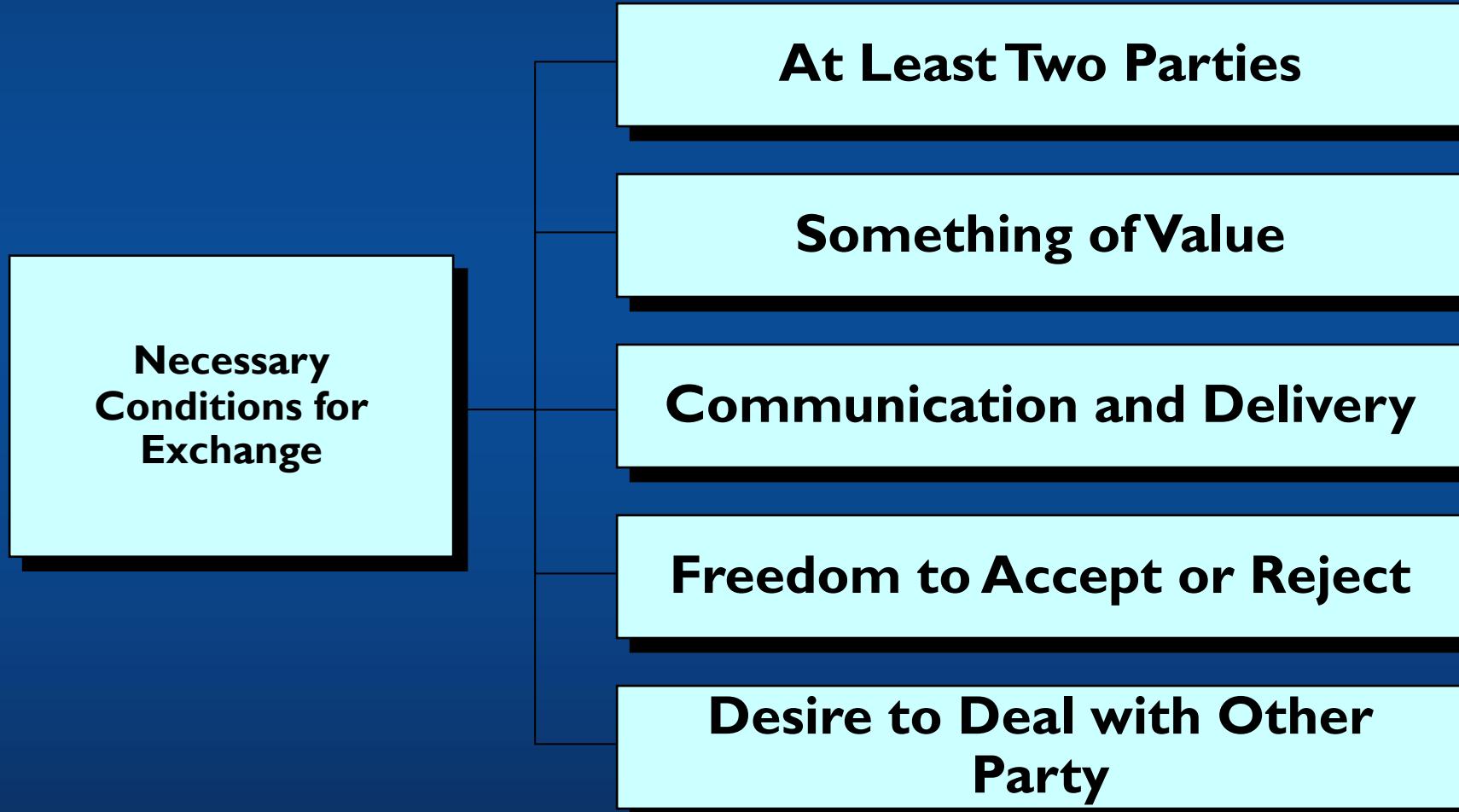
*(Mary Mundell, Durham Business School)*

## NEW view of marketing:

*Satisfying  
customer needs*

# The Concept of Exchange

Several of the previous marketing definitions involved the concept of an “exchange” of something of value.



## 2. Successful Marketing

# The Marketing Concept

- \* Choosing and targeting appropriate customers
- \* Positioning your offering
- \* Interacting with those customers
- \* Controlling the marketing effort
- \* Continuity of performance – i.e. it's not a one-off activity (otherwise your business will eventually fade)

# Success requires POISE:

- \* Profitable (must not cost more than sale)
- \* Offensive (rather than defensive)<sup>#</sup>
- \* Integrated (must not be a separate activity)
- \* Strategic (is future orientated)
- \* Effective (gets results)

(Hugh Davidson, Cornfield University; see his book “Offensive Marketing” (univ library link – not e-book))

# An approach to marketing that recognizes the importance of initiative and a proactive competitive stand in the marketplace

# Marketing Management Process

These are steps to consider when you are managing the marketing process:

- \* Analysis / Audit - where are we now?
- \* Objectives - where do we want to be?
- \* Strategies - which way is best?
- \* Tactics - how do we get there?
- \* Implementation - getting there!
- \* Control - ensure arrival.

# Questions to ask yourself about your marketing

- \* Who are our existing / potential customers?
- \* What are their current / future needs?
- \* How can we satisfy these needs?
  - \* Can we offer a product / service that the customer would value?
  - \* Can we communicate with our customers?
  - \* Can we deliver a competitive product or service?
- \* Why should customers buy from us?

### 3. Create a Marketing Plan

# Create a Marketing Plan

The following topics are detailed on the next slides:

1. Market Research
2. Economics
3. The 4 Ps:
  - \* Product
  - \* Place
  - \* Promotion
  - \* Price
4. Customers
5. Competition
6. Sales Forecast

# Marketing Plan: I. Market Research

- \* Market research can be “primary research” or “secondary research”
- \* Primary Research means gathering your own data.
- \* For example, you could:
  - \* do your own 'traffic' count at a proposed location,
  - \* use the yellow pages to identify competitors,
  - \* do surveys,
  - \* run focus-group interviews to learn about consumer preferences.

# Secondary Market Research

- \* Secondary research means using published information such as industry profiles, trade journals, newspapers, magazines, census data, and demographic profiles.
- \* Local libraries are pleased to guide you through their business data collection.
- \* There are more online sources than you could possibly use.
- \* Chambers of Commerce have good information on the local area.
- \* Trade associations and trade publications often have excellent industry-specific data.

# Marketing Plan: 2. Economics

- \* What is the total size of your market?
- \* What percent share of the market will you have?
- \* What is the current demand in target market?
- \* What are the trends in target market? E.g.
  - \* growth trends,
  - \* trends in consumer preferences, and
  - \* trends in product development.

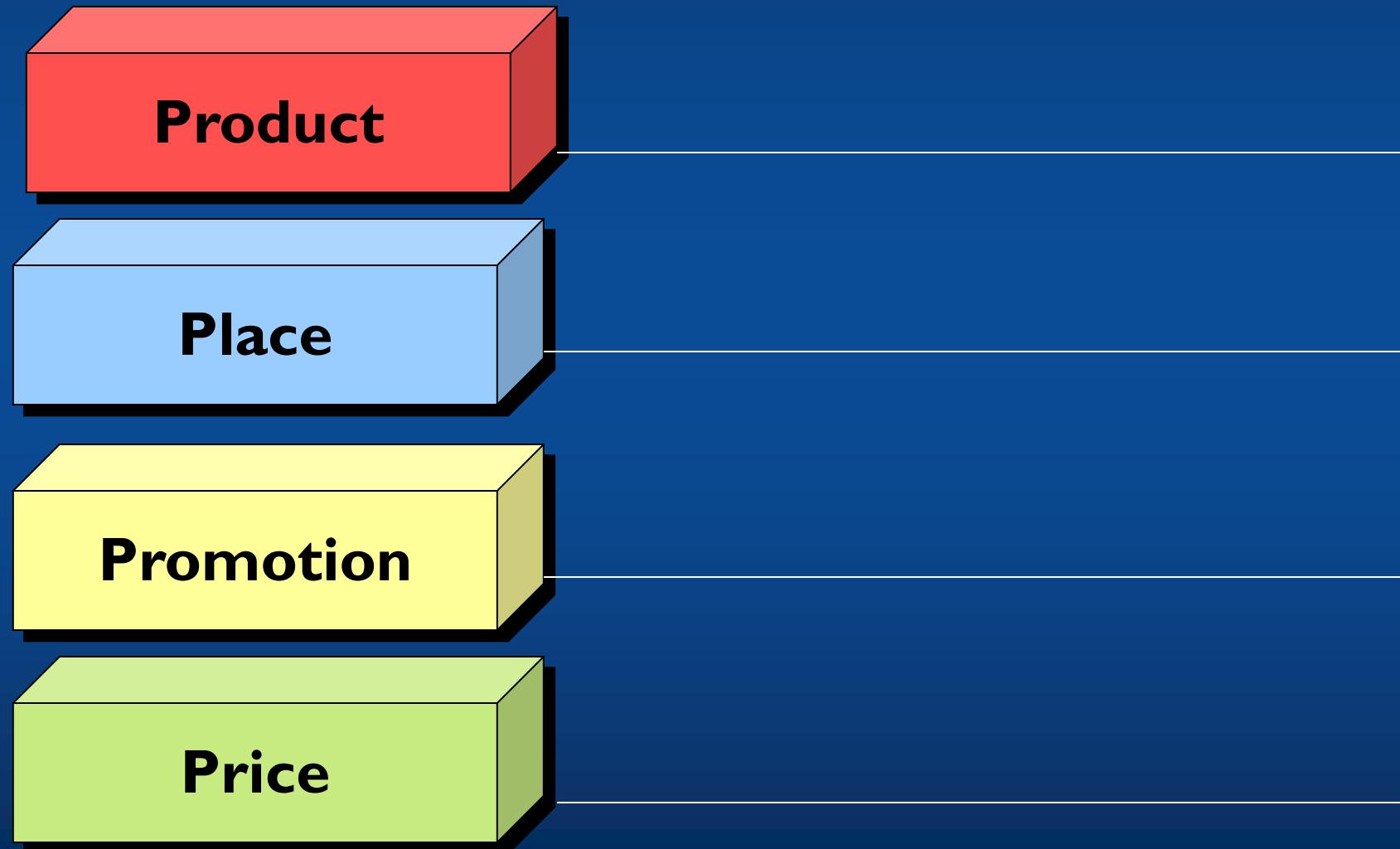
Q: Think about the above points for a new game that you have written. Imagine that you are hoping to make it successful on the Android/Apple app-stores.

Note: we had a talk at CSEE recently by the founder of [swrve.com](http://swrve.com), which is a startup dedicated to providing app developers the marketing data they need to promote their new apps successfully.

# Marketing Plan: 2. Economics

- \* What barriers to entry are there? Examples are:
  - \* High capital costs
  - \* High production costs
  - \* High marketing costs
  - \* Consumer acceptance and brand recognition
  - \* Training and skills
  - \* Unique technology and patents
  - \* Unions
  - \* Shipping costs
  - \* Tariff barriers and quotas

# Marketing Plan: 3. The “Four Ps”



# The Marketing Mix

This refers to the set of controllable, tactical marketing tools that the firm blends to produce the response it wants in the target market.

- \* Product:

- \* Variety, features, brand name, quality, design, packaging and after sales services (e.g.: delivery, warranty, service contracts, support, follow-up, and refund policy).

- \* Place:

- \* Distribution channels, coverage, logistics, locations and transportation.

- \* Promotion:

- \* Advertising, sales promotion, public relations, image, sales collateral (brochures etc.).

- \* Price:

- \* List price, discounts, payment period and credit terms.

# Marketing Plan: 4. Customers

- \* Identify your customers, their characteristics and their locations.
- \* Description will be dependent on whether you plan to sell to other businesses or directly to consumers.
  - \* If you sell a consumer product, you could sell it through a channel of distributors, wholesalers, and retailers or directly (e.g. for online B2B or B2C)
- \* You must carefully analyse both the end consumer and the middleman businesses to which you sell.
- \* You may have more than one customer group. Identify the most important groups. Then, for each customer group, construct what is called a demographic profile.

# Customers Demographic Profile

- \* Age
- \* Gender
- \* Location
- \* Income level
- \* Social class and occupation
- \* Education
- \* Industry (or portion of an industry)
- \* Location
- \* Size of firm
- \* Quality, technology, and price preferences
- \* Other (specific to your industry)

# Marketing Plan: 5. Competition

- \* What products and companies will compete with you?
- \* List your major competitors.
- \* Will they compete across the board, or just for certain products, certain customers, or in certain locations?
- \* Will you have important indirect competitors? (e.g.: video rental websites compete with cinemas and theatres, although they are different types of businesses.)
- \* How will your products or services compare with the competition?

# Competitive Analysis

Compare yourself to each competitor in terms of:

- \* Products
- \* Price
- \* Quality
- \* Selection
- \* Service
- \* Reliability
- \* Stability
- \* Expertise
- \* Reputation
- \* Location
- \* Appearance
- \* Sales Method
- \* Credit Policies
- \* Advertising
- \* Image

For each factor rate your performance 1 to 5:

	Strength	Weakness	Importance to Customer
Competitor			
Me			

# Marketing Plan: 6. Sales Forecast

- \* Try to estimate how many of your product you can sell
  - \* How many, of what?
  - \* When?
    - \* Give a month by month forecast
  - \* What sales price?
    - \* Allow for initial discounts / forecast price increases
- \* Base it on market research / past sales
- \* For new products, compare to past similar products to make an educated guess

# Reminder: Cash-Flow Forecast

Month	Jan	Feb	Mar	Apr	May	Jun
<b>Cash outflow</b>						
Rent and property taxes	750			750		
Energy costs		425	425	325	225	225
Payroll costs	9,400	11,516	11,516	11,516	11,516	11,516
Communications		83	83	83	83	83
Insurance	750					
Components		4,000	7,000	10,000	10,000	10,000
Advertising		500		250		500
Road tax and insurance (van)	700					
Professional fees			300			
Van operating costs	300	300	300	300	300	300
<b>Monthly cash outflow</b>	<b>11,900</b>	<b>16,824</b>	<b>19,624</b>	<b>23,224</b>	<b>22,124</b>	<b>22,624</b>
<b>Cash inflow</b>						
Income from retail sales	4,000	5,000	6,000	6,000	6,000	6,000
Income from trade sales		5,000	7,500	12,500	15,000	18,000
<b>Monthly cash inflow</b>	<b>4,000</b>	<b>10,000</b>	<b>13,500</b>	<b>18,500</b>	<b>21,000</b>	<b>24,000</b>
<b>Net monthly cash flow</b>	<b>(7,900)</b>	<b>(6,824)</b>	<b>(6,124)</b>	<b>(4,724)</b>	<b>(1,124)</b>	<b>1,376</b>
<b>Cumulative cash flow</b>	<b>(7,900)</b>	<b>(14,724)</b>	<b>(20,848)</b>	<b>(25,575)</b>	<b>(26,696)</b>	<b>(25,320)</b>

(Reminder from management accounts lecture)

## 4. Conclusions

# Conclusion

- \* Marketing is essential for any business:
  - \* Initially, you have to find target and reach customers
  - \* It should be ongoing; you need to keep customers
- \* You will be asked to do some market research and generate a marketing plan for your team-project

# A Critique of Marketing

- \* Some Criticisms

- \* Too many advertisements are annoying, misleading, or both.
- \* There are too many unnecessary products.
- \* Middlemen raise prices but don't add value.
- \* Marketing makes people materialistic.

- \* Most of the criticisms result from misunderstandings about marketing

- \* (Perreault & McCarthy – authors of various marketing books)

# Next Lecture

- \* Next lecture is on Contracts
- \* Quiz on today's lecture on Moodle

# CE29x Team-Project Challenge

## Contracts

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose and Michael Fairbank

# Announcements

- \* Git/Jira good practice tips:
  - \* <https://blog.intructo.com/how-to-save-a-puppy-by-creating-a-clean-git-repo>
- \* SAMT Survey
- \* Individual Challenge week (Monday 18<sup>th</sup> Jan – Friday 22<sup>nd</sup> Jan)
  - \* There will be an explanatory presentation by myself on the Monday morning.
  - \* The Challenges will require approximately 4 days work to complete and make a good pass.
  - \* Presentations and marking take place on the Friday – keep that day fully available.

# Contracts - Context

- \* We have considered the legal framework and how it applies to our disciplines
- \* We have looked at laws protecting copyright, designs and patents
- \* We know that software and hardware sometimes go wrong - but what recourse do people have
- \* This lecture is about contracts and liability

# Considerations

What can a company or an individual do when the software they have purchased does not perform as expected?

- \* What sort of agreements are there?
- \* What does the law have to say?
- \* What happens when one party fails to meet obligations?
- \* How far can producers go in limiting liability?

# Lecture outline

- I. The sale of goods Act 1979
2. Contract Law
3. Contracts for Outsourcing
4. Contracts for Bespoke Software
5. Contracts for Consultancy and Contract Hire
6. The structure of a Contract
7. Ownership Issues
  - \* Using software licences

# I. Sale of Goods Act 1979

# Sale of Goods Act 1979

- \* Quality of supplied goods defined as:
  - \* Fitness for all the purposes for which goods of the kind in question are commonly supplied.
  - \* Appearance and finish.
  - \* Freedom from minor defects.
  - \* Safety
  - \* Durability.
- \* Can software quality be measured, and are minor defects OK?

# St Albans City Council v ICL

- \* ICL is a former British computer company – now taken over by Fujitsu
- \* Council required a new system to administer the newly created Community Charge (Poll Tax, approx 1990).
- \* System failed in many aspects
  - \* Performance
  - \* Reliability
  - \* Database reported wrong figures
- \* Council under-recovered £1.3M revenue in first year.
- \* Finally awarded full amount after appeal.
- \* Actual cited acts were: Supply of Goods and Services Act 1982 and the Unfair Contract Terms Act 1977.

# St Albans City Council v ICL (2)

- \* Important definition was made by the Judge:
  - \* Software was Goods (as defined by the Sale of Goods Act)
  - \* Without Software, Hardware could not function.
  - \* Software was not just information but actively defined the way the total system worked.
  - \* Also, an implication was made, if Software was not goods then what else could it be?
- \* However, current best practice is to define requirements, both functional & non-functional, within Contract of Supply rather than attempt to invoke the Sale of Goods Act after delivery.

## 2. Contract Law

# Contract Law

- \* A contract is an agreement between two parties that is enforceable in law.
  - \* It sets out the aims of both parties, their obligations and responsibilities.
  - \* It defines at what point the contract is complete
  - \* It can also set out what should happen if problems arise

# Contract Law

- \* Not every agreement is a contract. There must be:
  - \* An offer and an acceptance
  - \* valuable consideration i.e.
    - \* Each party must be receiving something and providing something
  - \* An intention by all parties to make a contract
  - \* All parties must be competent (e.g. old enough and of sound mind)
- \* A contract between two parties can be made orally or in writing.
  - \* i.e. you can have a verbal contract

# Validity

- \* Not every contract is valid (can be upheld in law) e.g.
  - \* A contract to commit a crime
  - \* A contract where one or other party is disqualified
- \* Even legal contracts can have restrictions e.g.
  - \* Sale of Goods Act (1979) & Sale and Supply of Goods Act (1994)
  - \* Supply of Goods and Services Act (1982)
  - \* Laws covering employment contracts
  - \* Etc.

# Liability for Defective Software

- \* Contracts sometimes try to exempt the developers from liability for defective software
  - \* However the Unfair Contracts Act 1977 restricts the extent to which liability can be limited
  - \* Not possible to limit liability at all if the defect causes death
  - \* Also have the Sale of Goods act 1979

# Specifics

- \* A contract should be as precise as possible re obligations and undertakings of those involved.
- \* A contract e.g. will specify
  - \* The system to be developed
  - \* The deliverables
  - \* The timescale
  - \* The payments
  - \* Etc

# The Unforeseen

- \* The unforeseen happens
- \* When it does the courts rely on:
  - \* The contract itself
    - \* The conditions
    - \* The warranties (beware it has a very specific meaning)
  - \* Inducements – what the parties said when they were negotiating the contract
    - \* If someone made false statements then the Misrepresentation Act (1967) might apply
  - \* Implied terms – if the contract says nothing what should it have said?
    - \* Accepted practice
    - \* Precedents

### 3. Contracts for Outsourcing

# Contracts for Outsourcing

- \* Large organisations regularly sub-contract design and implementation /manufacture to other parties
  - \* Called outsourcing
- \* It could be for Hardware and/or Software Development
- \* The work will be covered by a contract

# Contracts for Outsourcing

- \* Outsourcing contracts are normally long and complex
- \* They try to make things as explicit as possible
  - \* How is performance to be monitored + managed?
  - \* What if performance is unsatisfactory?
  - \* Which assets are being transferred from the client to the outsourcer?
    - \* Existing IT equipment?
    - \* Existing staff?
  - \* Duration and termination conditions of contract?
  - \* Ownership of the IP generated?
  - \* Audit rights
    - \* The customer's existing external and internal auditors may still need access to the newly outsourced assets for inspection
  - \* Contingency planning + disaster recovery

## 4. Contracts for Bespoke software

# Two domains for Software

- \* In regard to software we can consider two radically different domains:
  - \* Shrink-wrap software
    - \* An identical piece of software is sold to any customer who wants to buy it
  - \* Bespoke software
    - \* Custom software is written specifically for a large client

# Contracts for Bespoke software

- \* These should specify what is to be produced,
  - \* E.g. based on a SRS document
  - \* But a good contract should specify how the requirements can be varied by the customer after the SRS is finalised,
    - \* including payment and time consequences
- \* Should specify the acceptance testing procedures
- \* What QA standards will be used
- \* What methodologies used during development

# Contracts for Bespoke software

- \* The contract should also specify
  - \* Should the client get the source code?
  - \* And the build files? Build tools?
  - \* Unit tests used? What test results to expect?
  - \* Documentation
  - \* User manuals?
  - \* User training?
  - \* Training for client's maintenance staff

# Contracts for Bespoke software

- \* It should be made clear who will own the IP rights
- \* Points to make clear:
  - \* What if we build their product faster using our in-house class libraries which we developed over many years?
  - \* Do we want to allow the client to use those afterwards?
  - \* Could the client sue us afterwards for continuing to use those class libraries in other projects?
  - \* Usually developer will try to keep the copyright themselves

# Contracts for Bespoke software

- \* Any confidentiality clauses – to protect both parties
  - \* Protect our in-house software tools and methods
  - \* Protect their in-house business methodologies, customer contacts and trade secrets

# Contracts for Bespoke software

Acceptance criteria should be specified in the contract

- \* Ideally, the client will produce a fixed set of acceptance criteria, which when passed, will result in acceptance of the system
  - \* Ideally this list is fixed, at the start of acceptance testing
  - \* It cannot grow
- \* Should specify who will be present during acceptance testing

# Contracts for Bespoke software

Termination criteria should be specified,

- \* E.g. what if the client's business is taken over half-way through the contract?
- \* How to fix this amicably?
- \* Usually contract would pay the developer proportional to the work already done.
- \* What financial penalties are imposed on either party for walking away mid-way through
- \* Or for the developers failing to deliver on-time/at all.

## 5. Contracts for Consultancy and Contract Hire

# Contracts for Consultancy and Contract Hire

- \* Big consultancies often just supply a number of people to the client
  - \* E.g. Cap Gemini leases a team of 1 DBA + 3 Application senior-programmers plus one business analyst to a client
- \* Or freelance computer contractors might get a placement with client

# Contracts for Consultancy and Contract Hire

- \* Payment arrangements are usually fairly simple
  - \* People are just paid by the hour / day, to do whatever the client wants them to do
- \* Contract hire of persons is straightforward
  - \* E.g. pay a programmer to sit there and program
- \* Consultancy is more glorified form of this
  - \* Consultant might be an expert asked to assess some aspect of the client's operations, and try to improve it
  - \* Final deliverable might be a document

# Contracts for Consultancy and Contract Hire

- \* It is important that consultancy contracts specify:
  - \* Confidentiality rules
  - \* Terms of reference
    - \* - what the contractor is expected to do when there
  - \* Liability
  - \* Who has control of the final deliverable

## 5. The structure of a Contract

# The structure of a Contract

- \* Three main parts:
  1. Introduction
    - \* Names of the parties
    - \* Glossary of terms
  2. Standard Terms and Conditions
  3. Annexes or Appendices - define the specific project in detail
    - \* Requirements
    - \* Deliverables
    - \* Acceptance criteria
    - \* Price and Payment schedule etc etc

# Standard Ts & Cs

- \* Scope of the Work
- \* Clients responsibilities
- \* Project Control
- \* Warranty and Maintenance
- \* Change Procedures
- \* Ownership of copyright
- \* Confidentiality
- \* Indemnity
- \* Termination criteria
- \* Arbitration procedures
- \* Relevant jurisdiction
- \* etc. etc.

# Standard Ts & Cs

- \* See Sample Terms and Conditions for a Fixed-Price Contract
  - \* Referred to in this lecture's quiz

## 6. Ownership issues

# Ownership issues

- \* If you design a system or write a bit of software who 'owns' it?
- \* Recall from the CE201 lecture on IP:
  - \* If you work for a company as designer or programmer (or even in a related role) then the company probably owns the copyright
  - \* If that company is a sub-contractor then it possible that the organisation that commissioned the design owns it
  - \* If you are a self-employed contractor ...
    - \* It could be you, or the company that contracted you, or the company that contracted them
- \* You should make it so your contract specifies these details clearly

# Exploiting Ownership

- \* How does the owner of a design or of copyright exploit it.
  - \* As with any other property right, it may be
    - \* sold,
    - \* licensed,
    - \* mortgaged,
    - \* assigned or transferred,
    - \* given away,
    - \* or simply abandoned.

# Exploiting Ownership

Owners have three main options

1. Keep it "in house"
  - \* This is what many manufacturers do (although they may also license in another country).
2. Assign it to another party for a fixed sum or for royalties.
  - \* This is what authors of books typically do they assign copyright to the publisher for a fee.
  - \* The new owner is then free to exploit the copyright
3. Grant one or more licences to copy the work
  - \* With a software licence the user is granted the right to use the software and "copy it into the memory of their machine", or similar legal wordings

# Licence Agreements

- \* Usually software is not sold to the client outright.
- \* Usually the client is given a licence that allows certain usage actions
- \* May limit the client to usage on a limited number of machines
  - \* Or a max number of login accounts
  - \* Or usage for a given time period
  - \* May include upgrades and patches for the given time period

# Licence Agreements

- \* Open-source licences allow anyone to use the source code and other design material, subject to certain conditions
  - \* E.g. GNU public licence
- \* Note that just finding code that is uploaded to github does not make it “free and open source”; the software will still be subject to copyright.
  - \* You need to check its licence to get permission to use it
  - \* Also note that “No licence ≠ FOSS”
    - \* “No licence = lawsuit bait”

# Licence Agreements

- \* Think carefully what licence you put on code that you upload to the internet
  - \* And to the code you give to a client

Links:

- \* [Comparison of free and open-source licenses](#)
- \* <http://choosealicense.com/>

**Choose an open source license**

{ Which of the following best describes your situation? }

 I want it simple and permissive.

The [MIT License](#) is a permissive license that is short and to the point. It lets people do anything they want with your code as long as they provide attribution back to you and don't hold you liable.

Babel, .NET Core, and Rails use the MIT License.

 I'm concerned about patents.

The [Apache License 2.0](#) is a permissive license similar to the MIT License, but also provides an express grant of patent rights from contributors to users.

Elasticsearch, Kubernetes, and Swift use the Apache License 2.0.

 I care about sharing improvements.

The [GNU GPLv3](#) is a copyleft license that requires anyone who distributes your code or a derivative work to make the source available under the same terms, and also provides an express grant of patent rights from contributors to users.

Ansible, Bash, and GIMP use the GNU GPLv3.

# Further reading

- \* “Software Contracts and Licences”, (Chapter 12 of course textbook, F. Bott, *Professional Issues in Information Technology*, 2<sup>nd</sup> Edition).
- \* Tip: Think about a licence for your CE29x team product, and licences of any tools you have used to make it
- \* Quizzes:
  - I. Quiz on Contracts on Moodle

# Bibliography

Ayers, R. 1999. "*The Essence of Professional Issues In Computing*", Harlow: Prentice Hall

Chapter 12, Bott, F. 2014. "*Professional Issues in Information Technology*", Second edition

# CE29x Team-Project Challenge

2020-2021

## Gathering Requirements in Agile Projects

Professor Anthony Vickers

Room INW.3.17      email: vicka

(With acknowledgements to Keith Primrose/Iain Langdon/Mike Fairbank)

# Requirements

- \* What follows is partly based on early chapters from the book:
  - \* Mastering the Requirements Process: Getting Requirements Right 3e (Robertson & Robertson, 2013, published by Addison Wesley ). You do not need to purchase this book. There are some copies in the library but you do not need access.

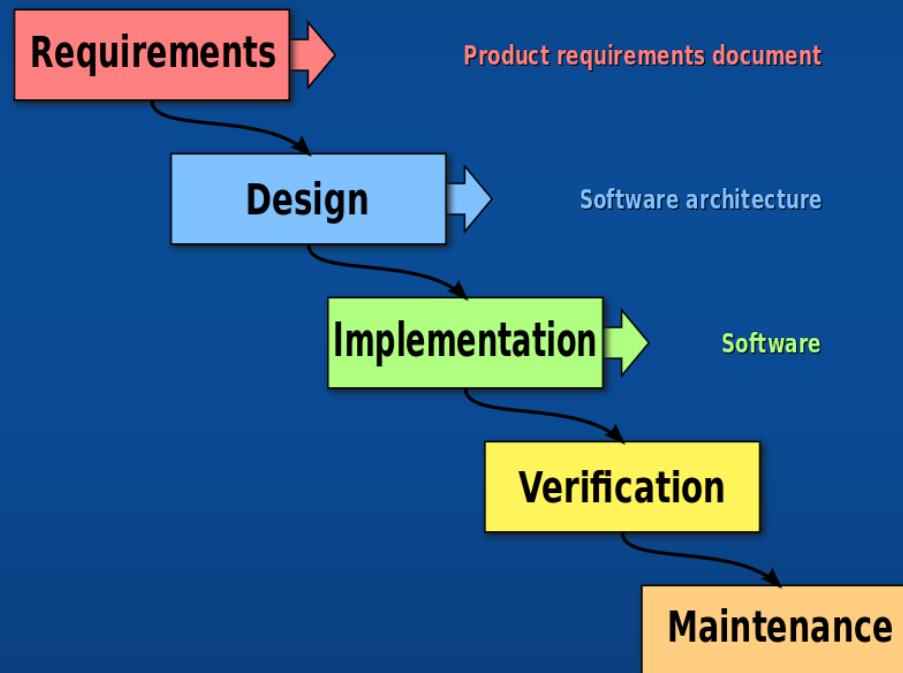
# This lecture

- I. Agile vs Waterfall
2. Requirements Introduction
  - \* Gathering Requirements
3. Requirements Documents (Waterfall)
  - \* SMART criterion
  - \* “7-Sins of a Specifier”
4. User Stories
5. Other Requirements Modelling Techniques
  - \* Functional / Non-functional requirements
  - \* Constraints

# I. Agile vs Waterfall

# Waterfall

Project is delivered in stages.



Each stage usually signed off by the client separately

# Waterfall

Waterfall pros:

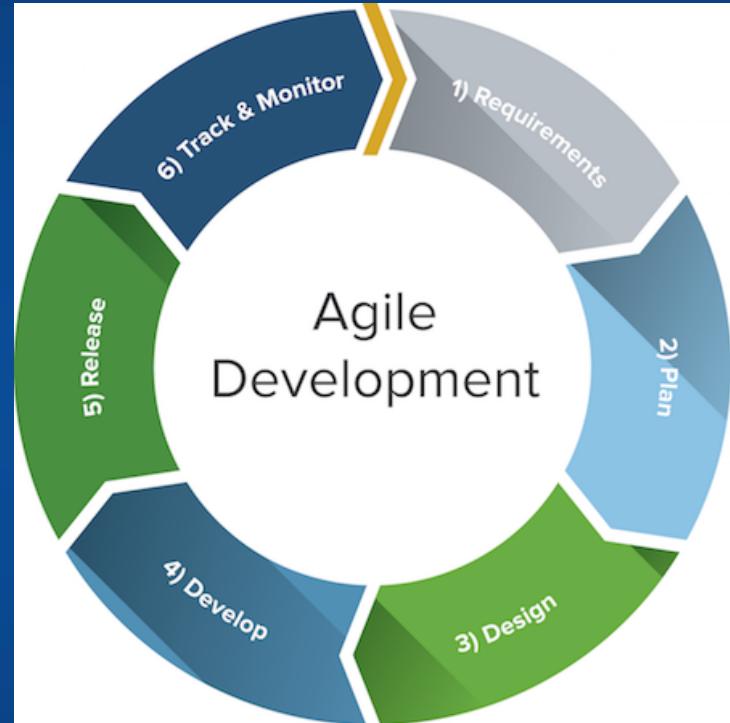
- \* Client knows what they are getting
  - \* Functionality
  - \* Price
- \* Gives clear milestones
- \* Clear documentation

Waterfall cons:

- \* Client might change mind when product arrives
  - \* Client doesn't know requirements
- \* Project scope and technology may change
- \* Very difficult for developers to accurately estimate what they can deliver on time
- \* Rigid structure not necessary for software (but maybe it is for building hardware / civil engineering)

# Agile

Project is developed iteratively:



Client is involved in the process:

Deliver product early. Get feedback from client.

Encourages rapid and flexible response to change.

Iterative

# Agile

Agile pros:

- \* Flexibly adapts to changing technologies/desires of client
- \* Client has involvement in product
  - \* does not get a surprise at the end
- \* Planning and estimation of tasks is refined as the project develops

Cons:

- \* Client doesn't usually get fixed price for given feature list
- \* Work may set off down bad design route before realising pitfalls
- \* Not suitable for all engineering projects
  - \* Foundation can't be changed after tower is built



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## 2. Requirements Introduction

# Requirements

- \* Requirements define what 'a product' is meant to do and meant to be.
- \* They exist regardless of
  - \* Whether you discover them or not
  - \* Whether you write them down or not
- \* The product will never be right unless it conforms to the requirements.
  - \* This may seem obvious but you can probably think of any number of counter examples.\*
- \* The art lies in discovering the "real problem"

# Requirements

- \* You must come to a correct understanding of the requirements, and get the client's agreement, or your product will be deficient.
- \* Getting the agreement in writing protects both you and the client.
- \* Products should be created to solve problems, not just so we can say we have created a product.

# Requirements

- \* You still need requirements regardless of the development lifecycle: Agile, Prototyping, Rational Unified Process, Spiral, Waterfall, whatever.
  - \* You can be as iterative as you like, but you still need to understand the needs of the client.
  - \* No matter how you develop the product, the need to understand the client's problem, and what the product has to do to address that problem, remains.

# Requirements

- \* Ideally we should understand the problem well enough to deliver a solution that provides the best payback at the best price.
- \* To do this we need to understand what the 'owner' values.

# Eliciting Requirements

- \* Ask questions
- \* Your job is to drag the necessary information out of the client
- \* For question gathering, consider the 5 W's (What, Why, When, How, Where and Who?) See:  
[https://en.wikipedia.org/wiki/Five\\_Ws](https://en.wikipedia.org/wiki/Five_Ws)

When questioning different potential users:

- \* Expect and watch for contradictions
  - \* Different requirements from different stakeholders
  - \* Unfortunately, this nearly always happens
  - \* Must be resolved



# Requirements Documents

- essential for waterfall delivery

# Requirements Documents

- \* In waterfall, one stage is to produce a “Requirements Specification” document
  - \* often abbreviated to just “the specification”, or “the spec”, or SRS (Software Requirements Specification)
- \* If you need to write a SRS, consider basing it on “IEEE Software Requirements Specification” (SRS)
  - \* Template on Moodle CE291
- \* If your SRS is high quality then it's good for you and the client:
  - \* The client knows what she's getting.
  - \* You know you won't be sued afterwards for delivering something different

# SMART

Individual Requirements should be SMART

\* **S**pecific (what, why, where, when, who, which?)

\* **M**easurable (How much, how many, how will I know when it is achieved, indicators for completion)

\* **A**chievable (How? No constraint clashes)

\* **R**ealistic (Can be done with the available resources)

\* **T**ime-bound (When? Give date lines for progress)

- \* See ([https://en.wikipedia.org/wiki/SMART\\_criteria](https://en.wikipedia.org/wiki/SMART_criteria))

# Seven Sins of a specifier

Bertrand Meyer (1985) identified a list of common problems that occur in software specification documents. So a good spec. should avoid these:

## I. Noise:

- \* A element that does not carry information relevant to any feature of the problem.

## 2. Silence:

- \* The existence of a feature of the problem that is not covered.

# Seven Sins of a specifier

## 3. Over-specification:

- \* An element that corresponds not to a feature of the problem but to features of a possible solution.

## 4. Contradiction:

- \* Two or more elements that define a feature of the system in an incompatible way.

## 5. Ambiguity:

- \* An element that makes it possible to interpret a feature of the problem in at least two different ways.

# Seven Sins of a specifier

## 6. Forward Reference:

- \* An element that uses features of the problem not defined until later in the document.

## 7. Wishful Thinking:

- \* An element that defines a feature of the problem in such a way that a candidate solution cannot realistically be validated with respect to this feature
- \* In other words, if a candidate solution cannot ever be “validated” against the specification, then the specification document is a failure.

# Grey Areas

We've seen that:

1. The SRS document should be specific
2. The SRS should not usually give the final design (see 7-sins “over-specification”)

So how do we balance these seemingly contradictory aims?

Guiding principles:

- \* Don't leave the requirements so vague so that your client and you can disagree on whether the objective has been met
- \* Try not to take options away from your designers
- \* If something is agreed with the client as a requirement...
  - \* then put it into the Requirements document



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### 3. Agile: User Stories

# User Stories

- \* In Jira, we will model each requirement as a User Story
- \* *User Stories* look at the requirements from a particular user's view point.
- \* General form: “As a [persona], I [want to], [so that].”
- \* Example: “As the departmental manager, I need to be able to view staff sign-in and sign-off times, so I can calculate their monthly pay-cheque.”
- \* We should try to create our “Stories” in Jira like this
- \* (see, [https://en.wikipedia.org/wiki/User\\_story](https://en.wikipedia.org/wiki/User_story) )

# User Stories

- \* General form: “As a [persona], I [want to], [so that].”
- \* A user story is the smallest unit of work in an agile framework. It’s an end goal, not a feature, expressed from the software user’s perspective.
- \* The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer.

# User Stories

- \* As Max, I want to invite my friends, so we can enjoy this service together.
- \* As Sascha, I want to organize my work, so I can feel more in control.
- \* As a manager, I want to be able to understand my colleagues progress, so I can better report our success and failures.
- \* As an investor, I want to be able to see how the total value of my funds varied over time, so that I can see if my investment was a wise one or not

# User Stories

- \* Pros:
  - \* Stories keep the end focus on the user
  - \* A good story will clearly indicate when it can be considered “done”.
- \* Consider: “As the departmental manager, I need to be able to view staff sign-in and sign-off times, so I can calculate their monthly pay-cheque.”
  - \* End user?
  - \* When is this done?

# User Stories

Password recovery story:

- \* “ \_\_\_\_\_ needs to be able to recover their password automatically, so that \_\_\_\_\_”

# User Stories

- \* User stories are fundamental to Jira and our project
  - \* See <https://www.atlassian.com/agile/project-management/user-stories> for more details
- \* Try and put all “Stories” into the format “As a [persona], I [want to], [so that].”
- \* User stories are also the building blocks of larger agile frameworks like epics, themes, and initiatives
  - \* See <https://www.atlassian.com/agile/project-management/epics-stories-themes>



# This lecture

- I. Agile vs Waterfall
2. Requirements Introduction
  - \* Gathering Requirements
3. Requirements Documents (Waterfall)
  - \* SMART criterion
  - \* “7-Sins of a Specifier”
3. User Stories
4. Other Requirements Modelling Techniques
  - \* Functional / Non-functional requirements
  - \* Constraints

# 4. Other methods of modelling Requirements

-try to include one or two of these in your Jira requirements

# Use Cases

\* *Use Cases are descriptions of how the system will be used to meet its intended goals.*

\* Example Use case:

- \* Use-case Title: “Item Purchase”
- \* Primary Actor: website user
- \* (Story): The user should be able to browse items for sale, select item to place in a virtual shopping cart, enter delivery-address and payment details, and later receive the item by post

\* Example Use case:

- \* Use-case Title: “Password recovery”
- \* Primary Actor: System administrator
- \* (Story): The system admin can reset any users password, but cannot view existing passwords. The system admin would do this when a colleague complains that they’ve lost their password. The SA would then inform the user verbally what their password was reset to.

Further reading:

\* see CE202 week 3+4, or [https://en.wikipedia.org/wiki/Use\\_case](https://en.wikipedia.org/wiki/Use_case)

# Use-Case Diagram

- \* A use-case diagram shows the relationship between the user and one or more different use cases.
- \* In Jira, you could attach a use-case diagram to a Story/Task

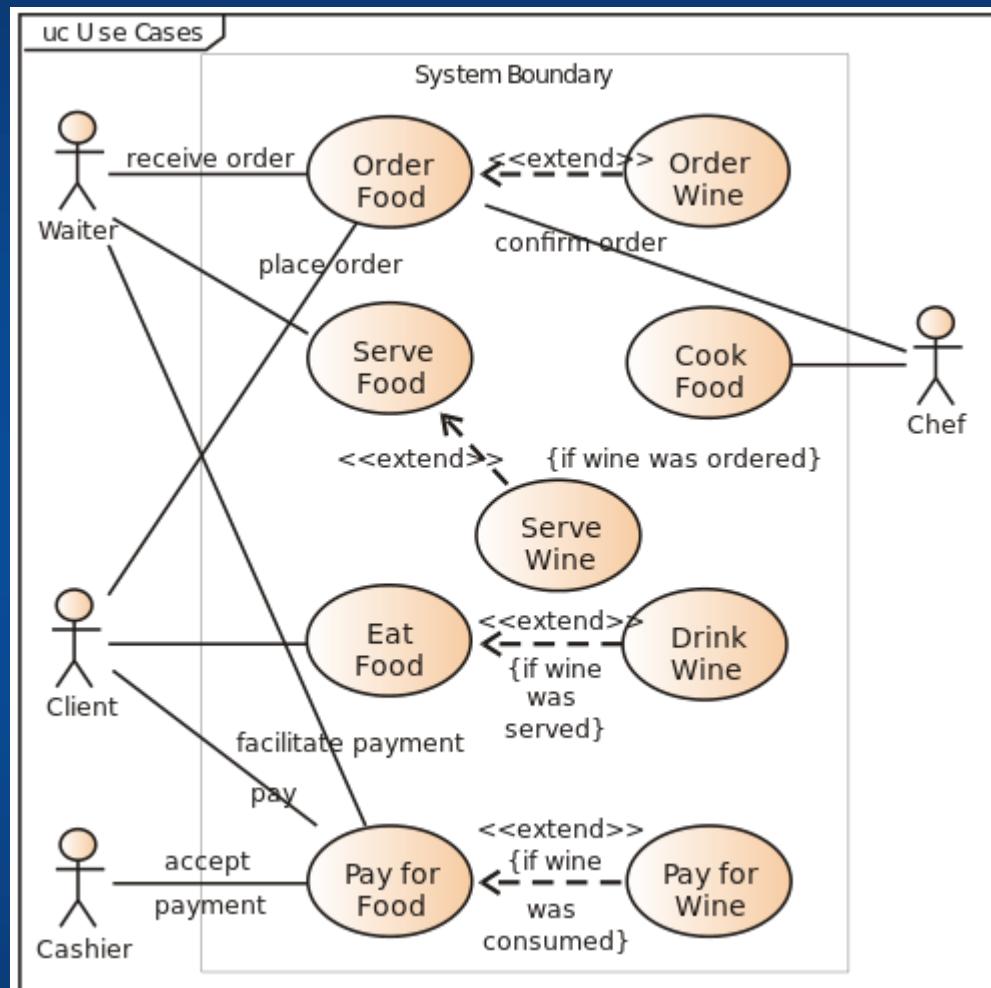


Image credit: [https://en.wikipedia.org/wiki/Use\\_case\\_diagram](https://en.wikipedia.org/wiki/Use_case_diagram)

# Modelling Techniques

## *Scenario-based Requirements*

- \* These are scenarios of a use-case, illustrating how things are meant to work,
  - \* e.g. “when the hard-drive is running low on storage, the system administrator will receive an email alert”
  - \* e.g. “when the administrator user clicks here, window XYZ opens”
- \* (What's problematic with these 2 requirements?)

# Personas

Some agile techniques use the concept of a *persona* to give developers a 'picture' of the user(s) of a product

- \* even going so far as to give those users a name
- \* E.g. Pete is a power-user who likes to use keyboard-shortcuts for all menu items
- \* E.g. Bill has vision problems and uses a screen reader for all web-browsing.
- \* (Further reading: <http://www.agilemodeling.com/artifacts/personas.htm>)

# Personas

Imagine developing a touch sensitive system to be placed in a shopping mall.

- \* The system allows users to search for shops that sell the products they have come to the mall to buy

Q: Using “personas”, who might we visualise as users of such a system? \*

# Requirements

- \* Requirements should define
  - \* What the product will do - Functional Requirements
  - \* How well it will do it – Non-functional Requirements
  - \* Any relevant constraints

# Functional Requirements

These describe actions that the product must take if it is to be useful to a user.

\* e.g.

- \* The product shall detect when the air temperature falls below freezing
- \* The product shall produce a schedule of all roads upon which ice is predicted to form within a given time parameter

# Non-functional Requirements

These are properties or qualities that the product must have if it is to be acceptable to client or user.

- \* Cover such things as look and feel, usability, security, legal attributes
- \* Can be critical to a product's acceptance
- \* e.g.
  - \* The product must be able to determine "friend or foe" in less than 0.25 seconds
  - \* The product shall provide a pleasing user experience
  - \* The product shall be able to be used by travellers in the arrivals hall who do not speak the home language.
- \* Beware of "fluffy" requirements. (What is problematic about the second one here?)

# Constraints

- \* Constraints are global requirements.
- \* Can be limitations.
  - \* on the project itself
  - \* or the eventual design of the product
- \* They are often documented as non-functional requirements.

e.g.

- \* The product must be available at the beginning of the next academic year
- \* The product shall operate as an IPad, IPhone, Android and Blackberry app.
- \* Beware of constraints that are not actually genuine business constraints. (What might be wrong with the last one?)\*

# Constraints and Non-functional Requirements

- \* Constraints and non-functional requirements can also be modelled as a user story
  - \* E.g. “Website must have 99.999% uptime” becomes
    - \* “As a user, I want the site to be available 99.999 percent of the time I try to access it, so that I don't get frustrated and find another site to use.”
- \* Otherwise can represent non-functional requirements / constraints as a task;
  - \* but that's not as good practice

Further reading: <https://www.mountaingoatsoftware.com/blog/non-functional-requirements-as-user-stories>

# Summary

# Summary

We've covered:

- \* Agile vs. Waterfall
- \* Waterfall SRS document
  - \* SMART requirements
  - \* The 7 Sins of a specifier
- \* Agile User Stories
- \* Other requirement modelling techniques

# Summary

Plus we've covered:

- \* Eliciting requirements from the client
- \* Functional / non-functional requirements
- \* Constraints

# Further reading on Requirements Gathering

More info:

1. <https://www.atlassian.com/agile/project-management/user-stories>
2. Further reading: Wysocki "Effective Project Management : Traditional, Adaptive, Extreme", chapter 3.

Take the Requirements review quiz on Moodle

Next Online Presentation:

“Estimating Tasks and Stories”

# CE29x Team-Project Challenge

## Estimating task durations

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose, Iain Langdon, Mike Fairbank and adaptavist

# Recap of Previous Lecture

## Previous Lecture

- \* Agile vs Waterfall
- \* Gathering Requirements
- \* Modelling Requirements
  - \* SRS
  - \* SMART Criteria
  - \* User Stories

# Recap of Previous Lecture

Benefits of Agile:

Agile methods Embrace Change:

- \* Requirements refine
- \* Information becomes available
- \* Technology evolves
- \* Legislation changes
- \* Business needs evolve

# This Lecture

- \* Agile: Scrum Versus Kanban
- \* Techniques for Estimation
  - \* Estimating whole Projects
    - \* Pricing Projects
    - \* The Work Breakdown Structure
  - \* Estimating Tasks
    - \* Story Points
- \* Duration, Effort + Resources

# Scrum vs Kanban

Scrum	Kanban
Iterations (Sprints)	Continuous Flow
Commit to delivery at start of each Sprint	Always deliver next priority item
Regular frequent delivery	Continuous Delivery expectation
Sprint Ceremonies and Roles	
	Embrace change
	Encourage early feedback
	Continuous Integration and testing
	Visual boards for progress

# Techniques for Effort Estimation

# Effort Estimation

- \* Managers must plan projects by predicting necessary effort (and cost) and assigning resources appropriately.
- \* Effort is measured in person-days, person-week, person-month or number of hours spent.
- \* It is tempting to pluck figures out of thin air, but is there any more rational approach?
- \* The desire by managers for improved methods of resource estimation provided one of the original motivations for deriving and using metrics and measures.

# Warm-up Estimation Exercise

- \* How long do you think it would take you to program “Asteroids” from scratch?
- \* Take the survey on Moodle in Unit 2



30-second demo of Asteroids

<https://www.youtube.com/watch?v=psaM7kK5Toc>

# Approaches to Effort Estimation

- \* Estimating whole projects:
  - \* Estimating by Analogy
  - \* Algorithmic model for estimates
  - \* Using a Work Breakdown Structure
  - \* Pricing projects
- \* Estimating individual tasks:
  - \* Expert Judgement or Guesses : based on non-documented experience
  - \* Delphi method
  - \* Using increasingly fine sub-tasks
  - \* Using Story Points

These are described further in the following slides:

# Estimating whole projects

1. Estimating by Analogy
2. Algorithmic method
3. Work Breakdown Structure
4. Pricing Projects

(Useful when you are bidding for a piece of work)

# Estimating by Analogy

- \* The results of similar projects from the past can be used as a basis for the estimate.
- \* Such project data can be found in local in-house project databases compiled in the past, or from a database obtained from a user group
- \* Danger of false analogy by lack of rigour in the choice of data and lack of formal method

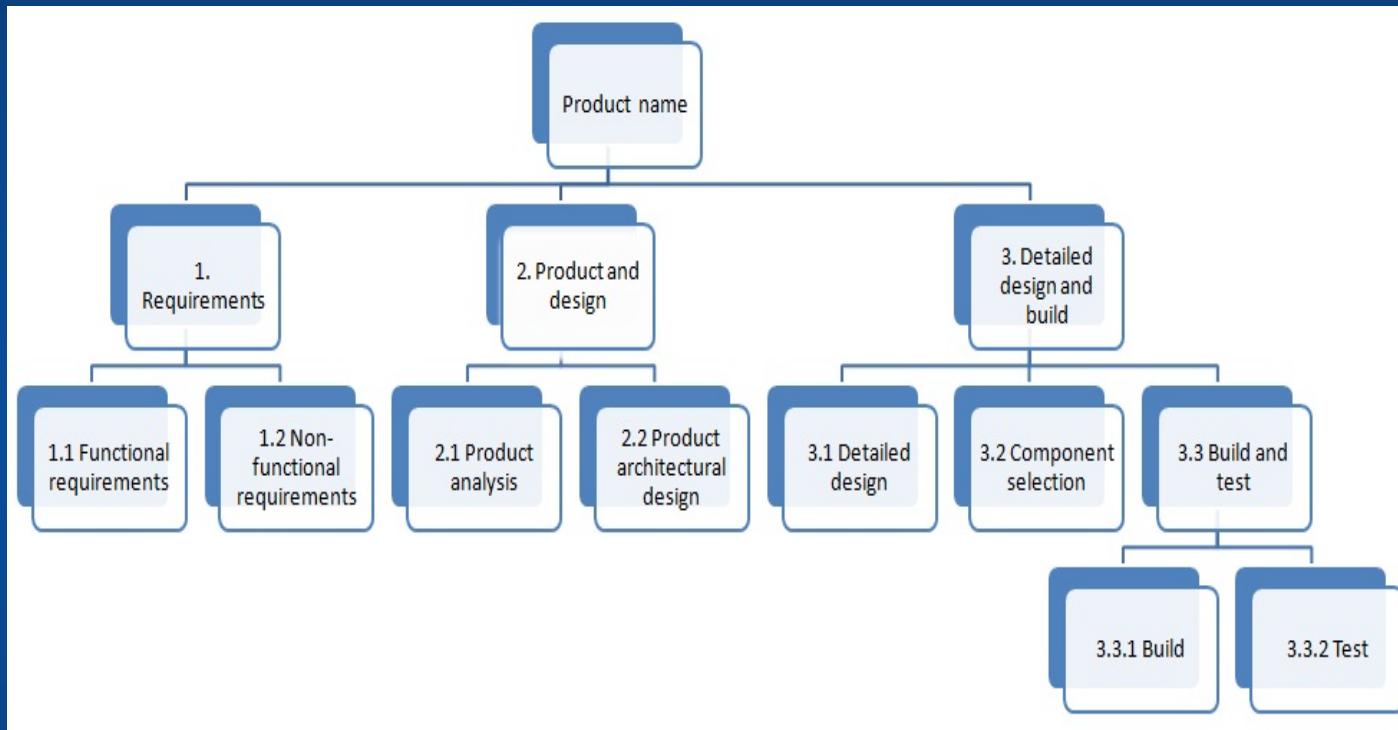
# Algorithmic model for Estimates

- \* Effort is expressed as a function or algorithm of one or more variables
  - \* Such as size of the product, complexity,
    - \* Number of database tables in the design
    - \* Number of windows in the design
  - \* capability of the developers
  - \* level of reuse
    - \* From previous similar project
    - \* Off-the-shelf open-source libraries

# Algorithmic model for Estimates

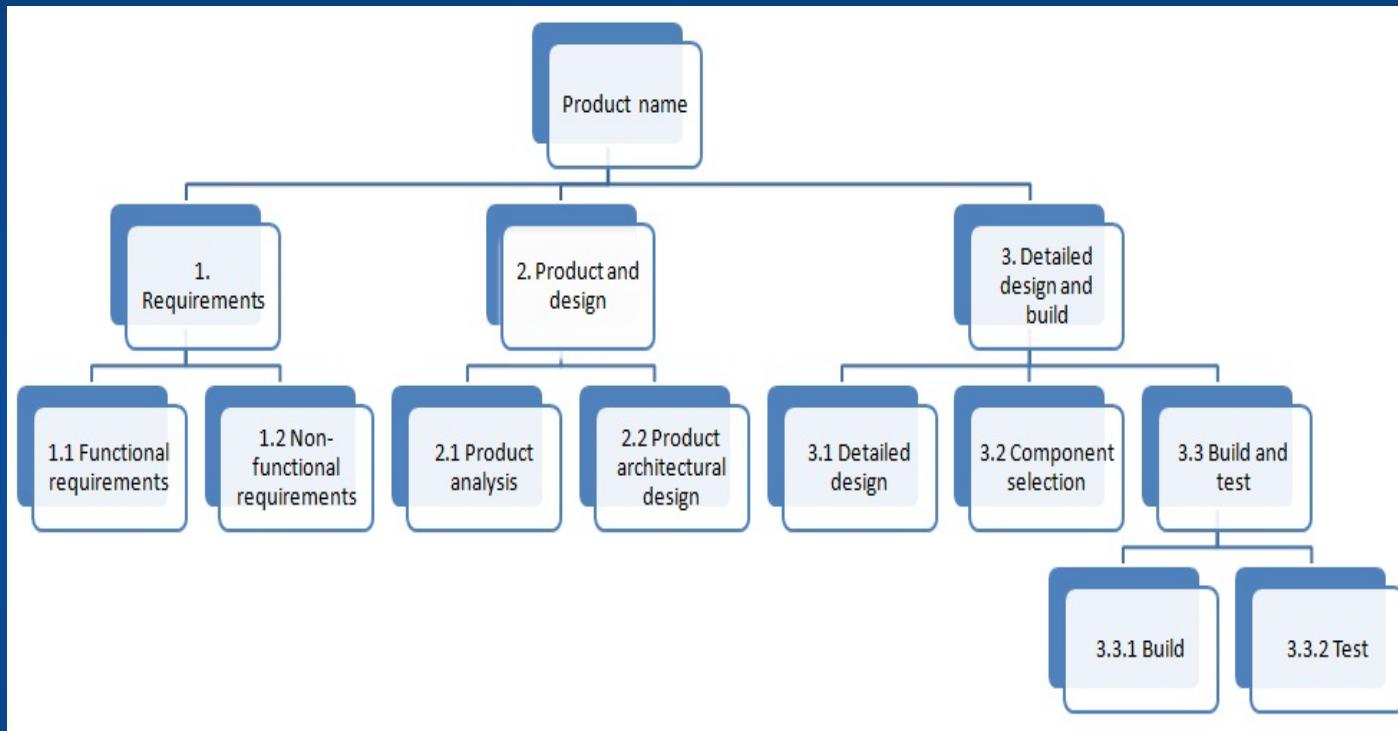
- \* A Work Breakdown Structure can be used to get an overview of the whole project (Waterfall)

# Work Breakdown Structure (WBS)



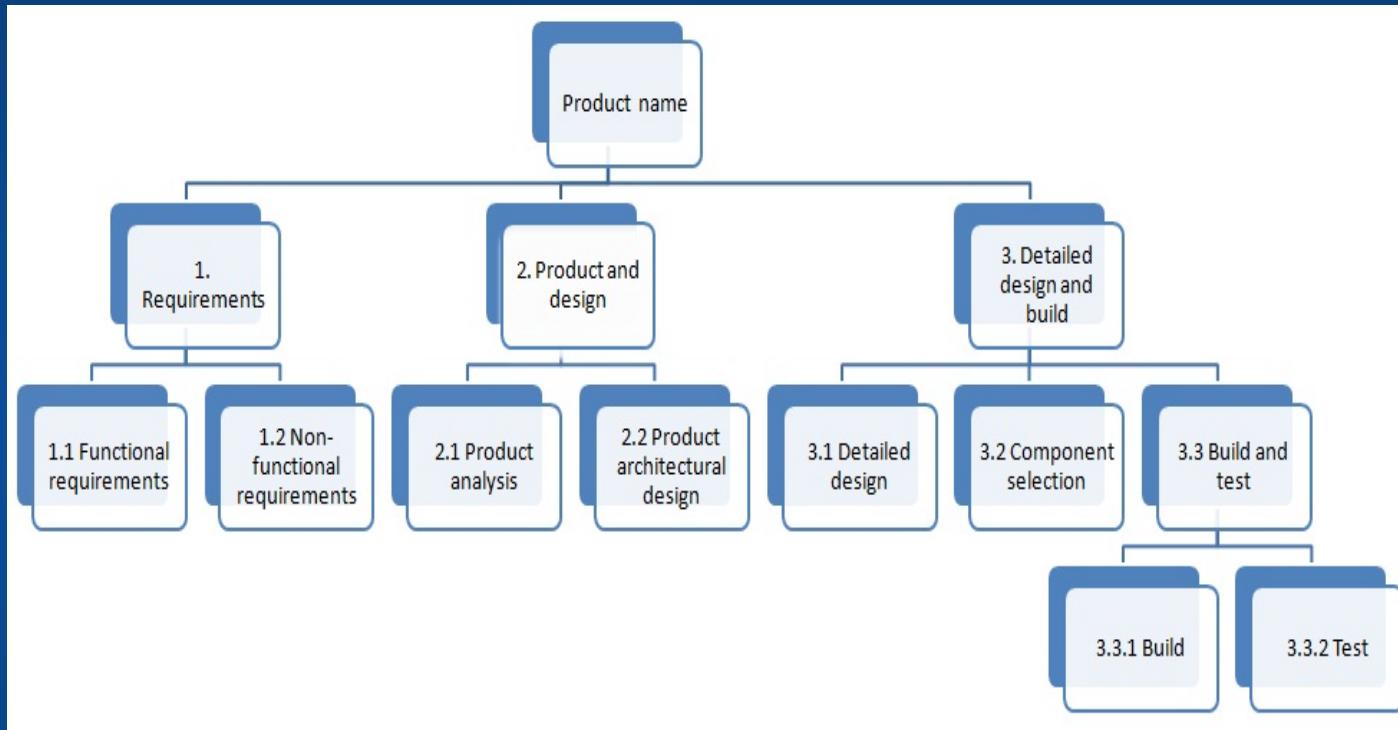
\* Watch the video tutorial on [WBS](#)

# Work Breakdown Structure (WBS)



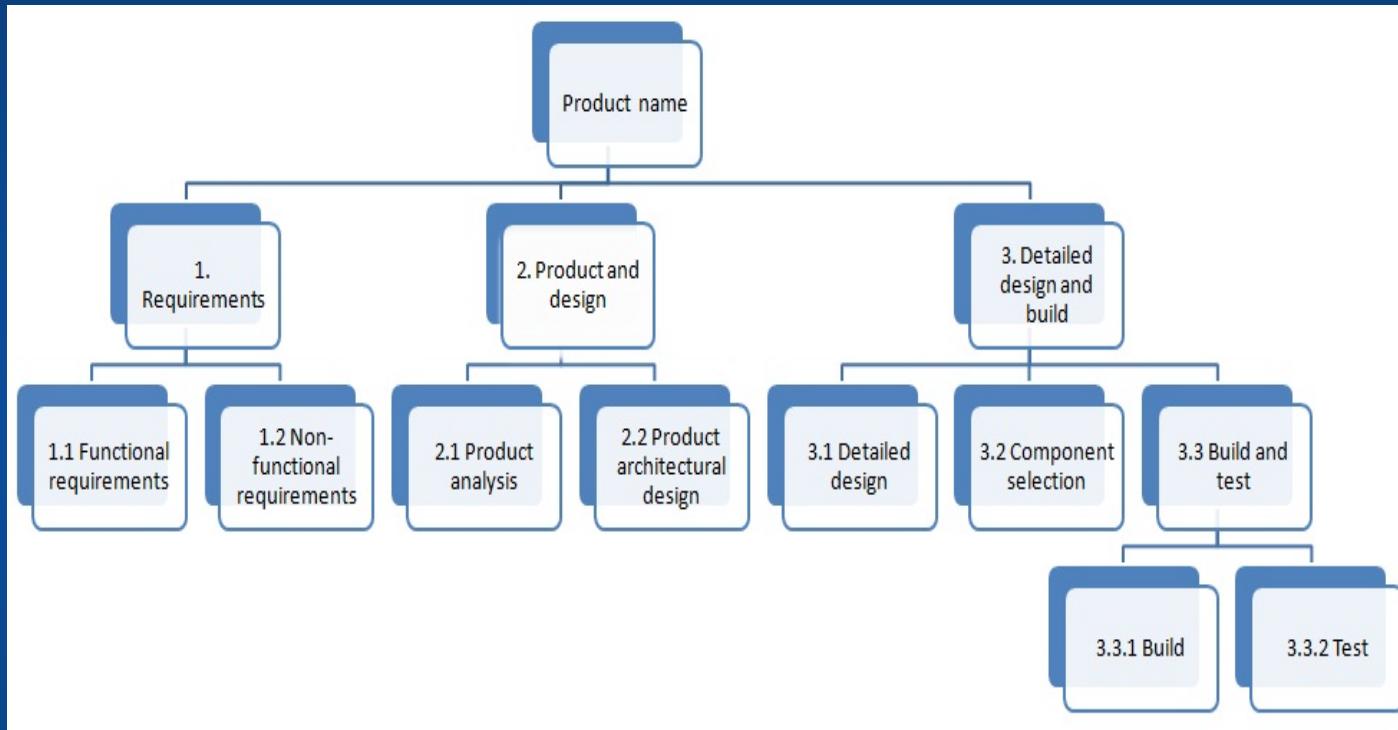
- \* Each descending level of the WBS consists of ordered sets of activities and tasks and represents an increasingly detailed description of the project elements

# Work Breakdown Structure (WBS)



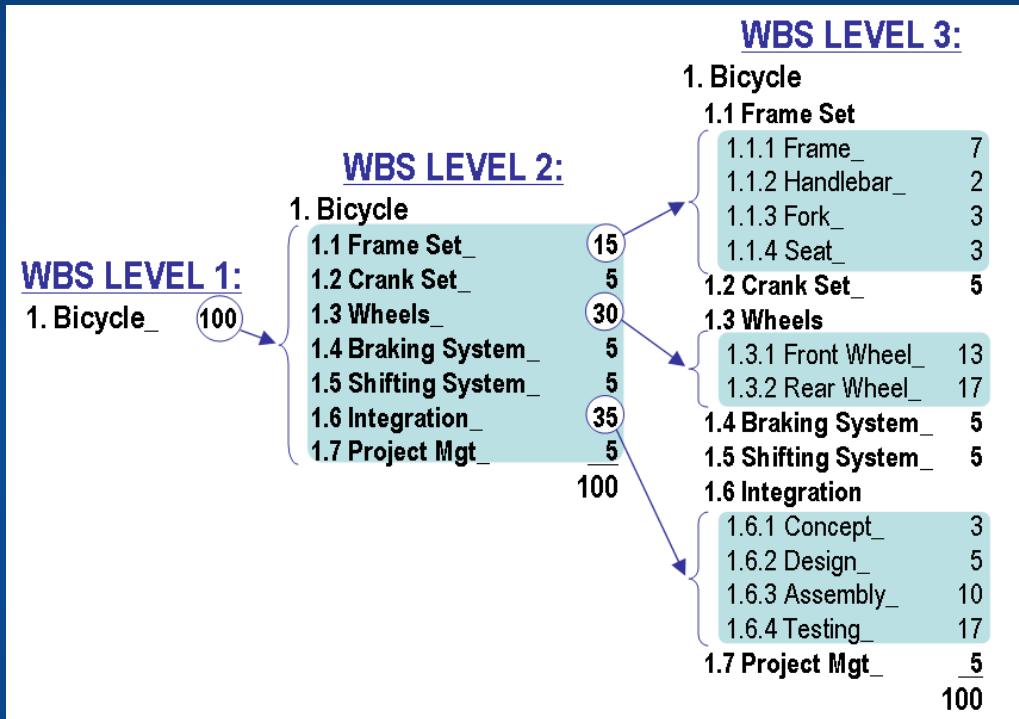
- \* For most engineering projects, the WBS usually consists of “deliverables”
- \* The WBS defines the whole scope of a project (“100% rule”)

# Work Breakdown Structure (WBS)



- \* Work not in the WBS is outside the scope of the project
- \* When the scope of the project changes, the WBS usually changes.

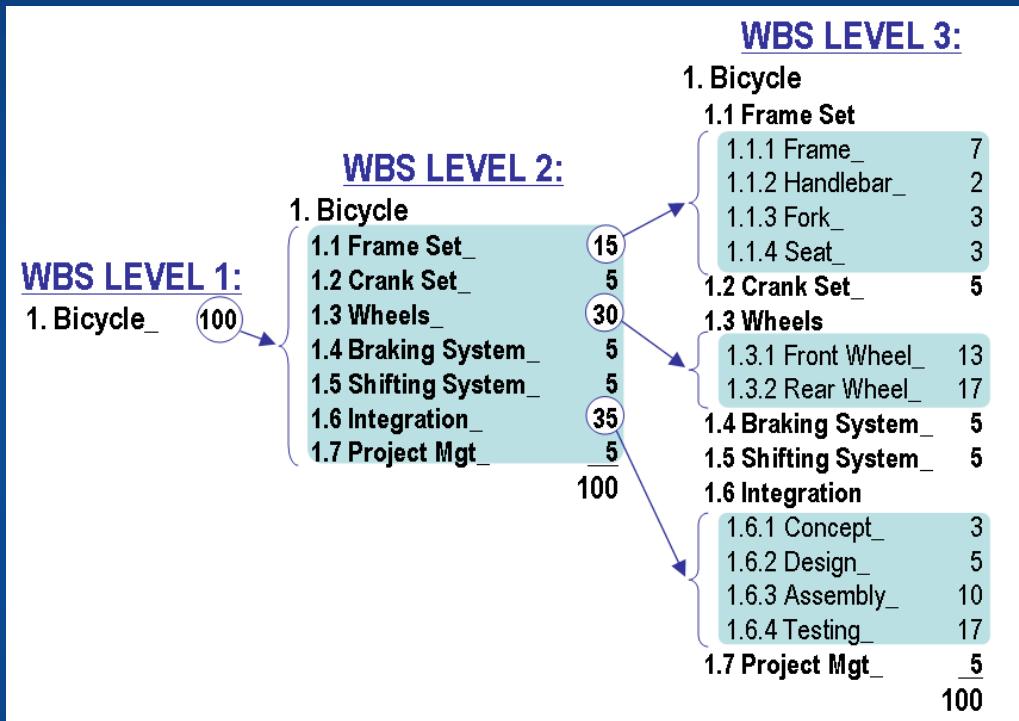
# Work Breakdown Structure (WBS)



- \* The lower-level components should be both necessary and sufficient for completion of the decomposed upper level item

What is the implication of this last comment and, what could cause it not to be true?

# Work Breakdown Structure (WBS)



- \* Constituent elements of WBS should be described in terms of tangible, verifiable results (services or products, components... ).

# Calculating Cost Estimates

Once the whole project scope and tasks are understood, we can price the project:

- \* Costs are based on effort and the cost of tasks are well known on the IT market:
  - \* Per/hour figure for analyst/designer etc.
    - \* + overhead figure
    - \* x utilisation factor (allowing for holidays, illness, training etc.)

Utilisation figure of > 80% is suspect – why?

# “Price to Win” estimates

- \* Unfortunately estimates in practice are often done on a price-to-win basis,
  - \* meaning that the cost and time expectation of the sponsor are accepted without validation as the actual estimate.
- \* The price the customer is ready to pay, the price to win the contract...
- \* Price-to-win means we need to calculate the number of hours we can afford to develop for, *after* we've chosen the price
  - \* – depends on the development team's hourly rate of pay.

# “Price to Win” estimates

- \* How much would you bid to develop Asteroids from scratch?
  - Must be delivered exactly 2 weeks from now.
  - Financial penalties for late/substandard delivery
- \* A combination of lowest bidder and best established reputation wins the contract!

# Estimation is a continuous process

Even in waterfall projects:

- \* Costs and durations will be re-estimated at key dates: end of phases and milestones; whenever a major change is introduced; when unexpected technical problems occur...
- \* Lecture on “project control” will discuss this further.
- \* Estimates are more and more accurate when advancing in the development process



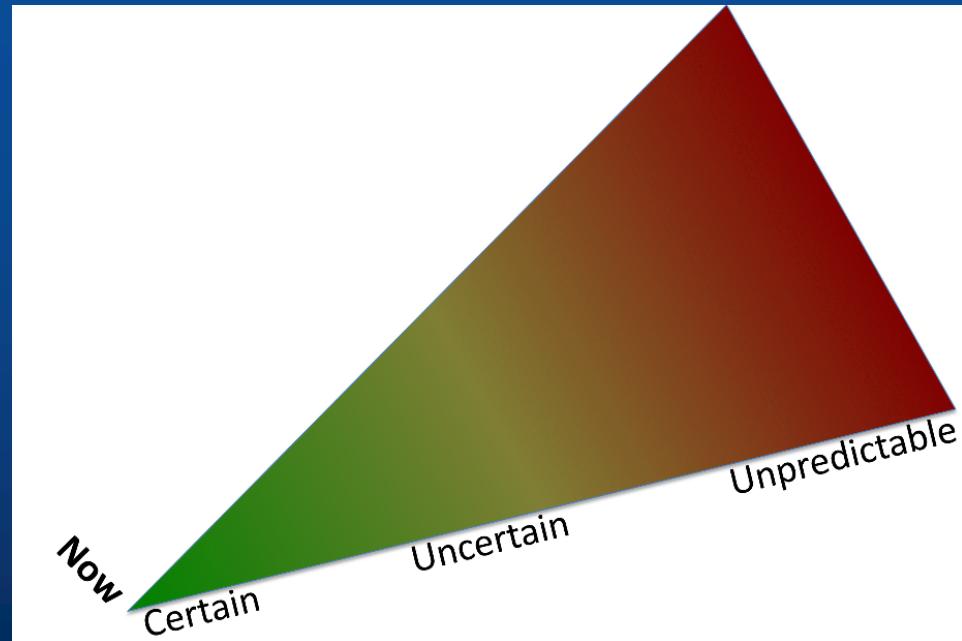
# This Lecture

- \* Agile: Scrum Versus Kanban
- \* Techniques for Estimation
  - \* Estimating whole Projects
    - \* Pricing Projects
    - \* The Work Breakdown Structure
  - \* Estimating Tasks
    - \* Story Points
- \* Duration, Effort + Resources

# Estimating Individual Tasks

# Estimating Individual Tasks

1. Delphi Method
2. Splitting into increasingly finer subtasks
3. Story Points and Velocity
  - \* Planning Poker



# 'Delphi' Method of Estimating

Delphi method of estimation is as follows:

- \* Get a wide number of experts (or non-experts) with relevant experience (database, application, communications, operations, package, development environment, industry...) to make an initial estimate.
- \* All have the same information concerning the project
- \* Individual estimates are discussed in turn with all experts including the reasons and assumptions made by each individual
- \* Second round where each expert makes a revised estimate to incorporate others findings and discussion
- \* Take the median, extremes excluded

# 'Delphi' Method of Estimating

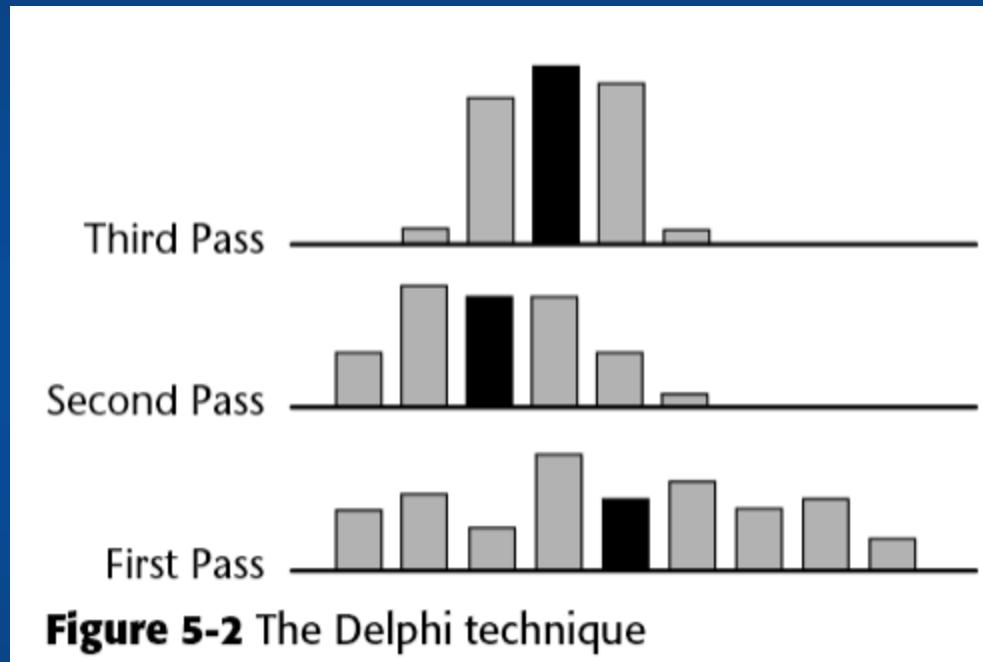


Fig 5.2 from Wysocki "Effective Project Management : Traditional, Adaptive, Extreme"

# 'Delphi' Method of Estimating



- \* You were asked: “*How long do you think it would take for yourself to program the classic arcade-game Asteroids from scratch?*”
- \* I will review the Asteroid Estimation Survey in a live presentation.
- \* For the Delphi method to be applied, after the survey, we should all discuss our answers and argue who is right and why, and then survey again

# 'Delphi' Method of Estimating

Related to using a panel of experts to make estimates\*:

- \* In machine learning, we can *improve the accuracy* of machine predictions by using several different predictors and average, rather than relying on one.
  - \* Ensemble methods
- \* Likewise, the Bank of England uses a panel of experts who all have to agree when to set/change interest rates
- \* Bankers collate to rig/set interest rates (Libor scandal)

# Splitting finer subtasks can raise estimation precision

- \* What is our estimate for programming Asteroids, if we break the task down into finer sub-tasks:
  1. Get spaceship moving around a blank screen (with keyboard control)
  2. Create some drifting asteroids (no collision detection)
  3. Collision detection between spaceship and asteroids
  4. Collision detection between bullets and asteroids, and implement asteroid-splitting
  5. Finish game off (Game-over after 3 lives lost; score display, level restart after clearing level; UFOs)
- \* Take the refined asteroid survey on Moodle when released in Unit 2.
- \* Is using this method better than just plucking a figure out of thin air for estimating Asteroids?





# Story points: Measure complexity

- \* Instead of estimating in hours/days, we can estimate in relative task complexity: story points
- \* Rate how complex a task is *relative to the tasks rated so far*

# “Planning poker” with story points

- \* We are going to choose a complexity from the following options: 0,  $\frac{1}{2}$ , 1, 2, 3, 5, 8, 13, 20, 40, 100, ?,  $\infty$
- \* Can buy/make cards for your team to do this (need one pack each)
- \* Backlog of tasks to estimate:
  - \* Choose recipe
  - \* Find ingredients
  - \* Cook meal
  - \* Serve meal
  - \* Eat meal



# “Planning poker” with story points



- \* All team sits round and votes on tasks one-by-one using cards
  - \* After you've seen each other's cards, discuss the highest and lowest cards
  - \* “Why did you think *Find ingredients* took so long?”
  - \* Then everyone votes on the same task again
    - \* (Delphi method again)
- \* Very popular in Agile
- \* You should do this in your team meetings
- \* See <https://www.mountaingoatsoftware.com/agile/planning-poker> for more details

# Story points: Average Velocity

The number of average story points a team completes per sprint is called “velocity”.

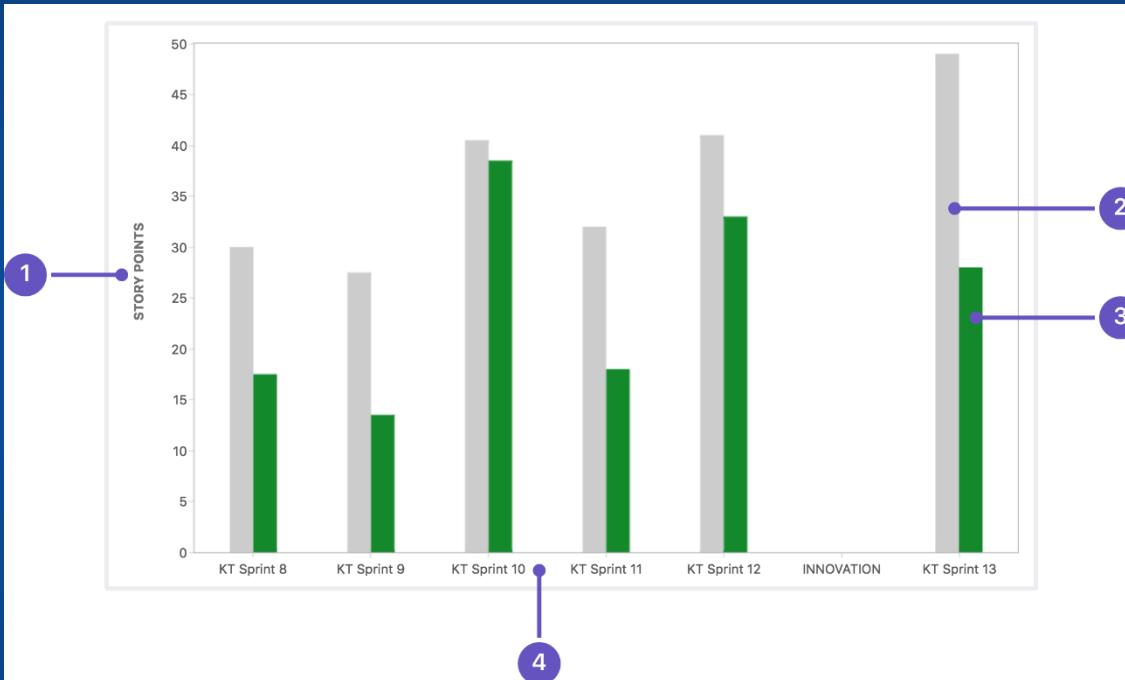


2 (Grey) = what the team promised each sprint (total story points)

3 (Green) = what the team delivered each sprint (total story points)

# Story points: Average Velocity

The number of average story points a team completes per sprint is called “velocity”.



- \* This team is averaging 24.75 story points per sprint (average of green bars)
- \* Can use this to plan what they can deliver next sprint
- \* Need a consistent way of assigning story points for velocity to make sense

# Story points: Average Velocity

The number of average story points a team completes per sprint is called “velocity”.



- \* Using velocity allows us to automatically rescale to a team's rate of work and scale of story points



# Duration, Effort + Resources

# Duration and Effort

- \* Duration is : How long it will take to complete the activity:
  - \* it is an elapsed time, not an effort estimation.
  - \* E.g. “this task will take 5 programmers 2 days to implement.”
- \* Effort is the total time spent by all resources on a specific task
  - E.g. the above task takes how many “programmer days” to complete?

# Duration, Effort + Resources

- \* “Resource” is the number of people (or machines) working on a task. E.g. Resource = 5 builders + 1 JCB digger
- \* Therefore:
  - \* Duration = Total Effort / Resource
    - e.g. duration = total “programmer days” / number of programmers available per day.
  - \* NB – the same units of measurement (e.g. days) must be used for each component

Whole days is generally a sensible minimum unit of duration.  
What is the risk of using hours?

# Resource Example

- \* Resource dictates the amount of useful work that can be done per day.
  - \* 6 builders get 6 times the amount of work done compared to 1 builder
- E.g. Three painters work two days on a task, they work 8 hours per day.
- \* The total resources available per day is
  - \* 3 people
- \* The total effort for the task is:
  - \*  $2 \text{ (days)} * 3 \text{ (people)} = 6 \text{ person days}$
- \* The duration is
  - \*  $\text{effort} / \text{resource} = 6 / 3 = 2 \text{ days.}$

# Duration, Effort + Resources

- \* The relationship between effort estimates and elapsed time is often not quite that simple
- \* A task with duration=2 days could take 4 calendar days if the task started on a Friday
  - \* We can't talk about calendar days until the final schedule is published (because start dates float around until then)
- \* Here are a just few things that might influence the elapsed time:
  - \* Calendars (staff has booked holiday)
  - \* Number of personnel
  - \* Skill sets
  - \* Availability of other resources (e.g. tools)

# Resource, Effort and Duration

- \* E.g. Adding a second programmer might not halve the duration of a task:
  - \* It might be that the second programmer can't start developing until the other has finished their bit
  - \* How should the Project Manager account for that?

# Impact of Dependencies on Duration

- \* Task dependencies have an impact on the duration of tasks
- \* E.g. Effort = 6 days. Resources = 3 painters.
- \* Dependencies could mean the 3 painters can't work on the same days
- \* For instance, 2 of them will do the walls and ceiling, the 3rd will do the stencils. Stencilling cannot start until walls and ceiling completed.
- \* How should we account for this in the planning?
  - \* We need to introduce three separate tasks
  - \* The wall and ceiling tasks can be run concurrently
  - \* But the stencilling task can only begin after the tasks made by the two others is completed
  - \* Now the 3 painters need longer than 2 days to complete the job.

# Summary of Lecture

- \* Looked at Estimating Projects and Tasks
  - \* Whole project estimation
    - \* Work Breakdown Structure
    - \* Algorithmic / Analogy methods
  - \* Delphi Method
  - \* Using finer subtasks
    - \* Planning Poker (Story Points)
- \* Pricing Projects
- \* Defined Effort, Duration and Resources
  - + their estimation techniques

Further reading: Wysocki “Effective Project Management : Traditional, Adaptive, Extreme”, chapters 4+5.

Practice quizzes for Unit 2 will be available on Moodle. Look out for them in Unit 2.

# CE29x Team-Project Challenge

## Critical Path Analysis

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose, Iain Langdon, Michael Fairbank

# Review of Previous Lecture

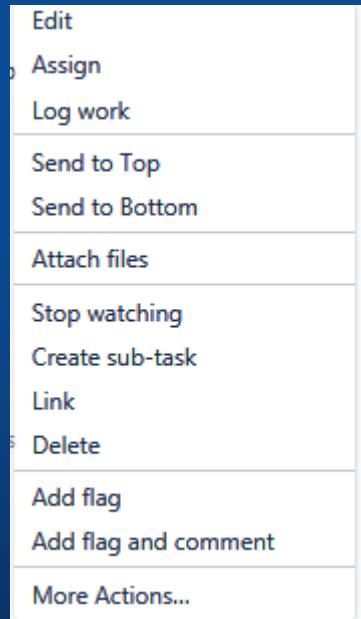
Looked at Estimating tasks and projects:

- \* Reviewed Agile vs Waterfall
  - \* And Scrum vs Kanban
- \* Work Breakdown Structure
- \* Methods of Estimating tasks and projects
  - \* Costing projects
- \* Story points and average velocity
- \* Effort, Duration and Resources

# Jira Tip

It's possible to subscribe/unsubscribe to issues to receive automatic emails when comments are added.

Just use the issue's context menu and select “start watching” or “stop watching”



# Critical path analysis

Today's lecture

- \* Dependencies between tasks
- \* Activity Network Diagram
- \* Scheduling: Critical Path Method (CPM)
- \* Total duration compression techniques
- \* Gantt charts in Microsoft Project

# Critical path analysis

Some tasks can't be done until others are done first  
⇒ Task Dependencies

Are some tasks more important than others to be done as soon as possible, for the project to be finished quickly?

- Q: What tasks are required to make a cup of tea?
- Q: Which task dependencies are there?
- Q: Which of those tasks are critical to start as soon as possible?

# Critical path analysis

This leads to the idea of certain activities being “critical ones”

- \* To start as soon as possible
- \* If those tasks are late then the whole project will be late.

And certain tasks not being critical:

- \* they have some “slack” in when they can start

# Critical path analysis

- \* Critical path analysis is part of “Program evaluation and review technique”, (PERT)
  - \* developed by the US Navy in the 1950s

# Ordering tasks

- \* Calculating precedence table
- \* Generating an activity network

# Dependency Table / Precedence Table

- \* “Tasks” are also known as “activities”
- \* A “precedence table” (Dependency table) below shows the tasks (activities) involved in a project with their durations, and immediate predecessors

Task (Activity)	Duration	Immediate Predecessors
A	2	-
B	4	A
C	4	-
D	5	B, C
E	6	C
F	3	E

# Example Task List: moving home

- \* Imagine the main tasks required
- \* Then detail them

Task	Duration	Immediate Predecessors
A. Pack boxes		
B. Purchase boxes		
C. Hire removal company		
D. Load the van		
E. Wrap glasses and other delicacies in newspaper		
F. Cancel utility companies		
G. Drive van to new house		
H. Unload van		
I. Redirect mail		

# Example Task List: moving home

- \* Imagine the main tasks required
- \* Then detail them

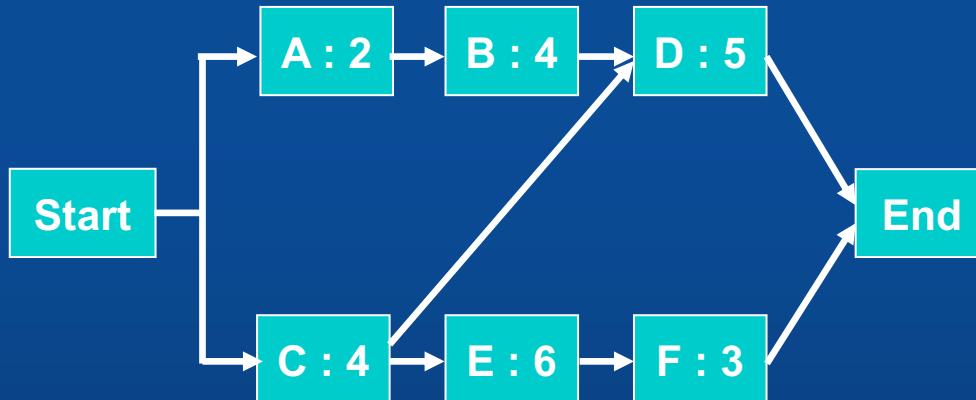
Task	Duration	Immediate Predecessors
A. Pack boxes		B,E
B. Purchase boxes		-
C. Hire removal company		-
D. Load the van		A, C
E. Wrap glasses and other delicacies in newspaper		-
F. Cancel utility companies		-
G. Drive van to new house		D
H. Unload van		G
I. Redirect mail		-

# Activity network

We can display the precedence table as an “activity network”:

- \* Nodes represent the activities (tasks)
- \* Connections show the dependencies

Task	Duration	Immediate Predecessors
A	2	-
B	4	A
C	4	-
D	5	B, C
E	6	C
F	3	E



- \* This shows activity B cannot start until A has finished
- \* It also shows D cannot start until all arrows coming into it indicate completion (i.e. until B and C have finished).
- \* Note, no need to say D depends on A! This occurs automatically through dependency chaining.

# Activity network

I. Try and represent the precedence table above as an activity network:

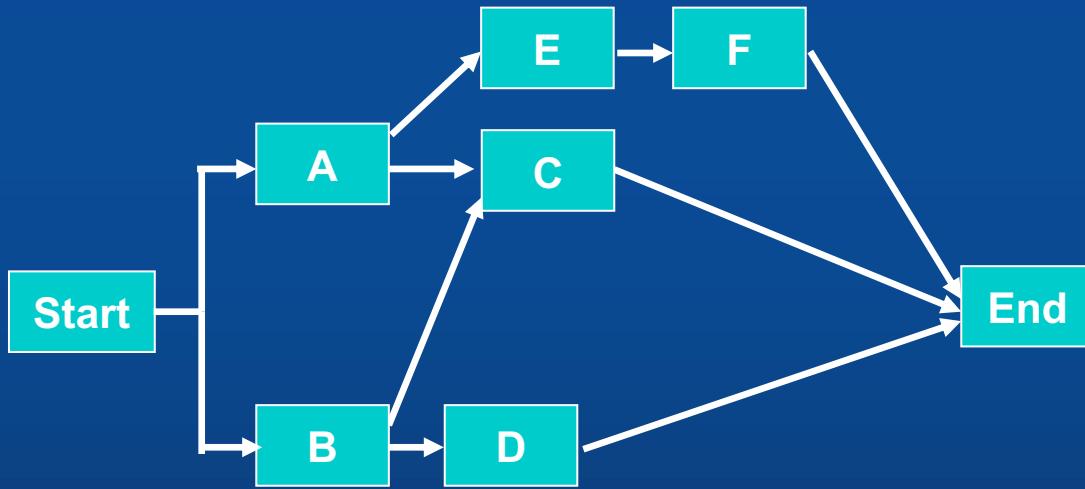
Task	Duration	Immediate Predecessors
A	2	-
B	4	-
C	4	A, B
D	5	B
E	6	A
F	3	E

Start

# Activity network

I. Try and represent the precedence table above as an activity network:

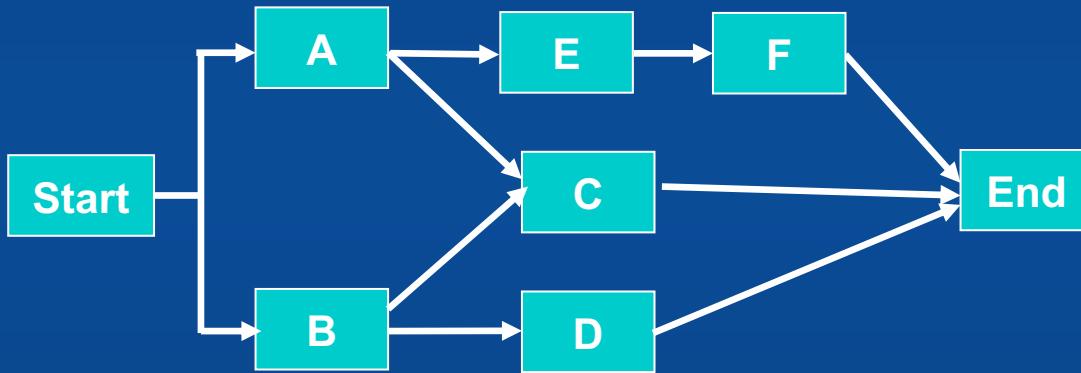
Task	Duration	Immediate Predecessors
A	2	-
B	4	-
C	4	A, B
D	5	B
E	6	A
F	3	E



# Activity network

I. Try and represent the precedence table above as an activity network:

Task	Duration	Immediate Predecessors
A	2	-
B	4	-
C	4	A, B
D	5	B
E	6	A
F	3	E



Just tidying it up a bit.

- \* Try to avoid crossing arrows
- \* Try to make arrows all point towards the right (so time flows right)

# Activity network

2. Try and represent the precedence table above as an activity network:

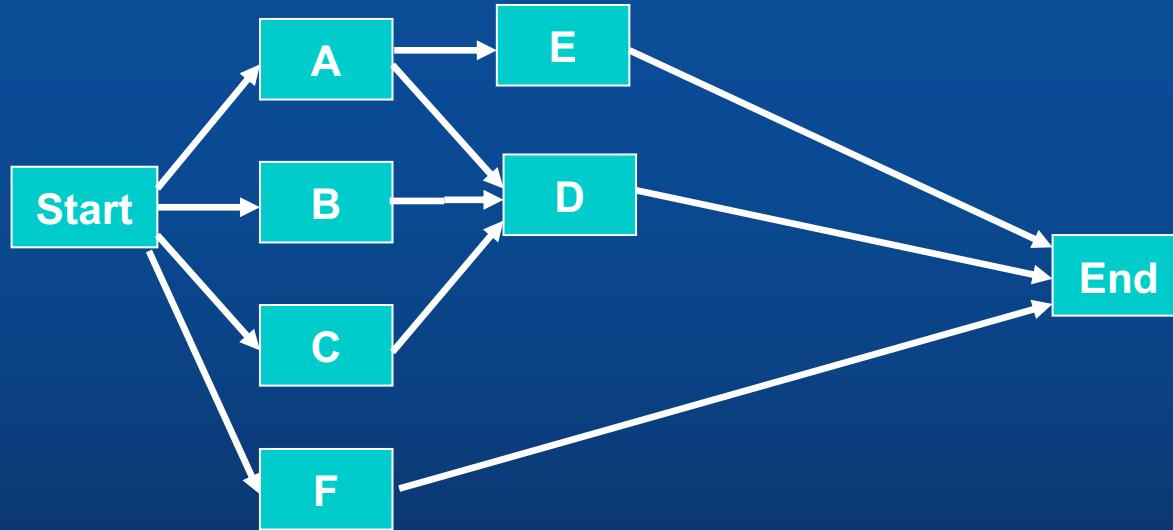
Task	Duration	Immediate Predecessors
A	2	-
B	4	-
C	4	-
D	5	A,B,C
E	6	A
F	3	-

Start

# Activity network

2. Try and represent the precedence table above as an activity network:

Task	Duration	Immediate Predecessors
A	2	-
B	4	-
C	4	-
D	5	A,B,C
E	6	A
F	3	-

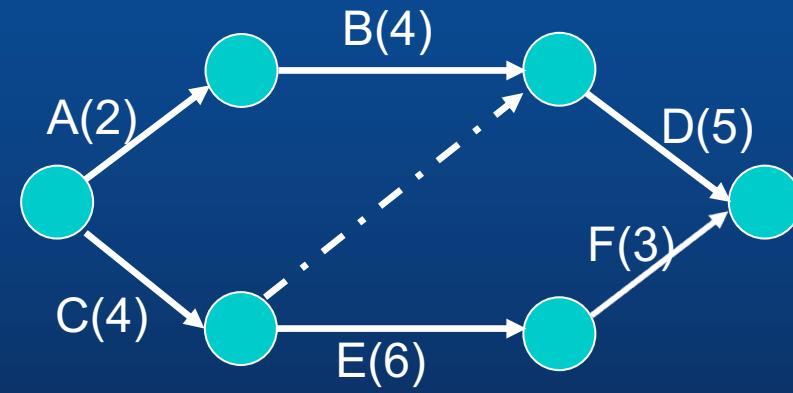


# Activity network – alternative display format

Or can use Arrow diagramming method:

- \* Now arrows represent the activities
- \* Connections between nodes show dependencies
- \* Nodes represent “milestones”.  
These are events which indicate when we are ready to move on.
- \* Milestone nodes “fire” (i.e. Milestones are completed) when all arrows coming into that node indicate completion of all preceding activities.

Task	Duration	Immediate Predecessors
A	2	-
B	4	A
C	4	-
D	5	B, C
E	6	C
F	3	E



# The Activity Network Diagram

- \* The Activity Network Diagram is the end-product of the task decomposition process
  - \* It should be accompanied by narrative to explain dependencies

# What you have done up to now

- \* Listed, from lesser to greater detail, the tasks that need to be achieved to cover the complete scope of the project
- \* Defined dependencies between tasks
- \* Built a network of tasks

# To finish the plan you need to:

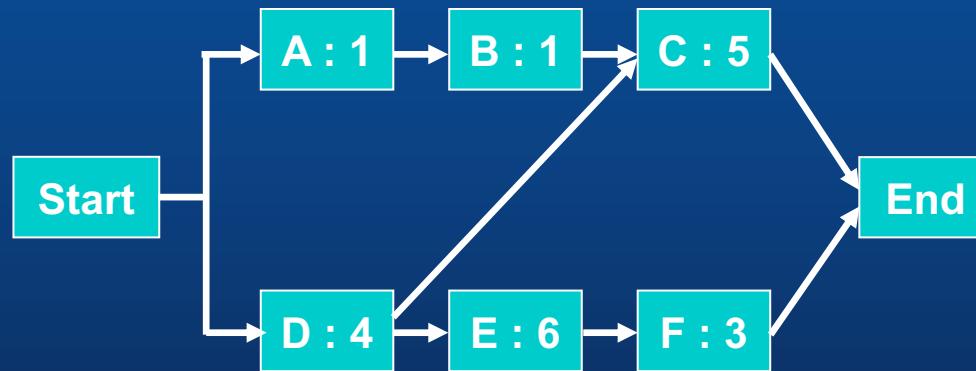
- \* Estimate the duration of the tasks (previous lecture)
- \* Plan your project
  - \* Critical path analysis technique
- \* Review your plan
  - \* Does it fit it into a specific global elapsed time (if one exists)?

# Analysing the Activity Network

1. Forward path calculation....
2. Backward path calculation....
3. Slack calculation....
4. Critical activities....
5. Critical path.

# Critical Path Method

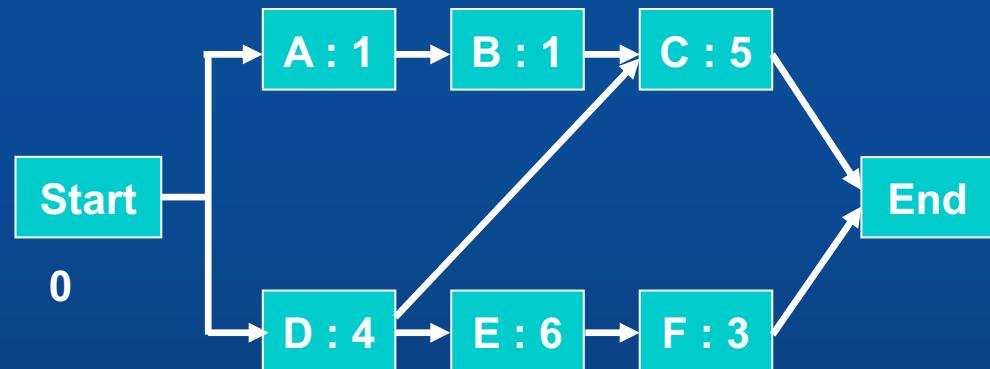
- \* A path is a sequence of activities that starts with a beginning activity and travels through a series of immediate successors until it terminates with an ending activity
- \* The length of a path is the total time it takes to go through the complete path
- \* For any network, there is a maximum of the lengths of all the paths through the network
- \* Any path whose length is equal to this maximum is called a critical path



# The Forward Path

- \* Calculate the Earliest Start Time (EST) and the Earliest Finish Time (EFT)
- \* These are “earliest” times in the sense that it is not possible to start/end these tasks any early than this.

Activity	Duration
A	1
B	1
C	5
D	4
E	6
F	3

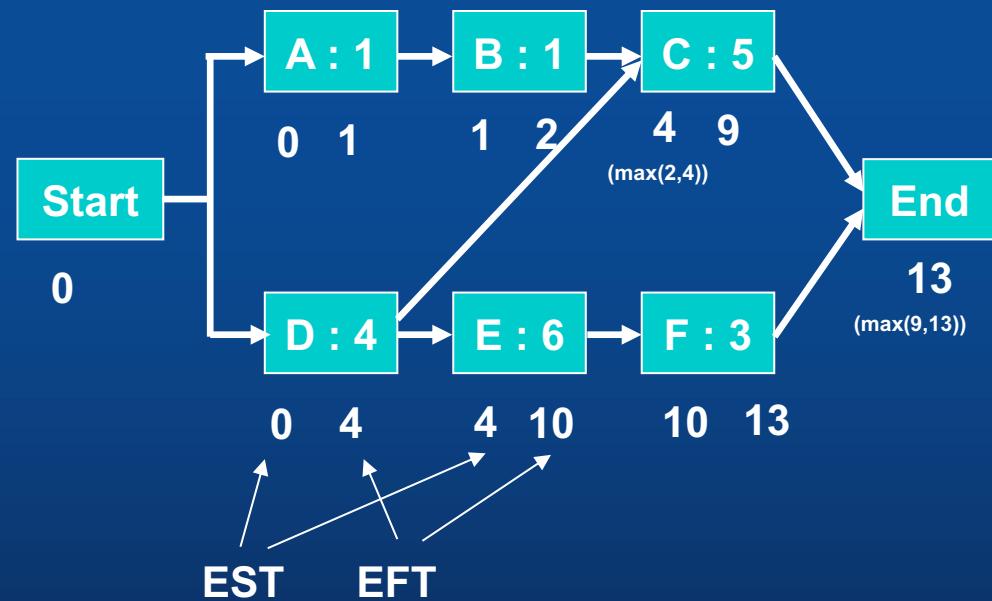


Complete the forward-path calculation

# The Forward Path

- \* Calculate the Earliest Start Time (EST) and the Earliest Finish Time (EFT)
- \* These are “earliest” times in the sense that it is not possible to start/end these tasks any early than this.

Activity	Duration
A	1
B	1
C	5
D	4
E	6
F	3

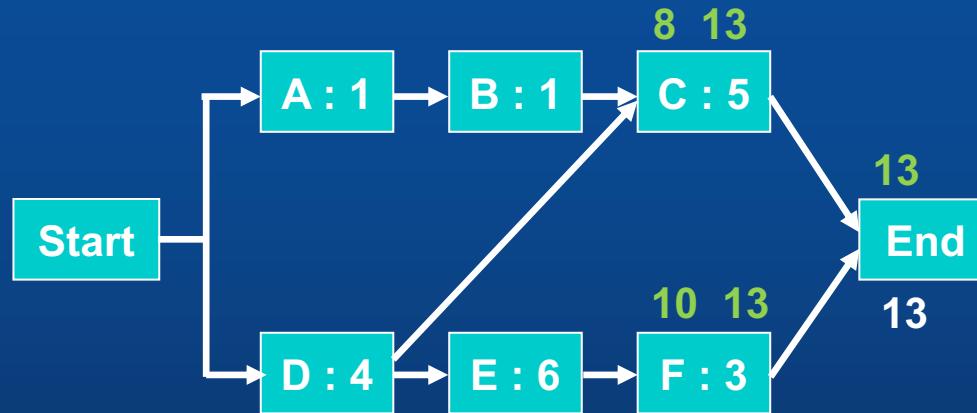


# The Forward Path Algorithm

- I. The EST for the beginning activity is 0
  - 2. For any task,  $EFT = EST + \text{duration}$
  - 3. For any task, the EST is the maximum of the EFT for all its immediate predecessors
- 
- \* This requires a “forward pass” through all of the network’s nodes

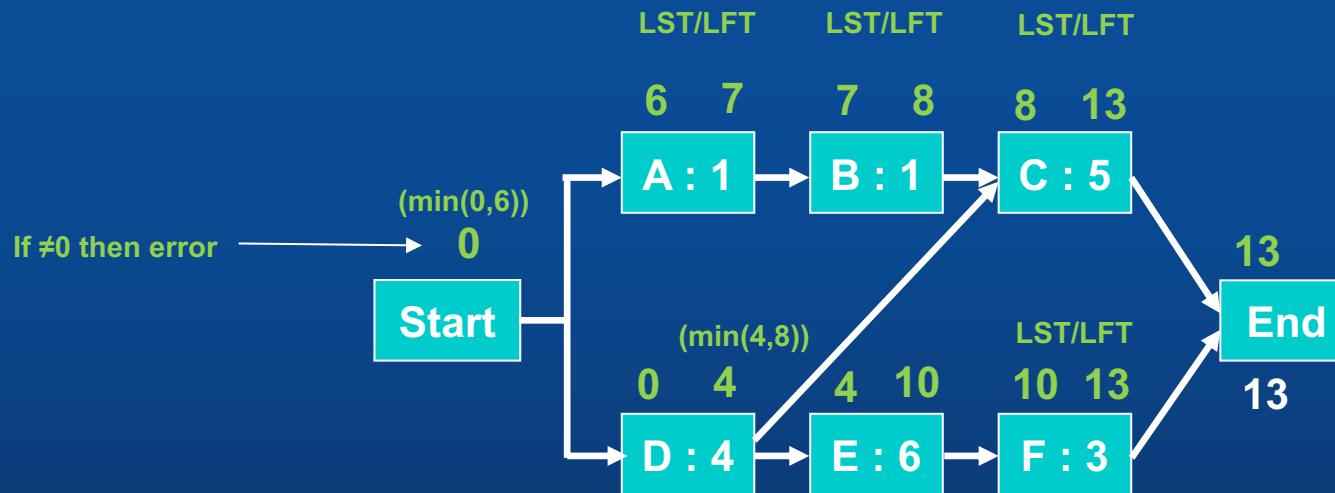
# The Backward Path

- \* Calculate Latest Start Time (LST) and Latest Finish Time (LFT)
- \* “Latest” here means latest possible *assuming we want the project completed in optimal time*, which we know from the previous slide is 13 in this example.
- \* Complete the diagram:



# The Backward Path

- \* Calculate Latest Start Time (LST) and Latest Finish Time (LFT)
- \* “Latest” here means latest possible *assuming we want the project completed in optimal time*, which we know from the previous slide is 13 in this example.
- \* Complete the diagram:



# The Backward Path Algorithm

1. For the “End” node, the LFT = EFT (calculated from the forward pass)
  2. For each task,  $LST = LFT - \text{duration}$
  3. For each task, the LFT is the minimum of the LST for all of its immediate successors
- \* This requires a backward pass through the network

# Calculating Slack

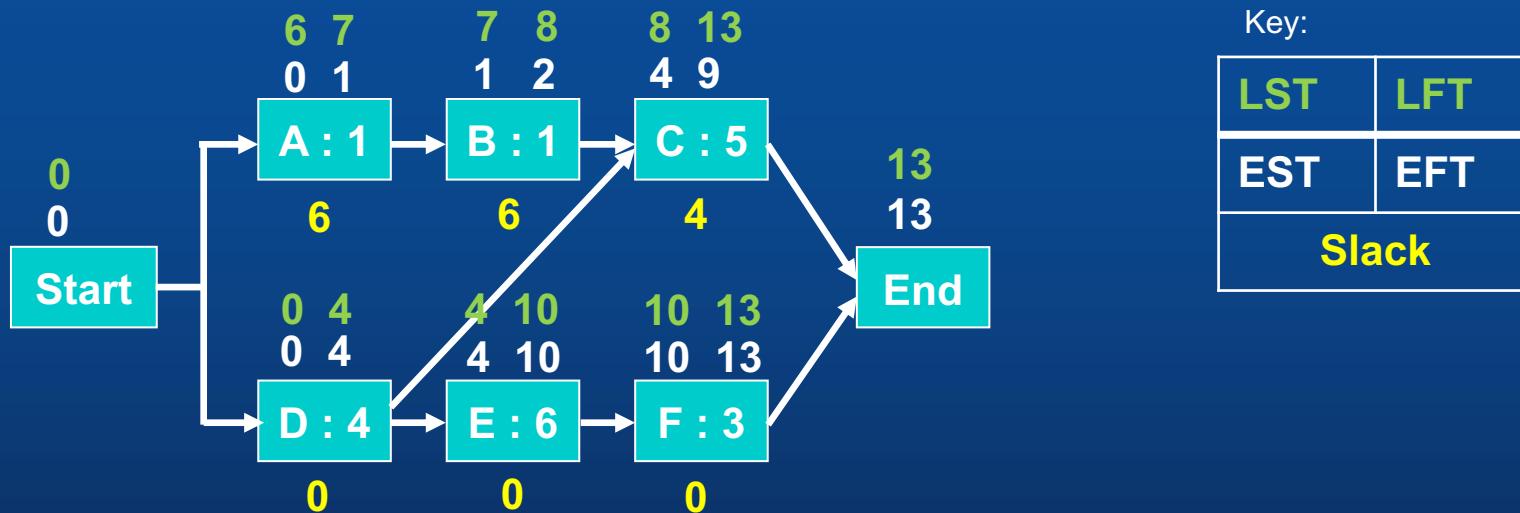
- \* Slack is the amount of time that an activity can be delayed past its EST or EFT without delaying the project.

- \* For each activity, the Slack is:

Latest Finish Time – Earliest Finish Time (LFT-EFT) or

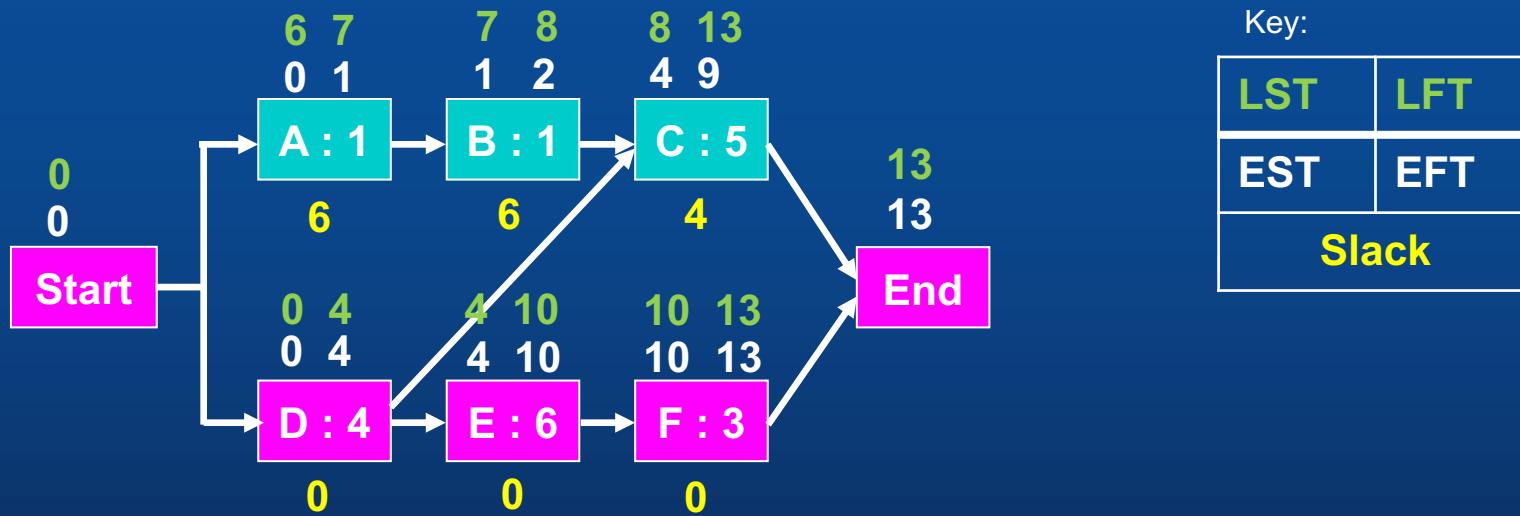
Latest Start Time – Earliest Start Time (LST-EST)

- \* E.g. below, C has a slack of  $13-9=4$



# Critical Activities and Critical Path

- \* Activities with zero slack are called **critical activities**
- \* If these are late then the whole project will be late
- \* The critical path here is **Start-D-E-F-End**
- \* The project manager must pay most attention to those activities on the critical path



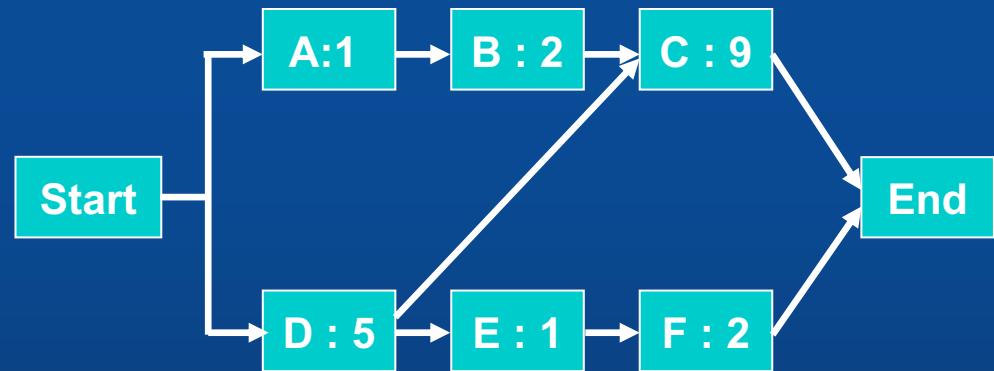
# Why Critical Path is important

- \* Slippage on a critical path results in slippage on the project completion date
- \* Improvement of the total project duration is mainly made by improvements along a critical path
- \* Critical activities need special attention, and their responsibilities and resources need to be carefully managed
- \* Activities on the critical path may not previously have been thought of as the most “important” (relevant, difficult...) activities of a project

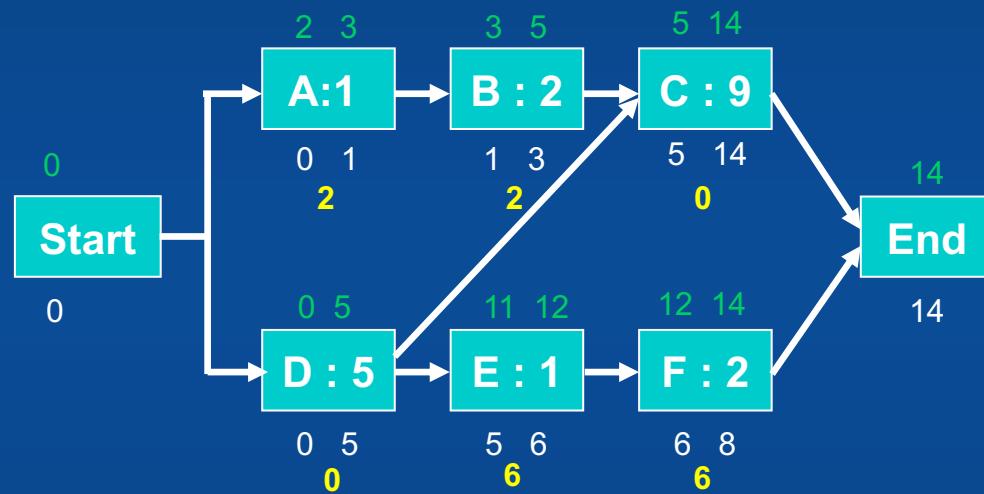
Q: What is the minimum number of critical paths?

# Critical Path Calculation Exercise

1. Do a forward pass and calculate the EST and EFTs
2. Do a backward pass and calculate the LST and LFTs
3. Calculate the slack of each activity
4. Identify the critical activities and critical path



# Critical Path Calculation Exercise



Critical path is “Start-D-C-End”

# Summary of Lecture

- \* Now you should be able to:
  - \* Generate a precedence table for tasks
  - \* Draw an activity network
  - \* Do a forward path and backward path calculation to find the LST/LFT/EST/EFT times
  - \* Calculate slack and critical activities

\* Further practice on today's lecture

Try the first quiz on Critical Path Analysis

# CE29x Team-Project Challenge

## Keeping your Project on Track, with Agile

Professor Anthony Vickers

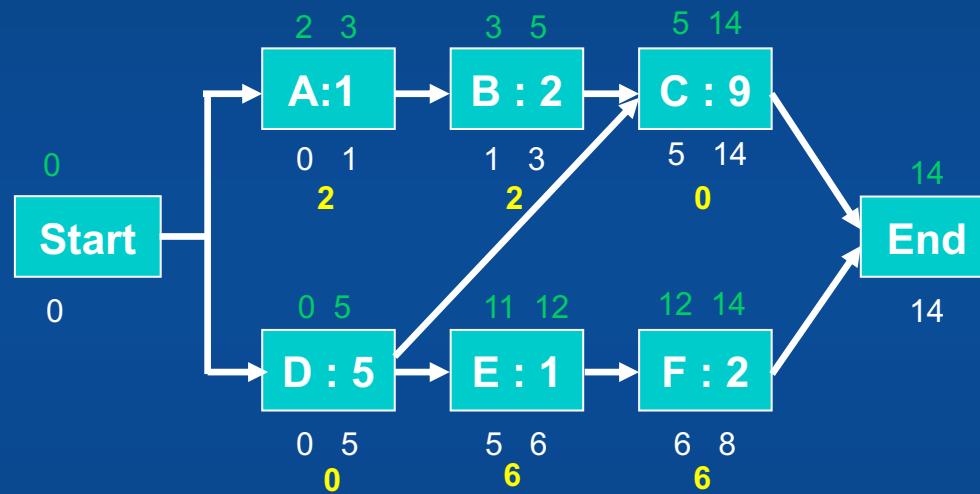
Room: INW.3.17

e-mail: vicka

# Scrum-meeting organisation Tips:

- Reminder:
  - Assign a scrum master each week
  - Scrum master responsible for
    - clicking “complete sprint” + “start sprint”
    - Holding the sprint retrospective
    - Leading the discussion on building the next sprint
  - Otherwise it's chaotic!
  - Arrive on time
- Try to ensure you just have one scrum board in Jira
  - don't want things getting cluttered

# Review of previous lecture

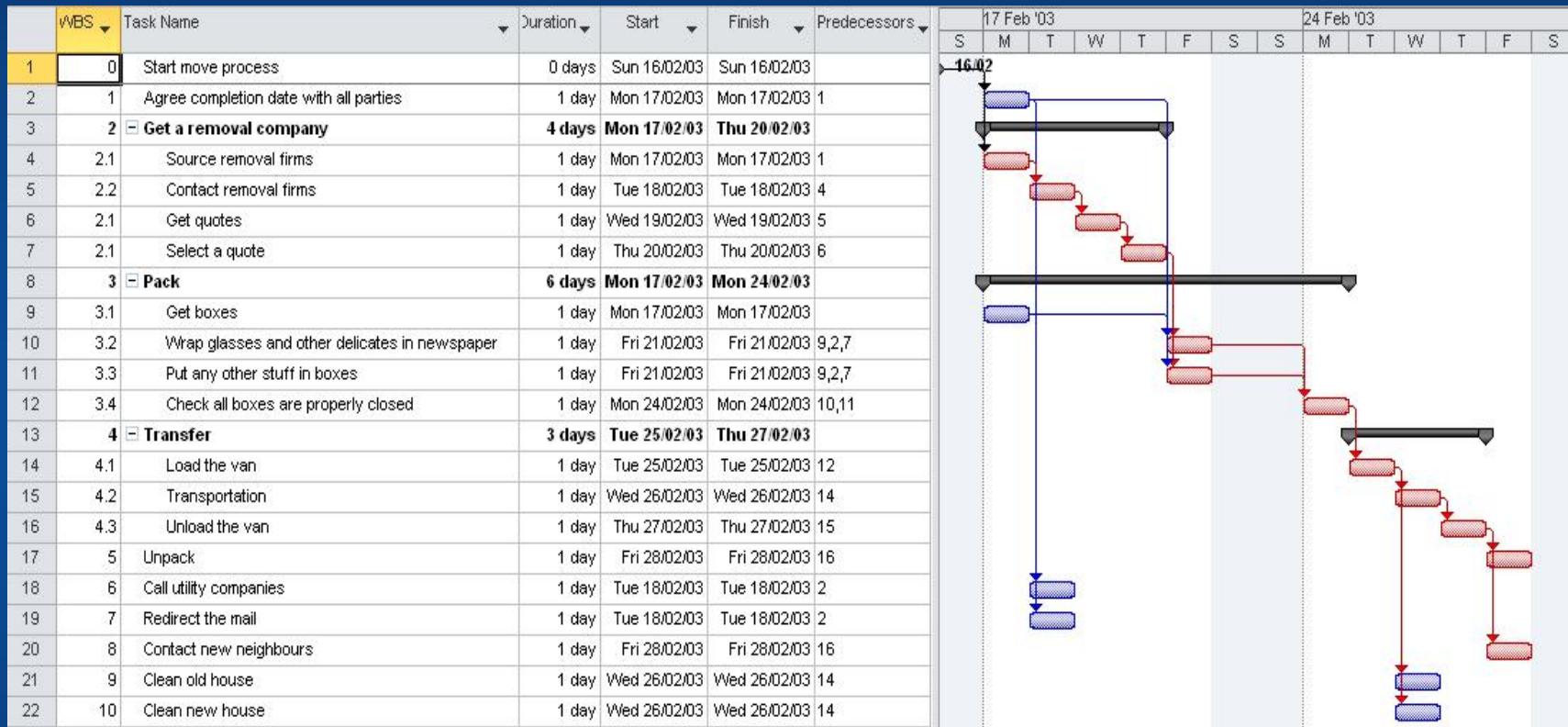


Critical path is “Start-D-C-End”

# Today's Lecture

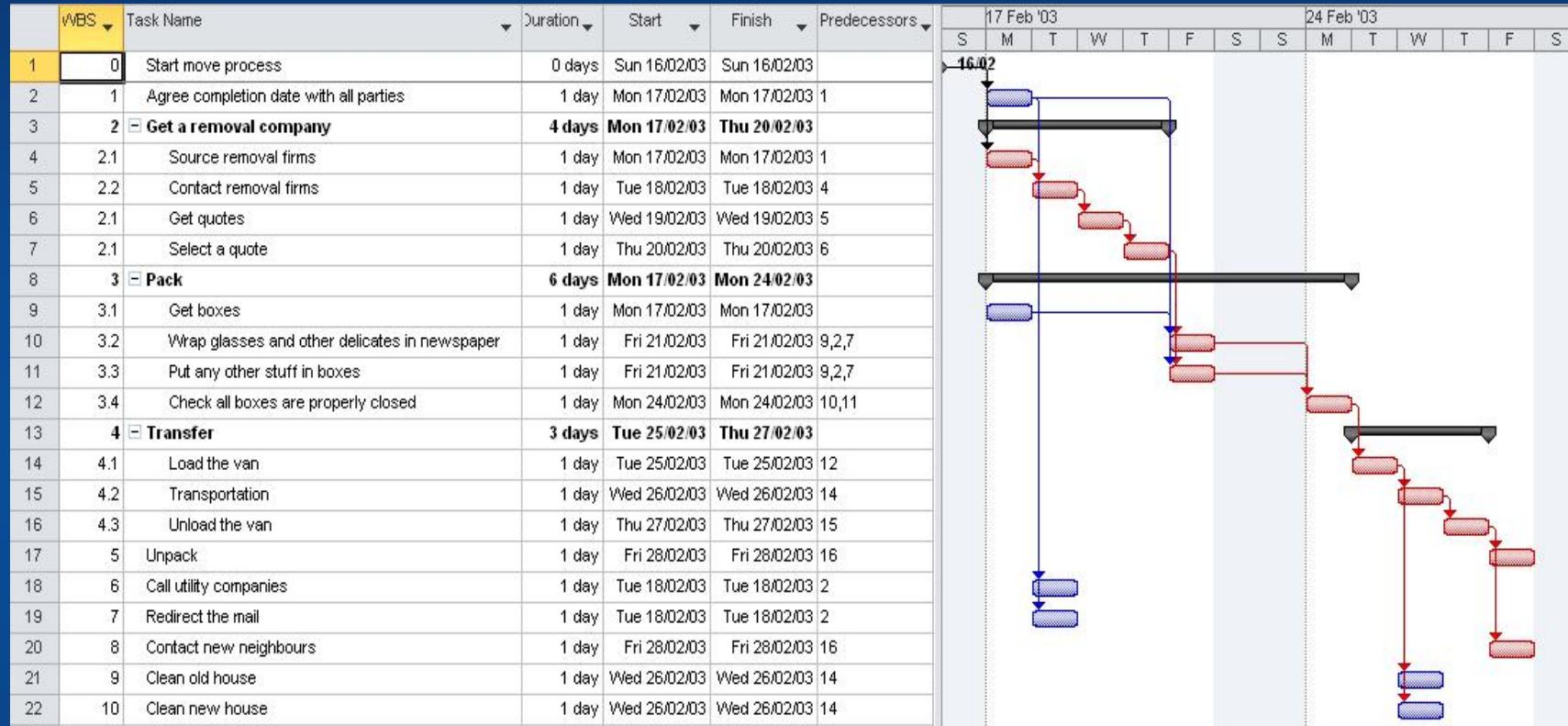
- Introduce Gantt Charts
  - Speeding a project up
  - Resource levelling
- Keeping your project on track in Agile:
  - Stand-up meetings
  - Progress reporting
  - Epics + Versions + Roadmaps
  - Burndown Charts
  - Continuous Integration

# Gantt Charts + Microsoft Project



- \* Pink tasks on Gantt chart are critical tasks, here on Microsoft Project
- \* How many critical pathways are there here?

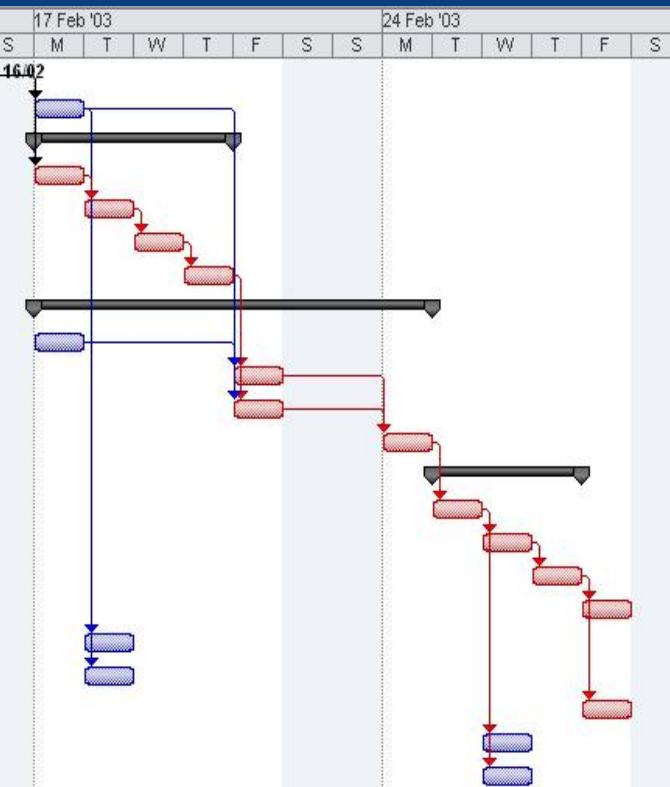
# Gantt Charts + Microsoft Project



- \* The above Gantt chart shows project schedule
- \* Project has a scheduled end date of Friday 28<sup>th</sup> Feb
  - \* Is client happy with that? What if not?

# Moving home example

	WBS	Task Name	Duration	Start	Finish	Predecessors
1	0	Start move process	0 days	Sun 16/02/03	Sun 16/02/03	
2	1	Agree completion date with all parties	1 day	Mon 17/02/03	Mon 17/02/03	1
3	2	Get a removal company	4 days	Mon 17/02/03	Thu 20/02/03	
4	2.1	Source removal firms	1 day	Mon 17/02/03	Mon 17/02/03	1
5	2.2	Contact removal firms	1 day	Tue 18/02/03	Tue 18/02/03	4
6	2.1	Get quotes	1 day	Wed 19/02/03	Wed 19/02/03	5
7	2.1	Select a quote	1 day	Thu 20/02/03	Thu 20/02/03	6
8	3	Pack	6 days	Mon 17/02/03	Mon 24/02/03	
9	3.1	Get boxes	1 day	Mon 17/02/03	Mon 17/02/03	
10	3.2	Wrap glasses and other delicates in newspaper	1 day	Fri 21/02/03	Fri 21/02/03	9,2,7
11	3.3	Put any other stuff in boxes	1 day	Fri 21/02/03	Fri 21/02/03	9,2,7
12	3.4	Check all boxes are properly closed	1 day	Mon 24/02/03	Mon 24/02/03	10,11
13	4	Transfer	3 days	Tue 25/02/03	Thu 27/02/03	
14	4.1	Load the van	1 day	Tue 25/02/03	Tue 25/02/03	12
15	4.2	Transportation	1 day	Wed 26/02/03	Wed 26/02/03	14
16	4.3	Unload the van	1 day	Thu 27/02/03	Thu 27/02/03	15
17	5	Unpack	1 day	Fri 28/02/03	Fri 28/02/03	16
18	6	Call utility companies	1 day	Tue 18/02/03	Tue 18/02/03	2
19	7	Redirect the mail	1 day	Tue 18/02/03	Tue 18/02/03	2
20	8	Contact new neighbours	1 day	Fri 28/02/03	Fri 28/02/03	16
21	9	Clean old house	1 day	Wed 26/02/03	Wed 26/02/03	14
22	10	Clean new house	1 day	Wed 26/02/03	Wed 26/02/03	14



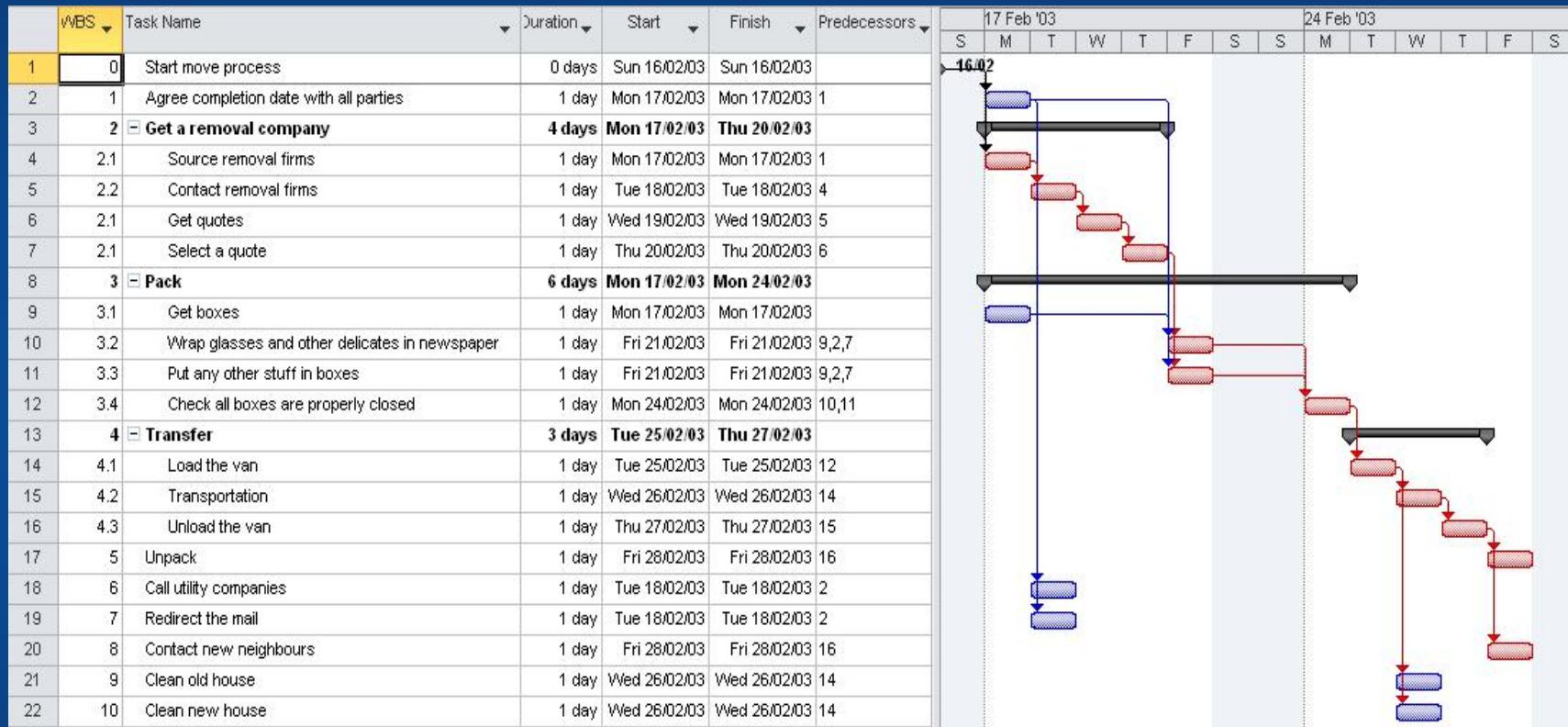
↑  
WBS

Tasks

↑  
Dependencies

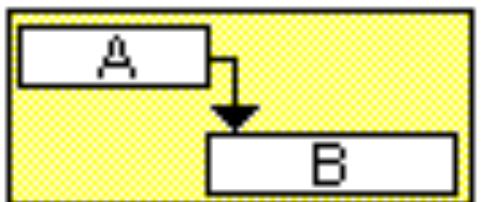
↑  
Gantt Chart

# Moving home example

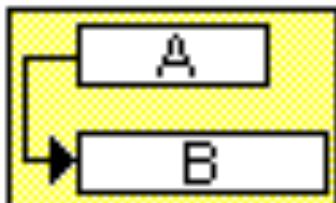


# Gantt Chart Task dependencies

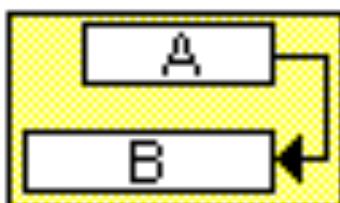
Finish-to-start  
(FS)



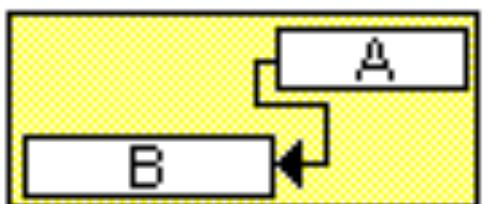
Start-to-start  
(SS)



Finish-to-finish  
(FF)



Start-to-finish  
(SF)



- \* B cannot start until A finishes.  
You can't get cash out of a bank until you have created an account.
- \* B cannot start until A starts.  
Once money starts to be paid in you can withdraw cash (including an overdraft).
- \* B cannot finish until A finishes.  
You can't close the account until you have paid back any overdraft.
- \* B cannot finish until A starts.  
You cannot close the account until you transfer the overdraft to another bank.

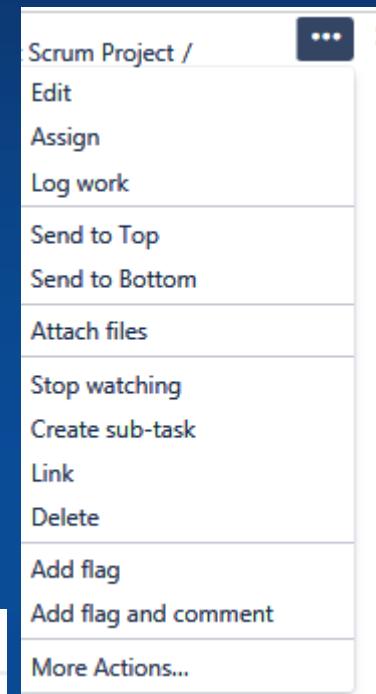
- \* Try to use FS whenever possible, if possible, always. Keeps life simple.
- \* See [https://en.wikipedia.org/wiki/Dependency\\_\(project\\_management\)](https://en.wikipedia.org/wiki/Dependency_(project_management))

# Task Dependencies in Agile

For a task-dependency in Jira, create a “link” to on an issue.

- \* To say a task can't be done until another issue is resolved, selects “is blocked by”
- \* Jira does not enforce these rules:
  - \* These are just *notes* for you to consider when you choose which issues to work on next

The screenshot shows the Jira "Link" dialog. On the left, there are tabs for "Jira Issue" (selected), "Web Link", and "Attachment". The "Comment" tab is at the bottom. In the center, under "Select a Jira issue to link this issue to", there are three sections: "This issue", "Issue", and "Attachment". The "Issue" section has a dropdown menu open, showing dependency types: "blocks", "is blocked by", "clones", "is cloned by", "duplicates", "is duplicated by", and "relates to". The "is blocked by" option is highlighted with a blue selection bar. Below the dropdown is a file attachment area with a cloud icon and the text "Drop files to attach, or browse.". At the bottom is a rich text editor toolbar with buttons for style, bold, italic, underline, etc.



# Speeding a project up

# Techniques for Compression

- \* What can we do if the client is not happy with the scheduled finishing time? Schedule-compression techniques:
- \* Fast Tracking: performing activities in parallel instead of sequentially
  - \* Example: Start assembling / building components before the design is complete. (Even though this is potentially violating a dependency.)
  - \* Use more incremental development models
  - \* Often results in increased rework

# Techniques for Compression

- \* Crashing – analyse cost and schedule to determine how to obtain the greatest compression by adding or reassigning resources
  - \* Not always realistic
  - \* Often results in increased costs, because resource allocation is not optimised
  - \* Adding resources is rarely a good solution

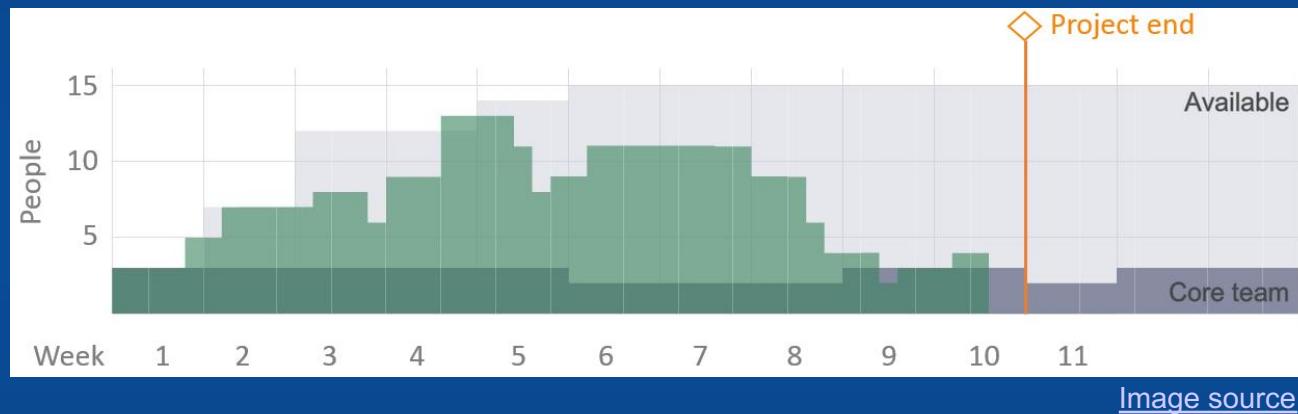
# Balancing Resources

# Balancing Resources

- \* The duration of most tasks is significantly affected by the resource assigned
  - \* Their capabilities
  - \* Their availability
- \* Don't assume that putting two people to work on a task will divide its duration by two – (see Fred Brooks – The Mythical Man Month).

# Resource Histogram

- \* A histogram of resources can be drawn after the Gantt Chart has been made



- \* What is the maximum number of people needed on the project at any one time?
- \* What is the size of the core team?
- \* Why is the maximum in the above graph a problem?

# Resource Histogram

- \* Any high difference in the level of resources will need to be well monitored, because integration of a new person or new teams always takes time
- \* Limiting these differences is called Resource Levelling
  - \* Achieve this first by moving *non-critical* tasks so that as few happen concurrently as possible.
    - \* Microsoft Project has a function to do this automatically
  - \* Further levelling by
    - \* Moving critical activities (i.e. extending the project),
    - \* splitting activities,
    - \* use alternative dependencies (start to start, end to end, start to end, lagged dependencies)

# Keeping your project on Track, with Agile

# Keeping your project on track

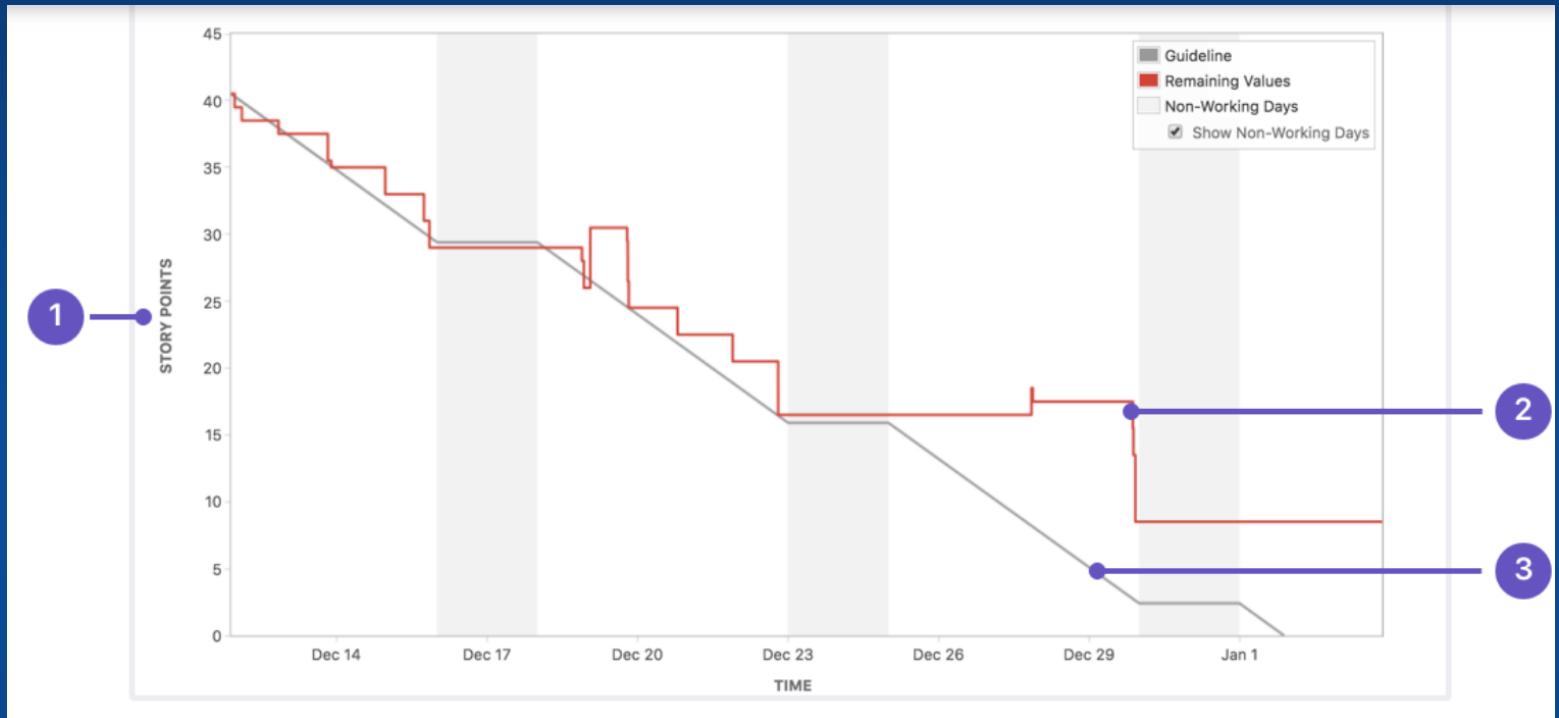
We need to monitor the project closely...

- \* To ensure it is on track to meet the deliverables, on time.
- \* To rapidly spot any deviation, and to respond and correct problems early.
  
- \* It's a key task for a project manager

# Keeping your project on track

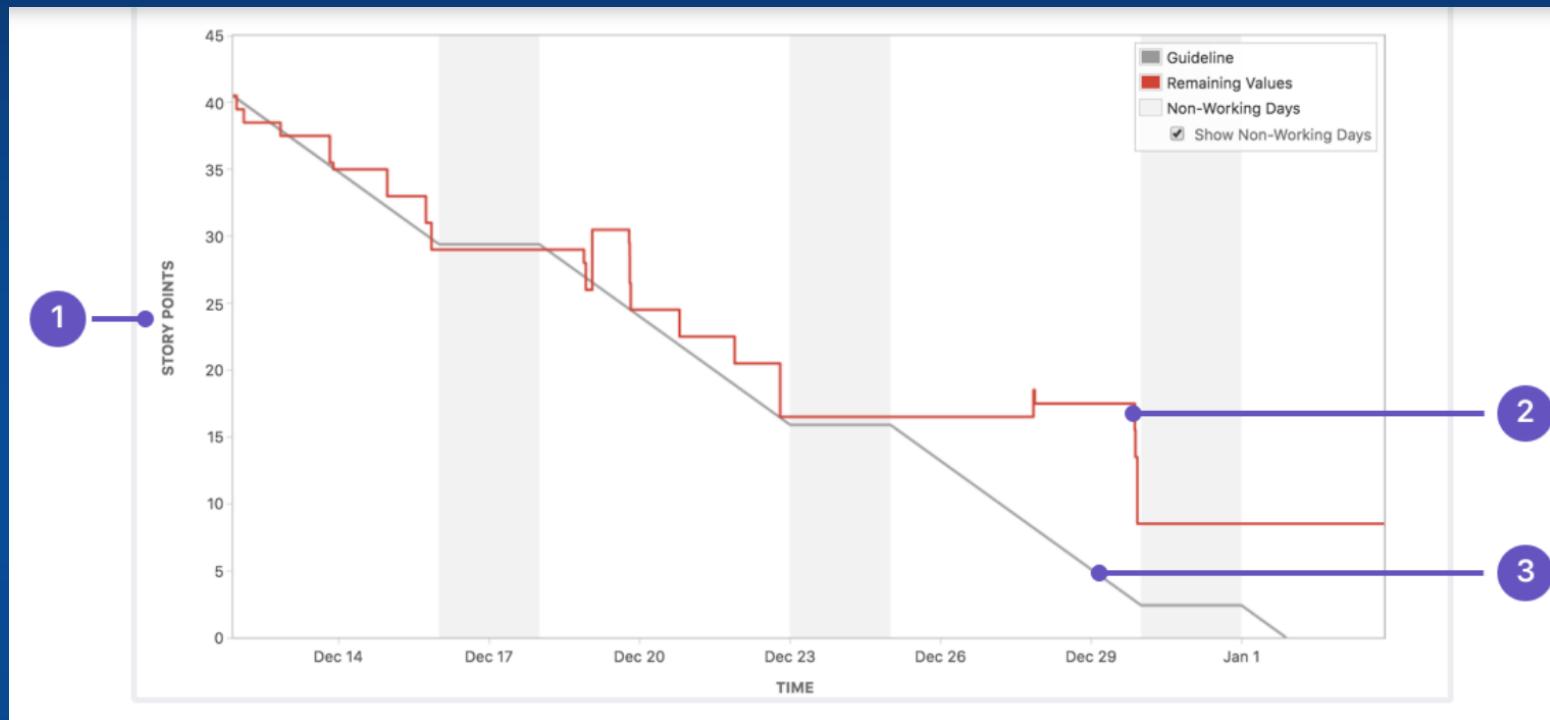
1. Burndown Chart
2. Keeping your sprint on target with stand-up meetings
3. Longer term planning in Agile
  - Roadmaps, Epics + Versions
4. Reporting in Jira
5. Continuous Integration Tools

# Burndown Chart



- Shows how a sprint is progressing, as story points get completed.
- A burndown chart shows the amount of work that has been completed in an epic or sprint, and the total work remaining.

# Burndown Chart

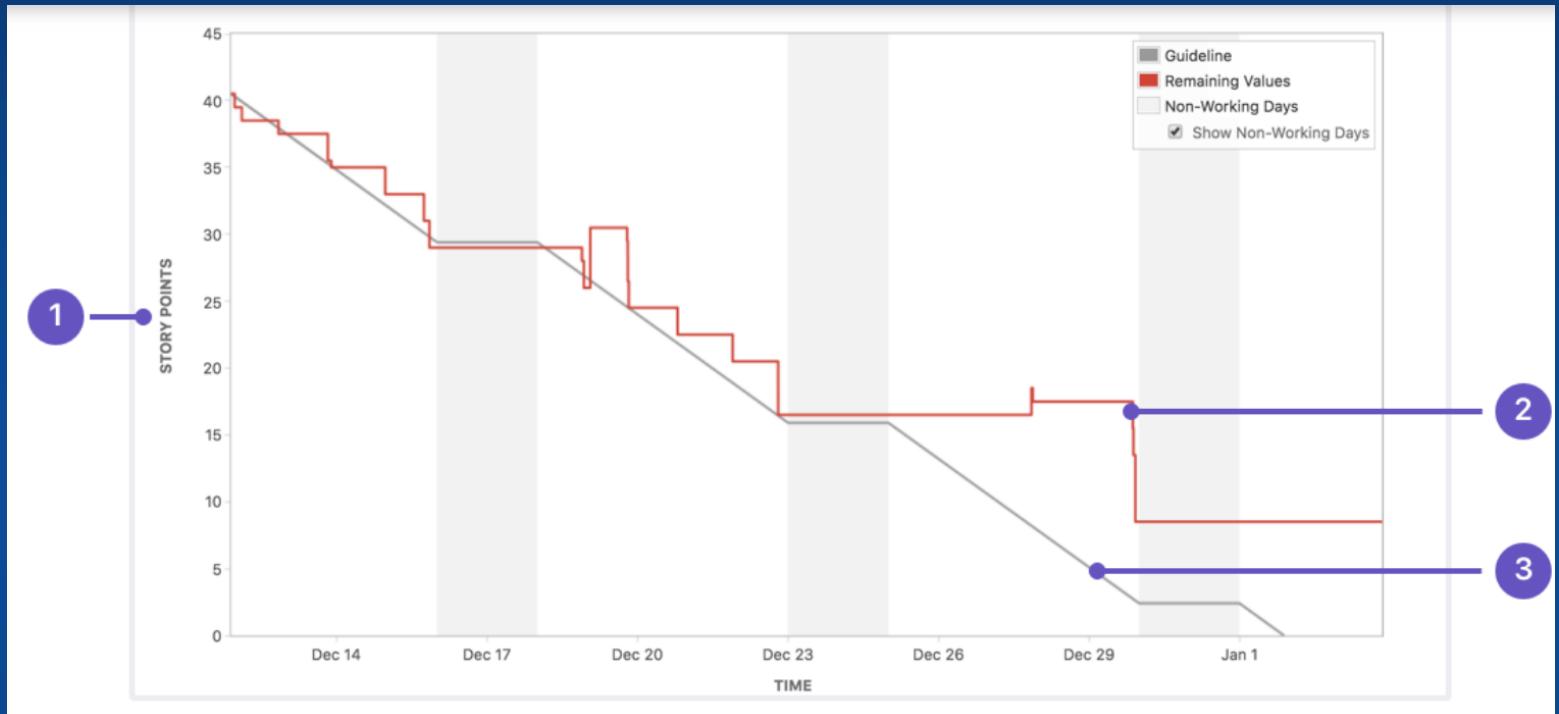


1. Estimation statistic (Story Points)
2. Remaining Values: Total story points left to go during sprint
3. Guideline: The grey line shows an approximation of where your team should be, assuming linear progress.

If red line is below grey line, then team is on track to completing all their work by the end of sprint.

*Solid grey vertical bars represent weekends – no work expected then.*

# Burndown Chart



- Burndown charts are used to predict your team's likelihood of completing their work in the time available.
- Red line should shows total story points remaining in the current sprint.
  - It should only decrease as work gets moved to “done”
  - If it increases then it means more work was put into sprint mid-way (bad)
    - That's a sprint scope-change, which is meant to be avoided.
    - Or an issue that's moved to done has to come back out again, e.g. due to it not being done properly the first time (e.g. poor testing / bugs); also bad.

# Keeping your sprint on target

- stand up meetings

# Keeping your sprint on target

- \* In the industry, every morning e.g. at 9am, a scrum team will hold the daily stand-up meeting.
- \* In each stand-up meeting, members take turn to speak, one at a time. Each person specifies 3 things:
  1. What did I work on yesterday?
  2. What am I working on today?
  3. What issues are blocking me?

# Daily Stand-up Meetings

- 1. What did I work on yesterday?
  - 2. What am I working on today?
  - 3. What issues are blocking me?
- \* These questions highlight progress and help the team flag up blockers.
  - \* Also, it strengthens the team when everyone shares the progress they're contributing to the team.

# Daily Stand-up Meetings

- 1. What did I work on yesterday?
  - 2. What am I working on today?
  - 3. What issues are blocking me?
- \* To keep attention focused on the speaker, an object may be passed round held by the current speaker
    - \* e.g. a squeezable toy
  - \* The stand-up should be brief, e.g. limited to 10 mins; and at a consistent time of day
  - \* Stand-up success can be reviewed in the sprint retrospective

# Daily Stand-up Meetings

- \* In our one-hour labs, there isn't time to do a scrum meeting, a stand-up meeting, and a sprint retrospective.
  - \* However it is a key part of agile in professional projects
  - \* You should experience it as closely as possible
- \* Hence you should arrange a physical or virtual standup meeting at least once per week, e.g. every Friday / Monday
  - \* This will prevent students coming back next week saying "I couldn't do the work assigned because I got stuck" to the surprise of everyone
  - \* You could hold a virtual meeting by creating an issue each sprint called "Stand-up meeting" and commenting on it
    - \* Each student needs to answer the 3 questions in that comment thread, in turn. By the end of the working day all students should have contributed to it

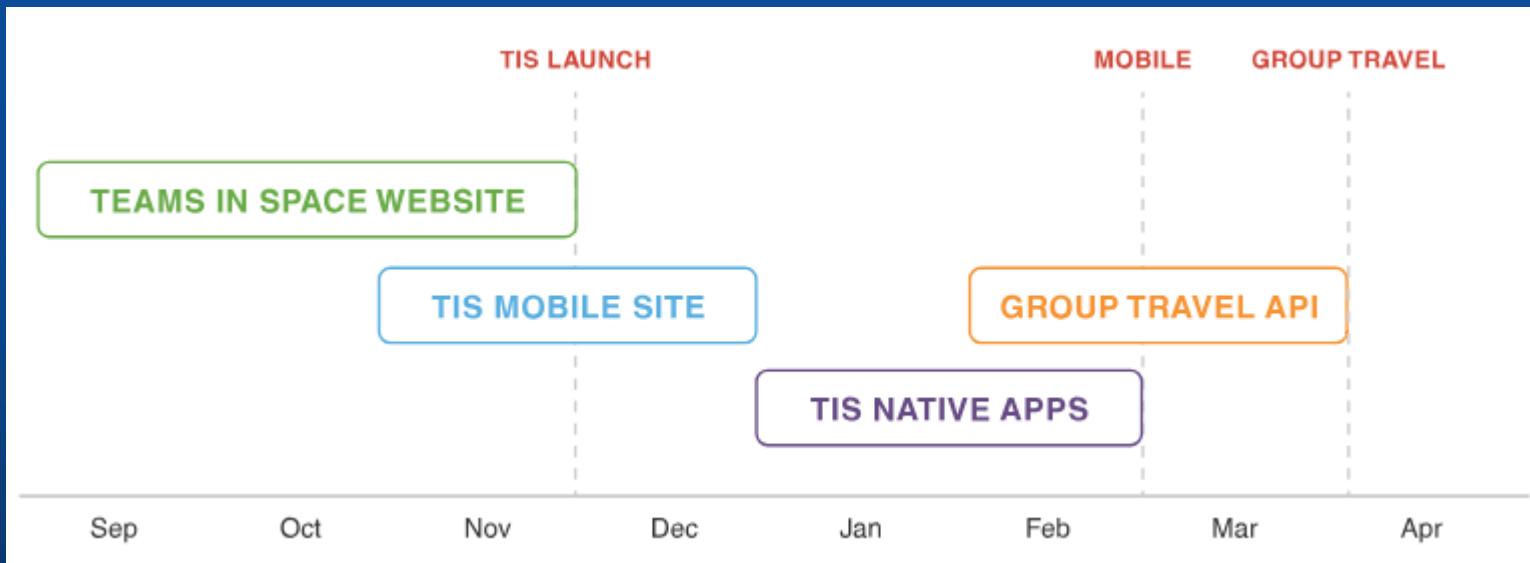
# Daily Stand-up Meetings

- 1. What did I work on yesterday?
  - 2. What am I working on today?
  - 3. What issues are blocking me?
- \* Daily stand-up meetings are part of Agile Scrum
- \* For more information see  
<https://www.atlassian.com/agile/scrum/standups>

# Longer Term Planning in Agile

# Long term planning in Agile

- \* Sprints tend to focus on short term product improvements
  - \* Can be problematic if you don't aim for a bigger picture
- \* To plan long term releases and features, a product roadmap can be used. <https://www.atlassian.com/agile/product-management/roadmaps>



# Epics

- \* Stories and Tasks are only focussed on small product features
- \* Stories and Tasks can be grouped together into “Epics”.
- \* First create the Epic as an issue in its own right

Create issue

Configure fields ▾

Project\*  
TIS Webstore Development ...

Issue Type\*  
Epic

Some issue types are unavailable due to incompatible field configuration and/or workflow associations.

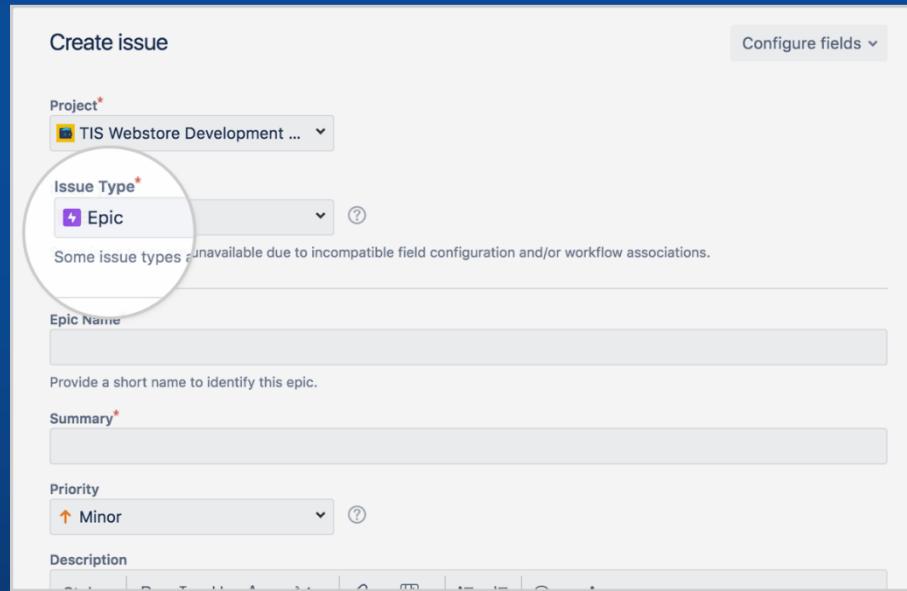
Epic Name

Provide a short name to identify this epic.

Summary\*

Priority  
Minor

Description



# Epics

- \* Then assign different stories to that epic
- \* Edit the story's attributes, and assign that story to your new epic:

Attachment

Drop files to attach, or [browse](#).

Linked Issues

blocks

Issue

Begin typing to search for issues to link. If you leave it blank, no link will be made.

Assignee

Automatic

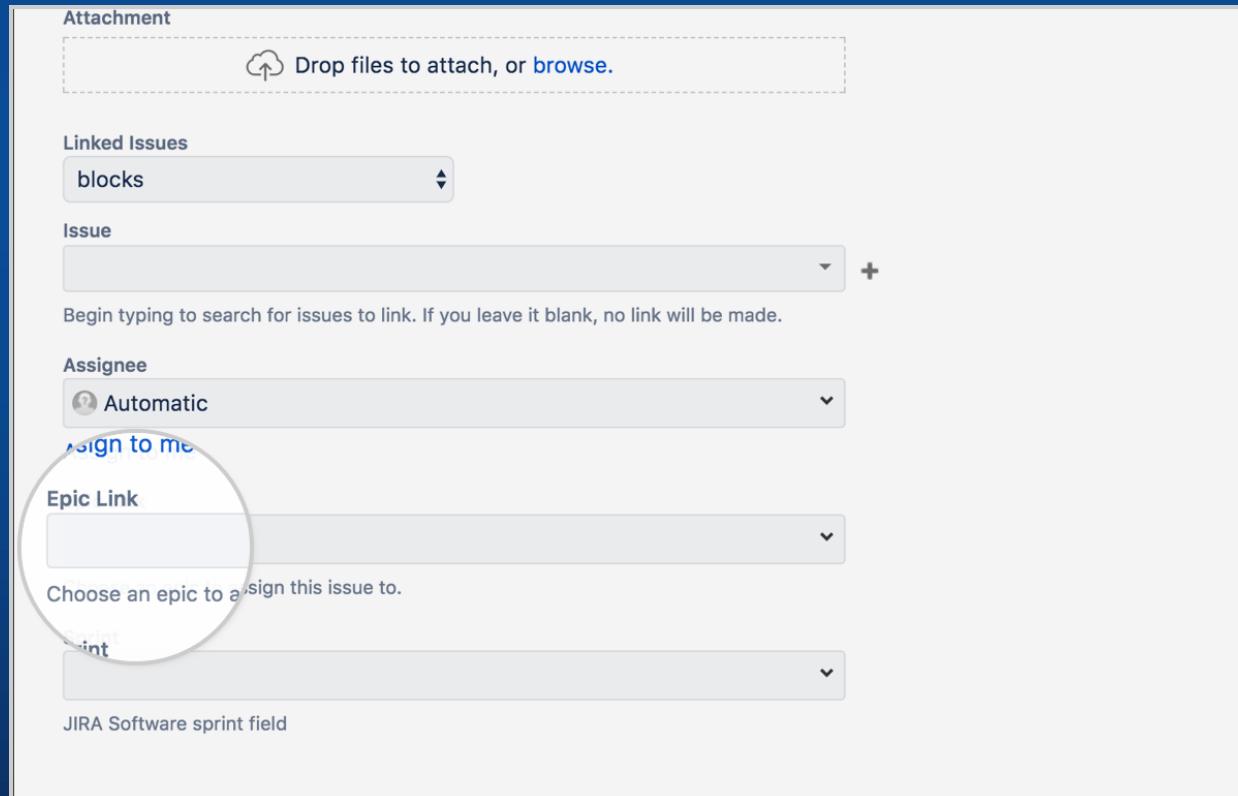
[Assign to me](#)

Epic Link

Choose an epic to assign this issue to.

Sprint

JIRA Software sprint field



# Epics

- \* To view epic, go to epics panel.
- \* Or view on backlog:

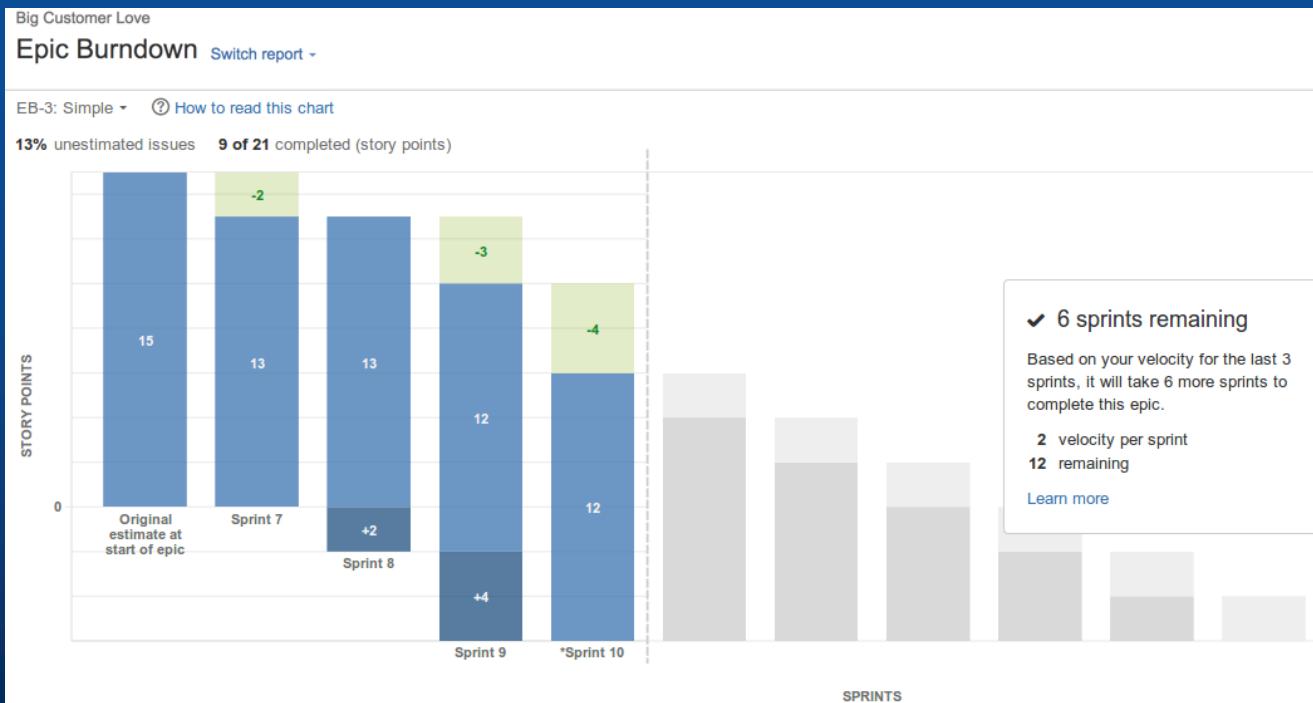
The screenshot shows a Jira Backlog board titled "Backlog" for the "dev" project. On the left, there are navigation tabs: "VERSIONS" (highlighted with a red circle), "EPICS" (highlighted with a red circle), and "STORIES". The "EPICS" tab is currently selected. The backlog is organized into two main sections: "Developer Sprint" and "dev Sprint 2", each containing 4 issues. The "Developer Sprint" section has a summary card for "My customers can't check out in the shopping cart" with three sub-stories: "Finance system - systems backup bug causes DB to crash", "TIS webstore finance report plugin update", and "Webstore billing bug causes outage". The "dev Sprint 2" section also has a summary card for the same epic. At the top of the board, there is a search bar, quick filters, and assignee dropdowns.

EPIC	Story	Status
Developer Sprint	My customers can't check out in the shopping cart	In Progress
	Finance system - systems backup bug causes DB to crash	To Do
	TIS webstore finance report plugin update	In Progress
	Webstore billing bug causes outage	In Progress
dev Sprint 2	My customers can't check out in the shopping cart	In Progress

- \* Use Epics to organise your stories into related groups.
- \* Further information:  
<https://www.atlassian.com/agile/tutorials/epics>

# Epic Burndown Chart

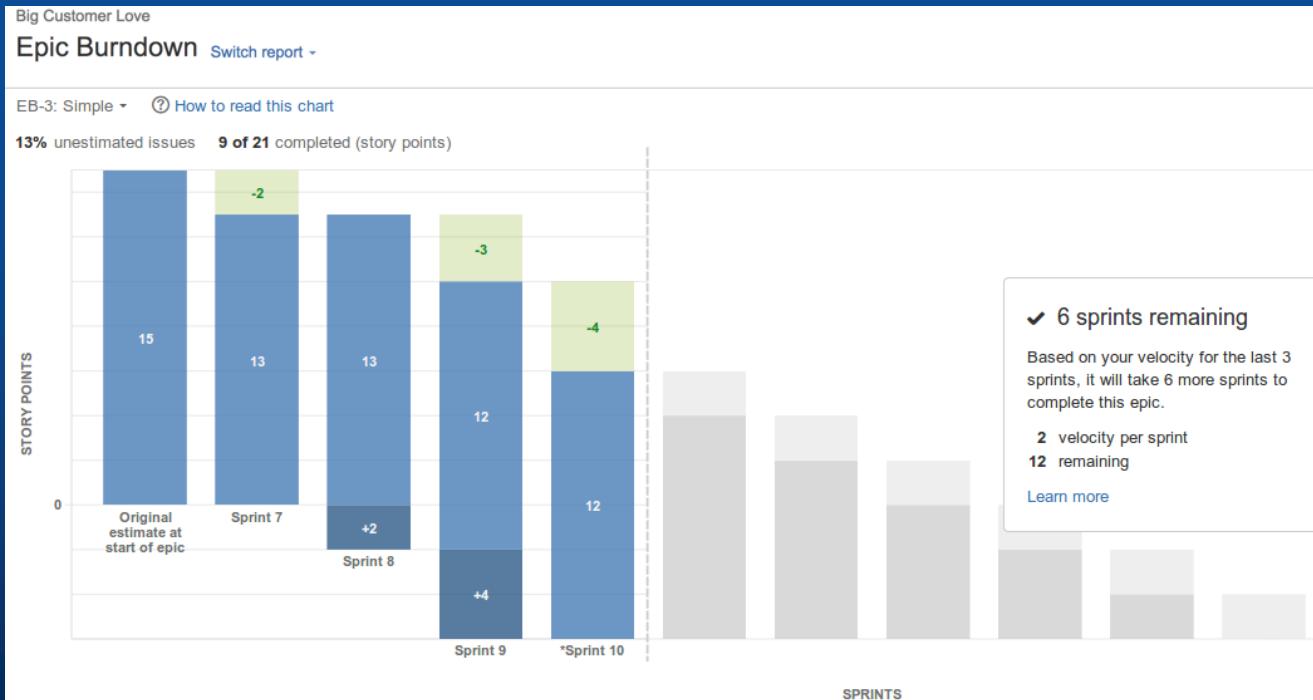
- \* Shows how many story points remaining in the epic, as the sprints progress
- \* Lets you predict if your epic will be completed in time



# Epic Burndown Chart

- \* Light blue=number of story points originally in epic at start of each sprint.
- \* Light green=number of story points done in that sprint
- \* Dark blue = number of story points added to epic during sprint
- \* Dark/light grey: predictions, based on team's velocity

Q: When do we think this epic is going to be completed?



# Versions

- \* Stories Tasks and Epics can be grouped further, into “Versions”
- \* Version is complete when all of its issues are complete

The screenshot shows a software interface for managing releases. At the top, there is a search bar and three quick filters: "Released", "Unreleased", and "Archived". A blue dot is positioned next to the "Archived" filter, with a purple circle containing the number "1" to its right.

The main table lists four versions:

Version	Status	Progress	Start date	Release date	Description
Version 4.0	UNRELEASED	No issues			
Version 3.0	UNRELEASED	<div style="width: 50%;"></div>			
Version 2.0	UNRELEASED	<div style="width: 100%; background-color: green;"></div>			
Version 1.0	RELEASED	<div style="width: 100%; background-color: green;"></div>			

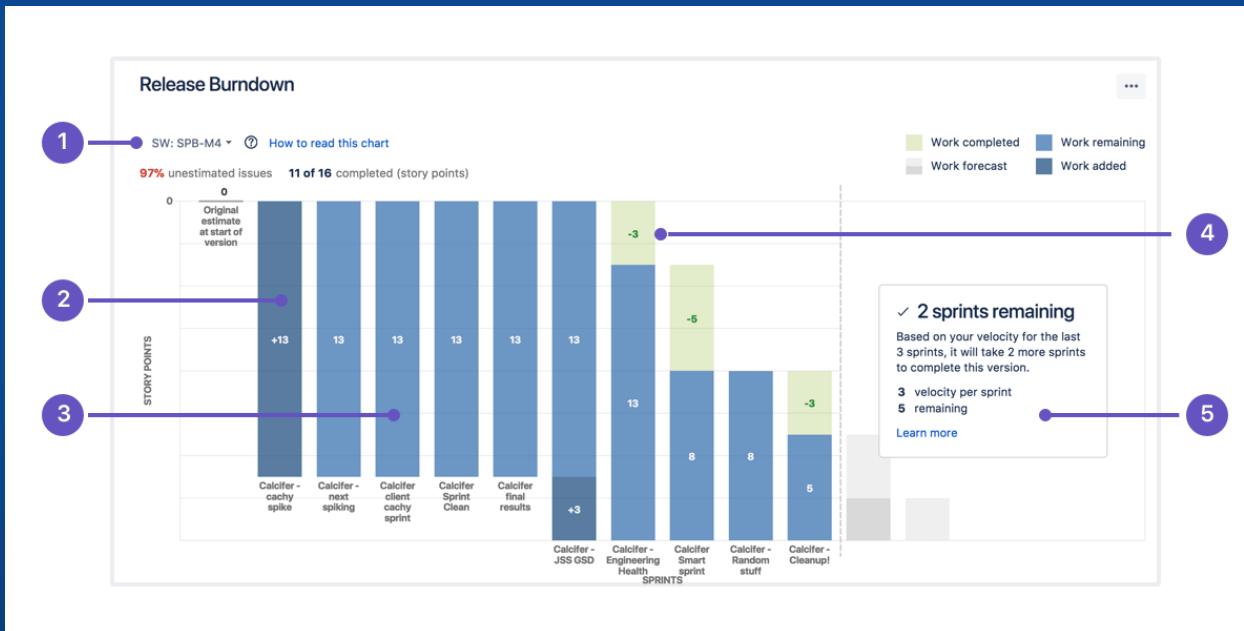
A mouse cursor is hovering over the progress bar for Version 2.0. A tooltip window is open, showing the following details:

- Version: Version 2.0
- 9 issues in total
- Done: 2
- In Progress: 3
- To Do: 4
- All issues

At the bottom of the table, there are input fields for "Version name", "Start date (optional)", "Release date (optional)", and "Description".

# Versions

- \* Can view Release Burndown chart
  - \* Same idea as epic burndown chart



- \* For more information on creating versions in Jira:  
<https://www.atlassian.com/agile/tutorials/versions>

# Other reports in Jira

- \* Burndown chart
- \* Velocity chart (Previous lecture)
  - \* Gives average rate of story points delivered per week
- \* Version / Epic burndown chart

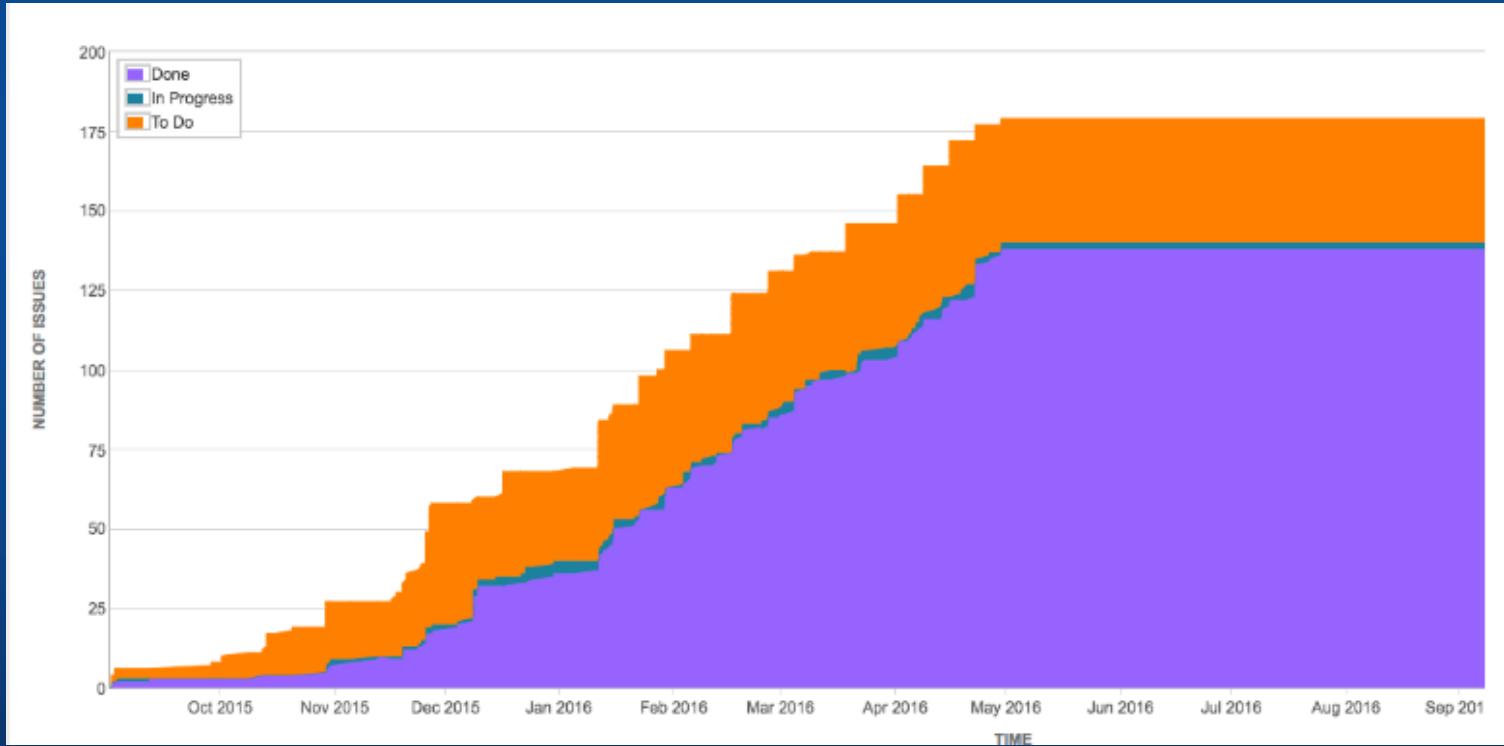
# Other reports in Jira

## Sprint Report

- \* Lists issues completed in a sprint
- \* Good information for discussion during sprint retrospective.
- \* Further information

# Other reports in Jira

- \* Cumulative Flow Diagram –
  - \* Checks that rate of issue's being done is keeping up with rate of issue creation
  - \* Useful for Kanban projects + support tickets work-rate management.



- \* Further information

# Continuous Integration Tools

# Continuous Integration (CI)

- \* You can configure the gitlab server to perform CI
  - \* See <https://docs.gitlab.com/ee/ci/> for details
- \* CI can be used to continually run unit-tests on your application
  - \* And email you whenever one of them breaks
  - \* Tests are scheduled to run automatically whenever someone pushes code to the server
- \* Obviously you need to have first created a good suite of unit-tests for this to be effective

# Continuous Integration (CI)

- \* Continuous testing in CI is an effective way to stop bugs you've fixed once from ever coming back
- \* Vital when many people are contributing towards a project collaboratively
  - \* Many ways for people to break things!

# Continuous Integration (CI)

- \* CI can also be used for “continuous deployment” (CD)
  - \* Live website automatically updates itself when you push code to gitlab
  - \* Can configure the specifics
    - \* e.g. it only goes to a team of testers’ version of the website first!
- \* Also, Continuous security
  - \* Emails you whenever one of your software tools is out of date, and therefore vulnerable

# Summary of Lecture

- \* Gantt Chart, Project Compression, and Resource Levelling
- \* Keeping your project on track in Agile
  - \* Stand-up meetings
  - \* Viewing burndown charts
  - \* Producing a project Roadmap, Epics and Versions
  - \* Continuous Integration tools

- \* Lecture quizzes:
  - \* **Critical-path analysis I**
  - \* **Keeping the project on Track**

# CE29x Team-Project Challenge

## Risk Management

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Michael Fairbank, Keith Primrose and Adaptavist

Partly based on material from: Frode L. Ødegård, Ødegård Labs Inc.

# Definition

## Risk Management:

“Is a formal process in which risk factors are systematically identified, assessed, and mitigated.”

# What is a risk?

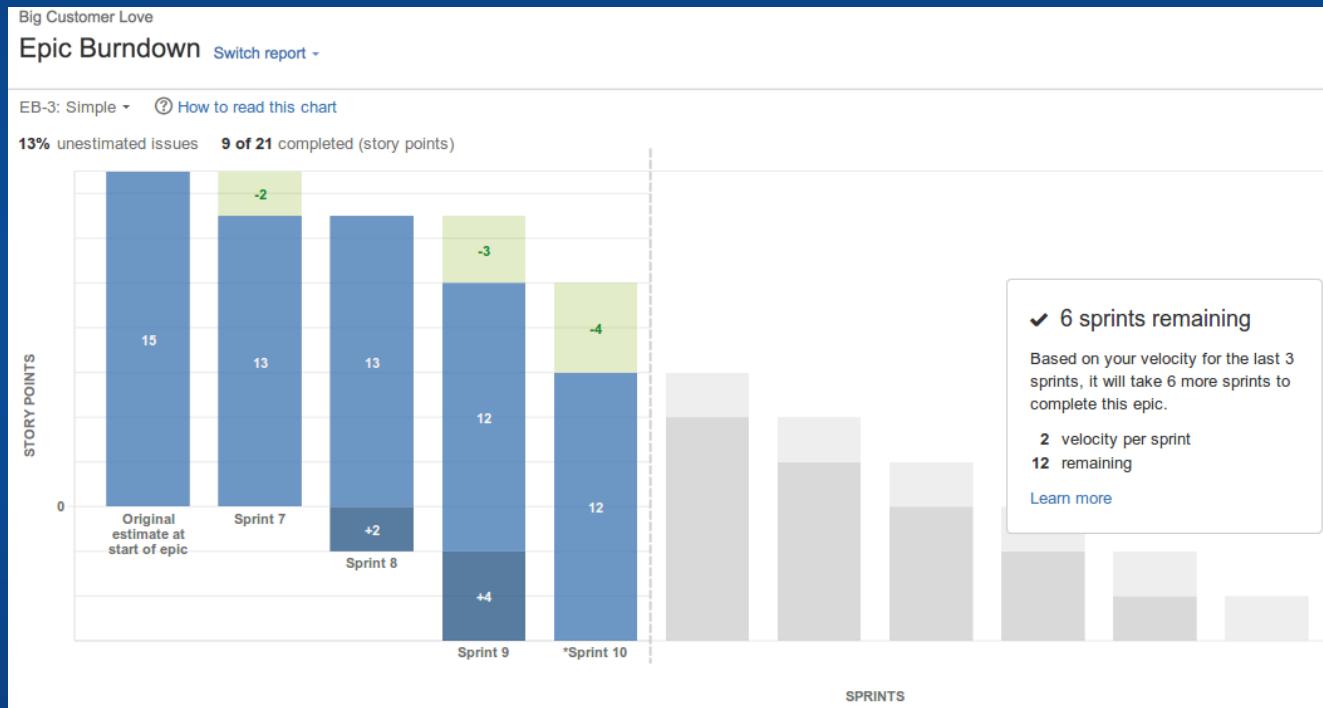
Risk: An uncertain event or set of events that if they were to occur, would have either a positive or negative impact on the project.

- Threats
- Opportunities

Q: Can you give examples of each of the above?

# What Risks affect your group project?

# What risks are associated with this diagram?



# Why do projects go wrong - I?

Process reasons:

- \* Inadequate understanding of customer needs
- \* Poor requirements documents / management
- \* Poor or no architecture/design
- \* Build first and ask questions later
- \* Poorly understood legacy design/components
- \* No peer reviews to catch problems early
- \* **Ineffective testing - misses serious defects** (e.g. caused by  
Programmers vouching for their own work quality)

# Why do projects go wrong - 2?

Product / Resource reasons:

- \* Resource constraints / inadequate funding
- \* Inexperienced or incapable personnel
- \* Lack of domain expertise
- \* Complex design
- \* Poorly defined interfaces
- \* Lack of appropriate tools

# Why do projects go wrong - 3?

## External risks:

- \* TalkTalk customer database hacked in 2015
  - \* 157000 customer records lost, including passwords, email address, possibly more
  - \* TalkTalk received record fine £400,000 at the time
- \* Regulations change – e.g. GDPR, Brexit
- \* Denial of Service attacks are common
- \* Patent trolls attack your new startup

# Anatomy of a risk

- \* Once a risk is identified, you need to consider:
  - \* Probability of the occurrence of the risk
  - \* The consequences - i.e. the size of the loss

# Risk Exposure: Quantification

Risk Exposure = Probability x Consequence

# Calculating Risk Exposure

Factor	Probability	Cost	Risk Exposure
Late delivery from vendor	0.25	28 days	7 days
Integration delay	0.6	15 days	9 days
Additional component testing needed, as there are 5% more components than first estimated	0.9	20 days	18 days
Test team report they may have to delay their work by 1 month	0.5	30 days	15 days
Total Risk Exposure	?	?	?

NB – You can't simply add these together, it depends on any relationships / dependencies between them

E.g. Additional component testing would be linked to the risk of requiring extra components that need developing.

# Why quantify risk

- \* Allows solution ideas to be evaluated more critically
- \* Allows feedback on impact of risks we anticipated
- \* Allows us to allocate resources to deal with risks
- \* Allows us to determine whether a risk is acceptable

# Recording a risk into Jira

Create risk issue like any normal issue.

Give it a:  
Summary  
Description  
Likelihood and  
Impact

The screenshot shows a Jira issue creation interface for a 'Risk' type issue. The 'Issue Type' is set to 'Risk'. The 'Summary' field contains the text: 'Rollout of new operating system could cause existing code to break'. The 'Description' field has two sections of text: 'The company is scheduled to install windows 11 to all client machines in February.' and 'This might break the current code which was only written and tested for windows 10.' Below the description is a rich text editor toolbar with various styling options. At the bottom of the form, there are dropdown menus for 'Likelihood' (set to 'Likely') and 'Impact' (set to 'Major').

Issue Type \* Risk

Summary \* Rollout of new operating system could cause existing code to break

Description

The company is scheduled to install windows 11 to all client machines in February.  
This might break the current code which was only written and tested for windows 10.

Likelihood Likely

Impact Major

# Recording a risk into Jira

The screenshot shows a Jira interface for creating a new issue of type 'Risk'. The 'Issue Type' field is set to 'Risk'. The 'Summary' field contains the text: 'Rollout of new operating system could cause existing code to break'. The 'Description' field contains the following text:  
The company is scheduled to install windows 11 to all client machines in February.  
This might break the current code which was only written and tested for windows 10.

Two dropdown menus are open on the left side of the screen:

- Likelihood:** Options include None, Rare, Unlikely, Possible, Likely, and Certain. The 'None' option is selected.
- Impact:** Options include None, Insignificant, Minor, Moderate, Major, and Catastrophic. The 'None' option is selected.

Red arrows point from the 'Likelihood' and 'Impact' dropdowns on the left to their respective 'Likelihood' and 'Impact' fields in the main form area. The 'Likelihood' field has 'Likely' selected, and the 'Impact' field has 'Major' selected.

$\text{Risk exposure} = \text{Likelihood} \times \text{Impact}$

# Recording a risk into Jira

Summary*	Rollout of new operating system could cause existing code to break	
Description	<p>Style <b>B</b> <i>I</i> <u>U</u> <u>A</u> <sup>A<sup>o</sup></sup> <sub>A<sub>o</sub></sub> </p> <p>The company is scheduled to install windows 11 to all client machines in February. This might break the current code which was only written and tested for windows 10.</p>	

Risk exposure = Likelihood × Impact

For this particular risk, how might we lower the exposure?

To lower the likelihood?

To lower the Impact?

NB – Prevention of the risk also costs resources

# Recording a risk into Jira

The screenshot shows a Jira risk recording interface. In the 'Summary' field, the text 'Rollout of new operating system could cause existing code to break' is entered. In the 'Description' field, there is a rich text editor toolbar above two paragraphs of text. The first paragraph states: 'The company is scheduled to install windows 11 to all client machines in February.' The second paragraph adds: 'This might break the current code which was only written and tested for windows 10.'

Risk exposure=Likelihood×Impact

- \* Add comments / enhance description to describe progress on resolving the risk.
- \* Leave risk in backlog until risk is resolved.
- \* When the exposure is zero, the risk can be moved to Done.
- \* For some risks, total resolution never happen until project is completed.

# Risk Matrix

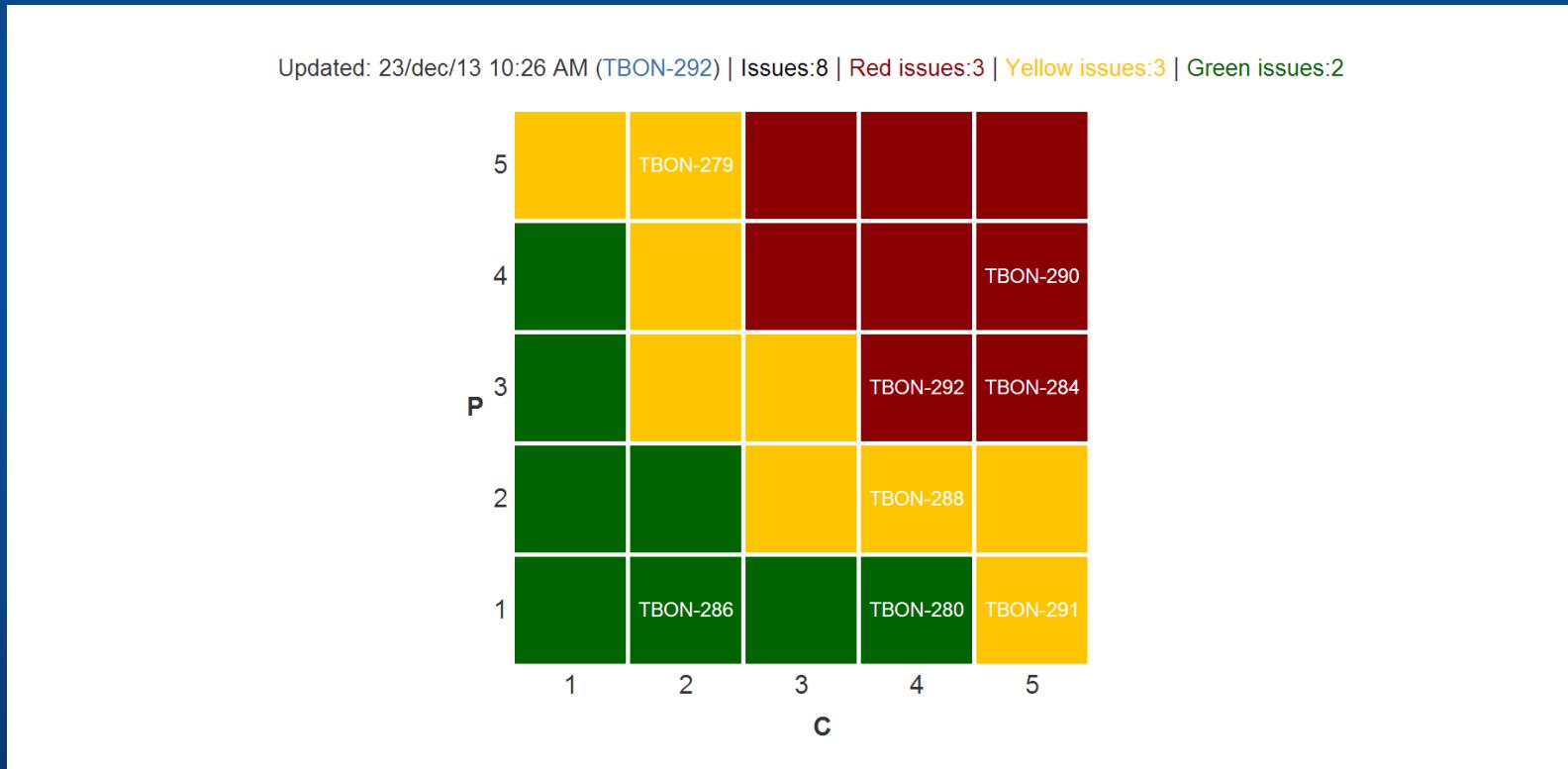
	Impact				
Likelihood	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	Lowest	Low	Medium	Medium	High
Unlikely	Low	Medium	Medium	High	High
Possible	Medium	Medium	High	High	Highest
Likely	Medium	High	High	Highest	Highest
Certain	High	High	Highest	Highest	Highest

\* The qualitative exposure of a particular risk can be viewed on this matrix.

Q: According to this matrix, what is the exposure of a risk with “Likelihood: Possible” and “Impact: Major”?

# Recording a risk into Jira

Some plugins (paid for) give an overview of all current outstanding risks:



Q: Which Issue has the highest exposure here?

# Formal Risk Management

# Formal Risk Management

- \* **PRINCE2** (PRojects IN Controlled Environments) is a project management methodology which includes standards for best practice in project management topics, including risk.



# Formal Risk Management

- \* The UK Government's Central Computer & Telecommunications Agency (CCTA) promoted a number of mandatory methodologies such as PROMPT, PRINCE and CRAMM.
- \* CRAMM stands for the CCTA Risk Assessment Management Method.
- \* The CCTA was part of the Office of Government Commerce, now closed. Is there any current UK Government oversight?

# The risk management process

1. Risk identification
  - \* Identify project, product and business risks
2. Risk analysis
  - \* Assess the likelihood and consequences of these risks
3. Risk planning
  - \* Draw up plans to avoid or minimise the effects
4. Risk monitoring
  - \* Monitor the risks throughout the project
  - \* Communicate status to stakeholders
5. Resolution
  - \* Implement the contingency plans

# Risk management process



# I. Risk identification

- \* Technology risks
- \* People risks
- \* Organisational risks
- \* Requirements risks
- \* Estimation risks

Q: Suggest some examples of each of these  
(e.g. for your CE29x group project)

# Identification: Communication

Notify all affected stakeholders:



- \* Customers
- \* Project / Program Manager
- \* Team Members
- \* Management
- \* Marketing
- \* Sales
- \* Customer Support
- \* Finance
- \* Quality Assurance
- \* ...

# Identification: Documentation

Each risk you identify can require documenting separately:

Header
Assessment
Action Plan
Tracking
Resolution

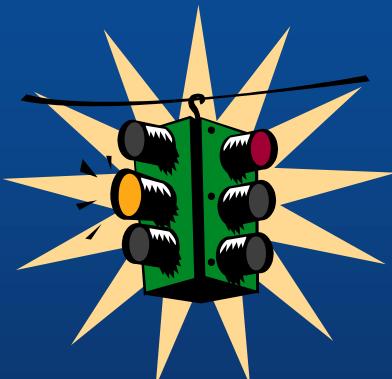
<b>Project</b>	<i>Name of project</i>
<b>Date</b>	<i>Date of entry</i>
<b>Risk name</b>	<i>Name of risk</i>
<b>Risk category</b>	<i>Type of risk</i>
<b>Probability</b>	<i>Likelihood of occurrence</i>
<b>Consequence</b>	<i>Severity of impact</i>
<b>Originator</b>	<i>Who reported this risk</i>
<b>Phase/activity</b>	<i>Where in process</i>
<b>WBS Element</b>	<i>WBS relationship</i>

NB: This is repeated for every identified risk

Adapted from *Managing Risk: Methods for Systems Development* by Elaine M. Hall, Addison-Wesley 1998

## 2. Risk analysis

- \* Assess seriousness of each risk from previous Risk Exposure calculation
- \* Risk effects might be catastrophic, serious, tolerable or insignificant
- \* Some organisations use a traffic light coding:



Red:	Major risk – must be addressed
Amber:	Minor risk – should be addressed
Green:	Negligible risk – fix if time allows

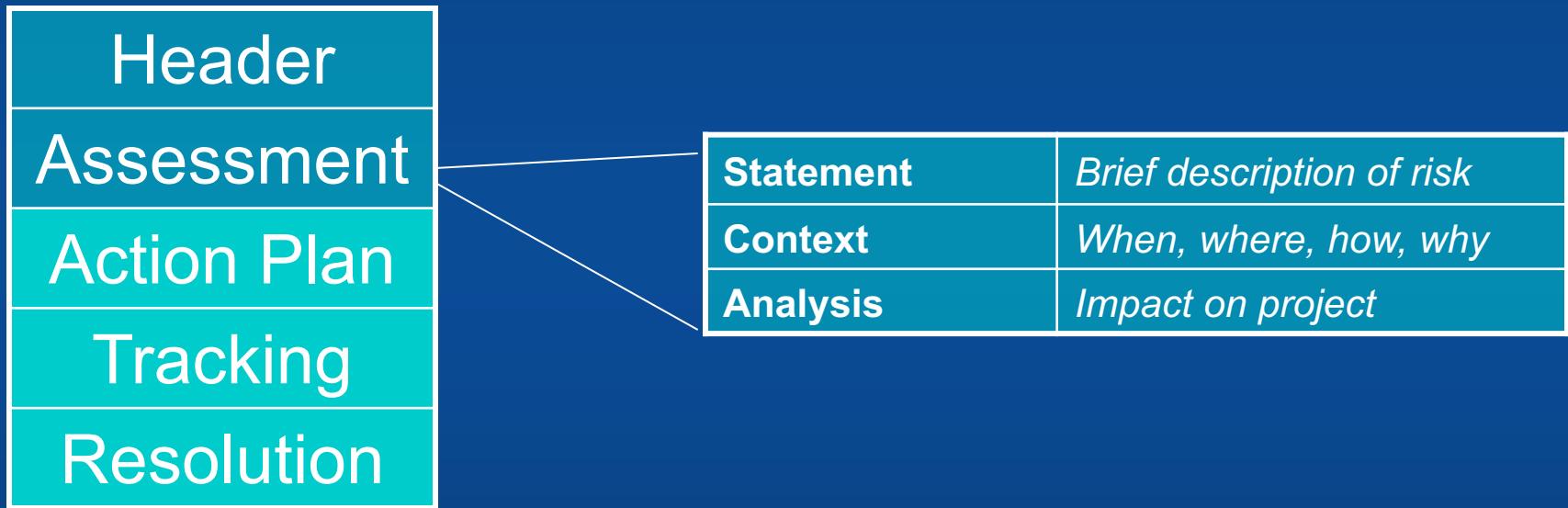
# Analysis of risks: Questions

- \* How severe is the consequence?
- \* How likely is the occurrence?
- \* Is the risk exposure acceptable?
- \* How soon must the risk be dealt with?
- \* What is causing the risk?
- \* Are there similarities between risks?
- \* Are there dependency relationships?

# Analysis of risks: Activities

- \* Grouping
  - \* Eliminate redundant risks
  - \* Combine related risks
  - \* Link dependent risks
- \* Determining risk drivers
  - \* Underlying factors that affect severity of consequence
  - \* May affect estimation of probability, consequence, risk exposure
  - \* Increases understanding of how risks can be mitigated
- \* Ranking
  - \* Order of likelihood, consequence, exposure, time frame
- \* Determining root causes (sources of risk)
  - \* Old-fashioned root cause analysis
    - \* What events are capable of causing the risk to occur?
  - \* Identify common root causes

# Analysis: Documentation



Adapted from *Managing Risk: Methods for Software Systems Development* by Elaine M. Hall, Addison-Wesley 1998

# Snapshot from a Risk Management database (kindly given by Capita)

Risk Reference	Date Raised	Risk title	Risk Description & Impact	Next Review Date	Risk Probability	Risk Impact	Gross Risk Rating	Risk response	Mitigating actions including dates	Risk Status	Date closed
Cdiv R403	06/08/2015	Code Management	Risk that code is not retrofitted for every release (all development teams), Impact would be that the code being tested would not be on latest code release and therefore causes regression meaning additional time & cost.	29 May 16	3	3	9	Avoid	17/08 - review with development teams & publish delivery schedule 06/10 - Approach for code management distributed, awaiting agreement risk now mitigated by new code approach. 9/11: GY to review with suppliers 14/12 - AE to chase RB for governance proposal 15/02: Continue to monitor bundles from suppliers 04/04: Continue to Monitor	Open	
Cdiv R417	07/10/2015	Infrastructure	there is a risk that the rollout of windows 7 laptops to the programme team results in a delay to development and testing which could lead to increasing costs and timelines	29 May 16	3	4	12	Accept	07/10 - in the event that first recipients cannot access required systems, we will request delay to programme rollout 19/10: users will be keeping their existing laptops therefore reducing impact of down time 9/11: new laptops for majority of team not expected until 2016 18/01: Continue to monitor 04/04: Further laptops being rolled out to the team over the next 2 weeks, monitor impact 18/04: Risk reduced 05/05: Continue to monitor	Open	
Cdiv R418	16/10/2015	Test Environments	There is a risk that we are unable to refresh the contract engine test databases in preparation for Policy Enquiry UAT which could increase the number of queries being raised through testing due to out of date data.	-	3	3	9	Avoid	Life - Activities in place to provide connectivity to test environment DB2T which is currently not being used by any other projects. IBM - Establishing point of contact for the refreshing of the 01AM environment. Also liaising with Bristol CDC team to understand impact to inflight and plan projects. 19/10: work under way to establish connectivity to DB2T target date for completion 23rd Oct. Trying to establish point of contact to refresh IBM environments 9/11: process now in place for refresh of IBM databases and DB2T environment created and tested. Close.	Closed	09/11/2015
Cdiv R419	19/10/2015	Resources	There is a risk that the decision to send onshore developers offshore will result in increased defects and extend timeline and cost of project	-	3	4	12	Reduce	19/10: to implement regular communication checkpoints and review of defect levels 23/11 - not seeing any impact following this decision, continue to monitor 14/12 - No issues since developers moved offshore, close	Closed	14/01/2016
Cdiv R438	02/02/2016	Manage Customer Details Timeline	There is a risk that the level of outstanding consolidated view defects will impact delivery timeline for Manage Customer Details resulting in increased costs and reduced benefits		3	3	9	Avoid	02/02: AE to look at financial impact of retaining resource to assist defect fixing 15/02: Consolidated view targeted for production this week, close upon implementation 29/02: Close	Closed	29/02/2016

## Risk Description & Impact

Risk that code is not retrofitted for every release (all development teams), Impact would be that the code being tested would not be on latest code release and therefore causes regression meaning additional time & cost.

there is a risk that the rollout of windows 7 laptops to the programme team results in a delay to development and testing which could lead to increasing costs and timelines

There is a risk that we are unable to refresh the contract engine test databases in preparation for Policy Enquiry UAT which could increase the number of queries being raised through testing due to out of date data.

There is a risk that the decision to send onshore developers offshore will result in increased defects and extend timeline and cost of project

There is a risk that the level of outstanding consolidated view defects will impact delivery timeline for Manage Customer Details resulting in increased costs and reduced benefits

\* So why do Capita bother keeping this log?

# 3. Risk planning

- \* Consider each risk and develop a strategy to manage that risk
- \* Avoidance strategies
  - \* The probability that the risk will arise is reduced
- \* Minimisation strategies
  - \* The impact of the risk on the project or product will be reduced
- \* Contingency plans
  - \* If the risk arises, contingency plans are plans to deal with that risk

# Planning: Resolution Strategies

- \* Risk Avoidance
  - \* Prevent the risk from occurring, reduce probability to zero
- \* Risk Protection
  - \* Reduce the probability and/or consequence of the risk before it happens
- \* Risk Reduction
  - \* Reduce the probability and/or consequence of the risk after it happens
- \* Risk Research
  - \* Obtain more information to eliminate or reduce uncertainty
- \* Risk Reserves
  - \* Use previously allocated schedule or budget slack
- \* Risk Transfer
  - \* Rearrange things to shift risk elsewhere (to another group, for example)

Q: Is this last strategy an acceptable practice?

# Planning: Activities

- \* Specify scenarios
  - \* How would we be able to tell it is really happening?
- \* Define quantified threshold for early warning
  - \* What to monitor, when we consider the risk to be happening
- \* Select resolution approach
  - \* What has the best Return on Investment?
- \* Specify risk action plan
  - \* Document decisions

# 4. Risk Monitoring / Tracking

- \* Monitor risk scenarios
  - \* Watch for signs of a risk scenario occurring
- \* Compare indicators to trigger conditions
  - \* Watch indicator metrics – do they meet trigger conditions?  
(E.g. triggers whenever we get more than 2 days behind schedule on the Gantt chart)
- \* Notify stakeholders
  - \* Let stakeholders know the risk is happening; execute action plan
- \* Collect statistics
  - \* Useful for next project you manage
  - \* Update a risk database (these list what has gone wrong in previous IT projects; e.g. see “PERIL database”)

# Planning/Tracking: Documentation



Adapted from *Managing Risk: Methods for Software Systems Development* by Elaine M. Hall, Addison-Wesley 1998

# 5. Resolution

- \* Execute action plan
  - \* Improvise, adapt, overcome
- \* Provide continuous updates
  - \* Let stakeholders know your progress in resolving the risk
- \* Collect statistics
  - \* Update risk database with solution

# Resolution: Documentation

Header
Assessment
Action Plan
Tracking
Resolution

Design Engineer	<i>Signature</i>
Quality Engineer	<i>Signature</i>
Project Manager	<i>Signature</i>
Marketing Manager	<i>Signature</i>

Adapted from *Managing Risk: Methods for Software Systems Development* by Elaine M. Hall, Addison-Wesley 1998

# 6. Learning from risks

- \* Post mortem:
  - \* What were the unanticipated risks?
  - \* What was the actual severity of consequence?
  - \* What resolution strategies worked well / not so well?
  - \* What types of risks could we
    - \* prevent or transfer?
    - \* protect ourselves from or reduce?
    - \* handle only by allocating reserves?
- \* Action:
  - \* What are the preventative measures we can take in the future?
  - \* Are there significant vendor / partner performance problems?
  - \* What can we share with other project teams?

# PRINCE2 Risk Log

\* Try to complete the PRINCE2 Risk Log for the following risks that might affect your group project:

1. Underestimation of task durations, causing late delivery
2. People risk: 2 team members are sick / refuse to turn up in the final 2 weeks of delivery.
3. Technology risk: Any of your choice, e.g. cseegit server fails
4. A requirements risk: Your user-requirements do not pin down the exact requirements, and the customer refuses to accept your final product.

# Summary

- \* Risks to project exist and can be disruptive
- \* Formal methods exists for assessing, documenting and mitigating these risks.
- \* As a project manager or team member, you should be aware of these methods and issues

# Further Reading

- \* PRINCE2:

- \* Risk Log Template document on Moodle
  - \* PRINCE2 course on Moodle (LinkedIn Learning)

- \* Fundamentals of Project Management : Managing Risk in Projects, by D. Hillson and D. Dalcher

# Further Reading

- \* Quiz: Risk Management – just 5 simple questions
- \* Quiz: Critical Path Analysis 2 – slightly harder
- \* Next lecture: Communications followed by a guest presenter giving you their insight into project management in their company

# CE29x Team-Project Challenge

## Communication in Projects

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose, Iain Langdon, and Michael Fairbank

# Team attendance

CE291				
Team	Number of members	Attendance events	Maximum possible	Percentage
1	6	14	18	78
2	7	14	21	67
3	7	17	21	81
4	7	8	21	38
5	8	10	24	42
6	8	17	24	71
7	7	12	21	57
8	7	14	21	67
9	7	7	21	33
10	7	15	21	71
11	7	12	21	57
12	8	8	24	33
14	7	18	21	86
15	7	8	21	38
16	7	9	21	43
18	7	19	21	90
19	8	4	24	17
20	8	4	24	17
22	7	18	21	86
23	8	12	24	50
24	7	12	21	57
25	6	6	18	33
26	7	16	21	76
27	7	10	21	48
28	6	10	18	56
29	7	9	21	43
30	7	1	21	5
31	6	17	18	94
32	7	14	21	67
33	7	6	21	29
34	7	13	21	62
			55	Average

CE292				
Team	Number of members	Attendance events	Maximum possible	Percentage
1	6	10	18	56
2	6	4	18	22
3	6	7	18	39
4	5	7	15	47
5	5	1	15	7
			34	Average

CE293				
Team	Number of members	Attendance events	Maximum possible	Percentage
1	7	10	21	48
2	6	6	18	33
3	7	2	21	10
4	7	3	21	14
			26	Average

CE299				
Team	Number of members	Attendance events	Maximum possible	Percentage
1	6	8	18	44
2	6	8	18	44
3	7	14	21	67
4	7	11	21	52
5	7	8	21	38
6	7	14	21	67
7	7	8	21	38
8	5	8	15	53
			51	Average

# Review of previous lecture

- I. Keep on top of Risk in project
  - \* What are you actively doing to lower the risk exposure?
  - \* Who is responsible for tracking and mitigating this risk?
  - \* (Who are your risk issues in Jira assigned to?)
2. Keep good communication with stakeholders (“stakeholder management”)
  - \* Are all stakeholders supportive of project?
  - \* Are all stakeholders up-to date with project progress?
3. Flexible Leadership style
  - \* Different team-members are motivated by different things.
  - \* How to get the best out of each person?

# Project Stakeholders

- \* Project Stakeholders
  - \* ...Anyone with any kind of “stake” in the project
  - \* Individuals and organisations who are actively involved
  - \* Or whose interests may be positively or negatively affected as a result of project execution or successful completion
- \* **Project management team** must identify the stakeholders
  - \* Determine what their needs and expectations are,
  - \* Keep them engaged in project success
  - \* Manage and influence those expectations to ensure a successful project

# Key Stakeholders

- \* Performing organisation
  - \* The enterprise whose employees are most directly involved in doing the work of the project
- \* Project manager
  - \* The individual responsible for managing the project
- \* Customer
  - \* The individual or the organisation who will use the project product
- \* Project team members
  - \* The people doing the work on the project who are working to realise the product
- \* Sponsor
  - \* The individual or group who provides the financial resources, in cash or in kind, for the project.

# Question

- \* So if you were building a major piece of software suite for the NHS, who might the stakeholders be?

# Stakeholder Management

- \* Beware of the situation where a stakeholder might give verbal assurances of enthusiasm for project,
  - \* but in more honest discussions admits low motivation,
  - \* and a low belief in project success
- \* Keeping stakeholders updated and on-side, with good communication skills, is essential for project's success

# COMMUNICATION IN PROJECTS

# Lecture Outline

- \* Communication
  - \* Purposes for Communication
  - \* Digital Communication
    - \* Professional Email Etiquette
  - \* Communication within Projects
    - \* When communication goes wrong
    - \* Change Management

# Purposes for Communication

# Purposes for communication

- \* Think about the PURPOSE or your communication
  - \* This can help you communicate more effectively
- \* Also think about WHO you are communicating to
  - \* And what is the context

# Purposes for communication

- \* Three W's of communication ...

What            *am I going to say ?*

Why            *am I trying to say it ?*

How            *can I best say it ?*

The answers interact with each other!

# Purposes for communication

- \* Some kind of persuasion is the purpose
  - \* Informing – giving information that is believed
  - \* Influencing – affecting a decision
  - \* Responding – establishing reputation, as in exams
  - \* Entertaining – keeping people absorbed
  - \* Warning – about danger
- \* Sometimes categories are combined - an *entertaining* article that is designed to *influence* your view on topic X.

# Purposes for communication

- \* How do we measure success in communicating ?
- \* Ask yourself:
  - \* “Have I got my message across?”
  - \* or persuaded you of its value or rightness?
  - \* or influenced your subsequent decisions?
  - \* or convinced you of my worth, reputation or skill ?
  - \* “Have I stayed relevant without unnecessary digression ?”

# SOCIAL CONTEXT OF COMMUNICATION

- \* Communication requires ...
  - \* originator - to create the communication
  - \* recipient - to understand the communication
  - \* suitable language - mutually understood
  - \* choice of mode ( mechanistic & social ) - to suit originator and recipient
  - \* willingness to modify, explain or interpret - to suit the recipient
- \* The focus of originators is ...
  - \* commonly inward, on themselves and their own context
  - \* better when it includes the likely context, and needs, of the recipients

# SOCIAL CONTEXT OF COMMUNICATION

## - it takes two (at least)



- \* think about your intended audience and their likely interpretation
- \* You should change your communication style, depending on your target audience.

# Language

- \* Communication requires some form of language
- \* Language is a set of signs and rules, mutually understood
  - \* spoken signs use sounds, written signs use ink, gesture signs use body
  - \* computer protocols are also languages - e.g. http or Ethernet
  - \* key issue is the requirement for mutual understanding

# Language (2)

- \* Language has many different modes
  - \* Mechanistic modes - spoken, written, gesture, etc.
  - \* Social modes - formal, slang, colloquial, technical, etc.
- \* Choice of mode tends to restrict subject matter and bias the expression,
  - \* which might ( deliberately ? ) include or exclude a particular audience
- \* Translating between modes can be difficult
  - \* Potential for confusion

## Language (3)

- \* Try searching LinkedIn Learning for Technical Writing courses. I have put some in Moodle.

# Digital Electronic Communications

# Digital Electronic Communications

- \* Digital Electronic Communications
  - \* Email and SMS (I-I communication)
  - \* Social media (Many-to-many communication)



- \* Dramatic increases in speed
  - \* has benefits
  - \* and disadvantages

# Digital Electronic Communications

Points for caution:

## I. Speed:

- \* You need to get it right because fewer people check your work
  - \* Hastily written email can't be revoked once you've clicked "send"
- \* Need to develop skills that were previously taken for granted
- \* Consider the number of people who publish Tweets and then want to hastily remove them
  - \* PR disasters to themselves or their companies
  - \* Great British Bake Off: Prue Leith accidentally reveals winner

# Digital Electronic Communications

Points for caution:

2. Disintermediation, i.e.:

- \* New technology removes layers of people between author and audience
- \* Intermediate stages, where correctness was evaluated, are vanishing
  - \* Quite likely you can email the CEO of your company directly
  - \* Lowly ranked staff can email “all-staff”
    - \* Or become anonymous whistle-blower

# Professional Email Etiquette

# Using Email effectively

- \* When you send an email, you want it to contain all the information the recipient needs
  - \* Otherwise it is likely to generate questions in return (i.e. create more emails and more work for both of you)...
- \* Proof read, and think twice before you click Send
- \* Try to get basic grammar + spelling right...
  - \* and look professional

# Using Email effectively

- \* You can use the McGhee Productivity Solutions (MPS) e-mail P.A.S.S. model to help compose your messages:
  - \* P — What is the purpose of this communication, and does the purpose relate to an objective?
  - \* A — What action is required; is there a due date; and who owns the action?
  - \* S — What supporting documentation does the recipient need?
  - \* S — Does the subject line effectively summarize the message?
- \* Think carefully about whether to use the To / CC / BCC fields
- \* More details are given in "CE29x hints for good e-mail communication"  
26

# Communication within Projects

# Communications Leadership

- \* To make a project run smoothly, need good communication.
  - \* Keep all parties informed
  - \* Try to avoid misunderstandings
- \* Some teams struggle in CE29x projects because of communication break-down

# Communications Leadership

“Stakeholder Management”

- \* Keep the stakeholders informed, of:
  - \* Project progress
  - \* Project Solution
  - \* Show them the complete “roadmap”, and ways of accommodating change along the way
- \* Include people from the Business / Organisational entities into the solution process; help them to own the solution
- \* How often are you to meet and update the various stakeholders?

# Project Communication methods

- \* Different approaches:
  - \* Meetings (i.e.  $\geq 2$  people)
  - \* Inter-personal relationships (i.e. 1 to 1)
  - \* Notes, memos, messages etc.
- \* The difficulty is to define and maintain the right level of communication for everyone
  - \* don't overwhelm people.
    - \* Let them get on with their jobs
    - \* And don't undersupply the required detail either!

# Project Communication methods

Intangible aspects of communication styles are important:

- \* The environment of the project, management styles and ownership are all just as crucial to success:
  - \* Trust / respect
  - \* Purpose – why we're doing what we do
  - \* Hands on / hands off management
  - \* Teams & roles

# Successful communication

A good communications strategy will hopefully have led to:

- \* The project's problem domain being well understood
- \* The project's goals (and their value) being clearly defined, communicated, and agreed upon
- \* All stakeholders understand all constraints of the proposed solution
- \* Partnerships and cooperation exists between all parties
- \* All parties maintain their commitment to the project & its success

# Communication plan

- \* A communication plan describes how the project team will communicate:
  - \* between themselves
  - \* with Project Sponsor
  - \* with Stakeholders

# Communication plan

- \* Communication plan defines:
  - \* Location of information repository (GitLab, intranet, SharePoint, Moodle, Jira, ...)
  - \* Timings of meetings
  - \* Contact information
- \* You want communication to be appropriately directed
  - \* All relevant people notified

# Communication plan

- \* In our group project, we have:
  - \* Scrum Master
    - \* Important role in getting team to learn from mistakes (sprint retrospective)
    - \* Buy in to delivering next sprint on time
  - \* Jira issues to comment on
    - \* Issues are “assigned to” people
  - \* Code commenting

# Communication plan

- \* Provide ‘templates’ for regular types of communication
- \* Use appropriate technology to communicate
  - \* Jira helps us with this:
    - \* Bug reports
    - \* Risk Reports
    - \* User Stories

# Communication plan

- \* Create a Glossary of Terms to establish common vocabulary throughout the business
- \* Define “Success” for the project before engaging
- \* Identify all potential stakeholders and solicit their involvement, including organisational stakeholders, not just the end users

# Communication plan

- \* Communication Plan might specify how information flows:
  - E.g. tester X, you pass bug requests to developer Y. No need to involve the users.
  - E.g. All communications with the client should go via the sales person / project manager
  - E.g. Client should be involved in fortnightly scrum meetings

# When communication goes wrong

# Consider these situations:

- I. WHAT IF? The real problem that the project is designed to address *remains hidden* from the stakeholders, or is more complex than they realise, and / or is changing?
2. WHAT IF? There is no consensus on vision and constraints? There are different perceptions and definitions of problem / solution domains

# Consider these situations:

3. WHAT IF? There is no understanding of the needs or interests of other parties?
  - \* Resulting in power struggles for control and / or abandonment of project ownership / responsibility
4. WHAT IF? Problem analysis replaces one problem with another

Crucial that people know where they are going and why – good communication is core to achieving this.

# Some Causes of a failed Communication Strategy

- \* Focusing on technology and not focusing on the causes of a business problem
- \* Lack of clarity of the business problem, attempting to solve a moving target
- \* Different vocabulary and communication styles
- \* Limited project methodology / process
- \* Skills predominantly ‘hard’ – e.g. technology, not ‘soft’ – e.g. listening and questioning
- \* Friction within organisation and between departments

Q: What is meant by vocabulary in this context?

# Change Management

Helping users and stakeholders embrace change

# Soft issues

- \* When the new IT system goes live, users might have their workflows changed.
  - \* This needs communicating effectively.
- \* Changes to processes are not always welcomed by users.
  - \* Organisational structures may need changing
  - \* Job descriptions often change
  - \* Old ways will be defended
  - \* Training will be required
- \* Taking a caring and considerate approach to telling the affected people how their lives will be affected by this project

# Soft issues

- \* Helping Stakeholders and Organisational staff embrace change is called “Change Management”
- \* “Change management” is a career in itself
  - \* See “Change Management Foundations”, A LinkedIn Learning course on Moodle.

# Users may show Different attitudes towards individual role

- \* The key is to take appropriate action:
  - \* Involve the willing / able
  - \* Avoid overreacting to the unwilling / unable
  - \* Find ways to coach the unable and sell to the unwilling.

	Low Willingness	High
Low Ability	They say: “Could be” Your goal: <b>SELL</b>	They say: “Can I?” Your goal: <b>DELEGATE</b>
High	They say: “Not Interested” Your goal: <b>TELL</b>	They say: “Want to be” Your goal: <b>COACH</b>

# Further Study

- \* Quiz on Communication
- \* Quiz on Critical Path Analysis 3
  
- \* Suggested LinkedIn Learning courses
- \* Next Presentations (Week 7) will cover Organisations and Ethics.

# CE29x Team-Project Challenge

## Ethics

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose and Mike Fairbank

# Topics for Today

1. Ethics – Definitions
2. Issues affecting CSEE professionals
3. Themes and Morality
4. Ethical Frameworks
  - \* Important Distinctions
5. Professional Codes of Conduct
6. The Free Software Foundation's view of Ethical Computing

# Acknowledgments

\* Some of these slides are based on those that accompany one or other of the following books:

1. "A Gift of Fire: Social, Legal, and Ethical Issues for Computers and the Internet, 2ed" (Baase 2003) (Baase & Clark 2003)
2. "Ethics & Technology: Ethical Issues in an Age of Information and Communication Technology" (Tavani 2004); chapters 1+2

# I. Ethics – Definitions and Examples for our profession

# Ethics - Definitions

## \* Ethics:

\* “is the philosophical study of morality, a rational examination into people’s moral beliefs and behaviour”

(Quinn 2004, p48)

\* “Principles of right or good conduct, or a body of such principles, that affect good and bad business practises.”

(NCN Ltd. cited on Google define)

# Professional Ethics

- \* Professional Ethics exist in
  - \* Medical,
  - \* Legal,
  - \* Accounting,
  - \* Engineering,
  - \* Computing,
  - \* ...and other professional fields.

# “Cyber-ethics”

- \* Cyber-Ethics (Tavani, 2004):
  - \* Ethics relating to cyber-technology
  - \* Cyber-technology: all types of computing/communication devices
- \* Other literature refers to cyber-ethics as
  - \* “Computer Ethics”
  - \* “Information Ethics”

## 2. Issues affecting CSEE professionals

# Issues affecting CSEE professionals

- \* The technologies of CSEE are becoming ubiquitous
- \* They have a major impact
  - \* Positive on some aspects of society
  - \* Also negative on some aspects
- \* New scenarios arise which have never risen before
  - \* No existing policy exists for them (“policy vacuums”, Moor 1999)
- \* How should we / do we deal with this?

# Recent Technology trends that have ethical implications

As a technology user:

- \* Using Ad-block software – who should fund websites?
- \* Installing “free” apps that secretly sell your data
  - \* Or creating them?
- \* Using free / proprietary software
- \* Signing up to 17-page licence agreements, without reading first
- \* Downloading music and films illegally

# Examples that could affect us

As a CSEE professional:

- \* Code reuse of other people's work
- \* Building on open source, while honouring their licences
- \* Making Licence agreements
- \* Delivering quality – meeting or exceeding customer's expectations. Satisfying the requirements and deliverables.
- \* Security of your clients' data

# Examples that could affect us

- \* Generating technology lock-in. Closed vs. open standards.
  - \* Microsoft's controversial Embrace and extend policy to web browsers
  - \* Inability of Open Office to properly display .docx files

# Examples that could affect us

- \* Do you allow your clients to take the source code you've written for them to another developer afterwards to add new features / fix bugs?
  - \* Or do you force them into a situation where you are the only company they can hire to do software maintenance (including fixing the bugs you yourself left in there)?
  - \* Service agreement

# Recent Trends

- \* Creating software that puts people out of jobs
  - \* Automation
  - \* Self-driving taxis + lorries coming soon



# Recent Trends

- \* Or changes their working conditions
- \* E.g. the gig economy
  - \* Uber, Deliveroo, etc.
    - + Workers pick and choose their hours
    - + Workers are “self employed”
    - Boss is an app, not a human
    - Is it just disguised employment?
    - + Cheaper for end user
- \* Deliveroo riders strike for minimum wage

# Recent Trends

- \* Creating tech that is potentially dangerous
  - \* Self-driving cars
  - \* Defence industry
  - \* Cyber defence / offence
- \* IEEE Spectrum Article: Can you program ethics into a self-driving car?

# Examples that could affect us

- \* Implementing code with malicious content – at the instructions of your client.
- \* E.g. recent blog, “The code I’m still ashamed of”
  - \* Junior programmer receives SRS to code a website with a medical “questionnaire”
  - \* SRS states that website must always recommend owner’s pharmaceutical product (regardless of questionnaire’s answers)
  - \* Pharmaceutical product has fatal side-effects
  - \* Programmer concludes “*As developers, we are often one of the last lines of defence against potentially dangerous and unethical practices.*”
- \* Q. Is this worth losing your client (or job) over?
  - \* TAKE/SEE SURVEY

# 3. Themes and Morality

# Themes

- \* There are many things to consider
- \* Old Problems in a New Context
  - \* We look for solutions learned in older technologies and update them. (E.g. the government extending phone tapping laws to apply to email interception)
- \* Adapting to New Technology
  - \* New activities may require a new set of rules to follow.
- \* The Global Reach of Technology
  - \* Social behavior and laws vary from country to country. (E.U. imposes constraints on what US companies can/can't do; and vice-versa)
  - \* Cross-border use of social media to influence elections
- \* Trade-offs and Controversy
  - \* We need to consider both sides of an argument

# Themes

- \* Differences Between Personal Choices, Business Policies, and Law
  - \* Arguments for personal choice exist
  - \* or organizational policy
  - \* But these are not sufficient for enforcing decisions [laws] against others.
- \* We need a framework to discuss these issues in a rational way.
  - \* Some of the issues are legal and are handled within a given jurisdiction
  - \* All of them are moral issues

# What is Morality?

\* Morality can be defined as:

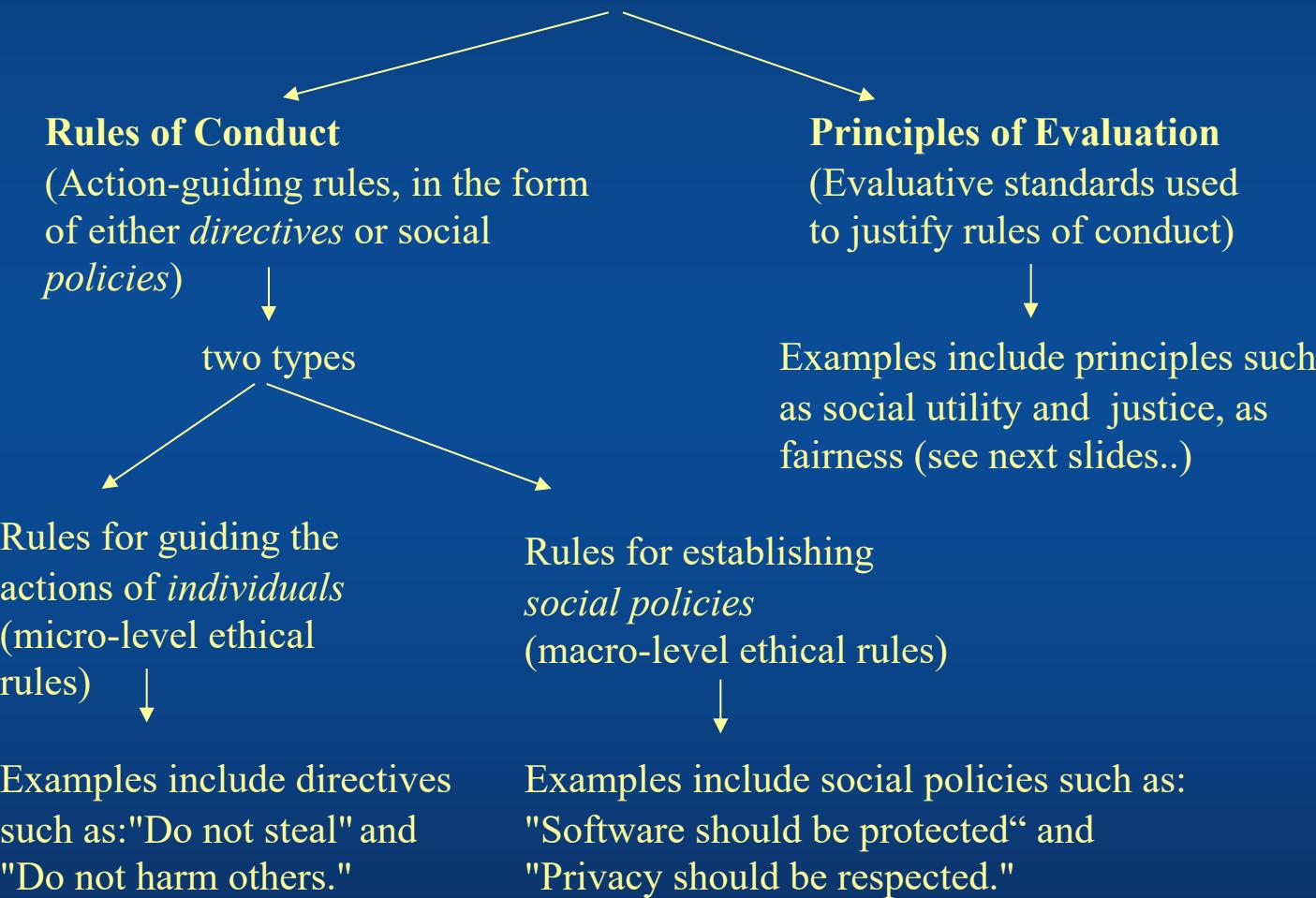
*a system of rules for guiding human conduct, and principles for evaluating those rules.*

Two points are worth noting in this definition:

- i. morality is a *system*;
- ii. it is a *system comprised of moral rules and principles*.

\* Moral rules can be understood as "rules of conduct," which are very similar to "policies."

# The different kinds of rules + principles that comprise a Moral System



# Behaving Ethically

- \* “Doing the Right Thing”
  - \* Behaving Ethically Includes:
    - \* Being honest.
    - \* Keeping promises.
    - \* Doing your job well.
    - \* Not stealing.

# Behaving Ethically

- \* So how do we decide *what* “doing the right thing” is?
- \* And *why* is it the right thing?

# Three Views

\* The religious view:

"Stealing is wrong because it offends God or because it violates one of God's Commandments."

\* The legal view:

"Stealing is wrong because it violates the law."

\* A philosophical view:

"Stealing is wrong because it is wrong" (independent of any form of external authority or any external sanctions).

# The Philosophical view

- \* Many philosophers and ethicists have argued that<sup>#</sup>, independent of either supernatural or legal authorities, reason alone is sufficient to show that stealing is wrong.
- \* They argue that reason can inform us that there is something either in the act of stealing itself, or in the consequences that result from this kind of act, that makes stealing morally wrong.

# which you may, or may not, find convincing

## 4. Ethical Frameworks

# Ethical Frameworks

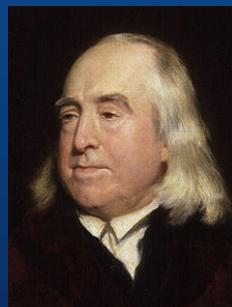
- \* To reason about morality we need some framework
- \* Over the years there have been many approaches:
  1. Consequence-based
  2. Duty-based
  3. Contract-based
  4. Character-based
  5. and others

# I. Consequence-based Ethics

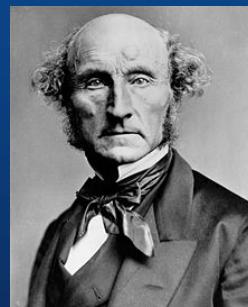
## \* Consequentialist ethics

- \* Strive to increase “utility” (that which satisfies a person’s needs and values) for the most people (the greater good).
- \* Consider the consequences for all affected people.
- \* Includes Utilitarianism (e.g.

Jeremy Bentham, John Stuart Mill)



1748-1832, England



1806-1873, England

# I. Consequence-based Ethics

## \* Consequentialist (cont'd)

- \* Rule-Utilitarianism: Choose rules, or guidelines for behavior, that generally increase utility.
- \* Act-Utilitarianism: Analyze each action to determine if it increases utility.

## 2. Duty-based Ethics

### \* Deontological (Duty-based) Ethics

- \* Emphasize duty, and absolute rules.

(from Ancient Greek, *deon*: obligation, duty *logia*: the study of)

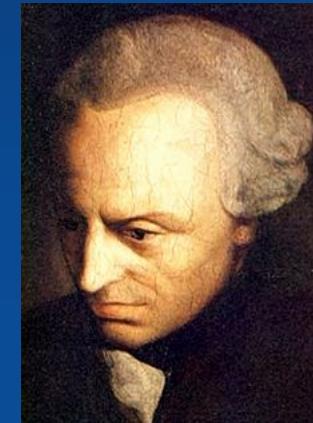
- \* Rules should apply to everyone.

## 2. Duty-based Ethics

### \* Deontological (Duty-based) Ethics

#### \* Includes Kant's Categorical Imperative

- \* Kant uses logic or reason to determine what is good.
- \* Is not concerned with happiness
- \* "Act always on that maxim or principle (or rule) which ensures that all individuals will be treated as ends-in-themselves and never merely as a means to an end". (Don't use and abuse people!)



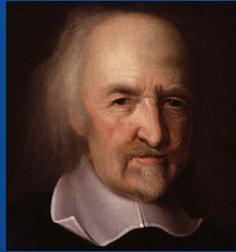
Immanuel Kant  
1724-1804, Prussia

# 3. Contract-based Ethics

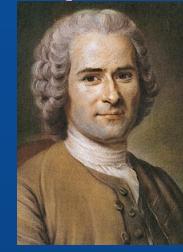
Contract-based ethics assert that we have some “Natural Rights” -

- \* Derived from the ‘nature of humanity’
- \* Includes 'The Social Contract'

(Thomas Hobbes, Jean-Jacques Rousseau)



1588-1679, England



1712-1778, Geneva

- \* Focus is on the process by which people interact.
- \* Respect the fundamental rights of others, including life, liberty, and property.

# 3. Contract-based Ethics

- \* These contract-based rights can be divided into “positive rights” and “negative rights”:
- \* Positive rights:
  - \* Impose an obligation on some people to provide certain things
  - \* (Positive rights oblige others to actively do something towards you)
  - \* E.g. your right in the UK
    - \* to be provided with an education
    - \* to receive health-care

# 3. Contract-based Ethics

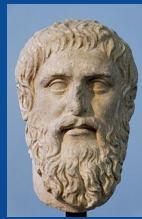
- \* Negative rights (liberties):

- \* The right to act without coercive interference.
- \* Negative rights oblige others not to interfere with you
- \* E.g. Your right not to be murdered
- \* E.g. Your right to free speech (without interference)
- \* E.g. Your right to own a computer (without interference)

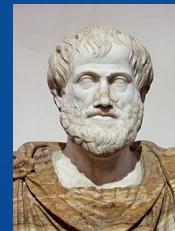
Further information: See Tavani 2.6.2. Also Negative and positive rights, Claim rights and liberty rights

# 4. Virtue Ethics (a.k.a. Character Ethics)

- \* Ignores the roles that consequences, duties, and social contracts play in moral systems
- \* Descends from Plato and Aristotle



~420BC, Greece



384BC, Greece

- \* Focuses on individuals acquiring good character traits  
"Virtues"

# 4. Virtue Ethics (a.k.a. Character Ethics)

- \* Aristotle argues that becoming an ethical person requires more than simply memorizing and deliberating on certain kinds of rules.
- \* Aristotle listed Four Cardinal Virtues:
  - \* Prudence (practical wisdom),
  - \* Temperance (self-control or moderation),
  - \* Courage,
  - \* Justice (fairness)

# Four Ethical Frameworks

Type of Theory	Advantages	Disadvantages
1. Consequence-based (Utilitarian)	Stresses promotion of happiness and utility	Ignores concerns of justice for the minority population
2. Duty-based (Deontology)	Stresses the role of duty and respect for persons	Underestimates the importance of happiness and social utility
3. Contract-based (Rights)	Provides a motivation for morality	Offers only a minimal morality
4. Character-based (Virtue)	Stresses moral development and moral education	Depends on homogeneous community standards for morality

# Combined approaches

- \* Some Ethicists have tried to combine aspects of two more theories, such as consequentialism and deontology.
- \* James Moor (1999) has devised a framework called “Just Consequentialism” that incorporates aspects of:
  - \* Deontology (duty and justice),
  - \* Utilitarianism (consequences).

# Moor's 2 Stage approach

1. *Deliberate over various policies from an impartial point of view to determine whether they meet the criteria for being ethical policies. A policy is ethical if it:*
  - a) *does not cause any unnecessary harms to individual groups (Utilitarianism)*
  - b) *supports individual rights, the fulfilling of duties, etc (Deontological)*
2. *Select the best policy from the set of just policies arrived at the deliberation stage, by ranking ethical policies in terms of benefits and (justifiable) harms. In doing this, be sure to:*
  - a) *weigh carefully between the good consequences and the bad consequences in the ethical policies (Utilitarianism) and*
  - b) *distinguish between disagreements about facts and disagreements about principles and values,*  
*when deciding which particular ethical policy should be adopted.*

# Conclusion

- \* We have to always try to reach the right decision
  - \* There is no one formula to solve ethical problems.
  - \* All professionals have to consider trade-offs.
  - \* Ethical theories help to identify important principles or guidelines.

# Some Important Distinctions

- \* Right, Wrong, and Okay: Acts may be
  - \* ethically obligatory, (E.g. Giving first-aid to an injured party)
  - \* ethically prohibited, (E.g. taking part in an elaborate tax-avoidance scheme)
  - \* ethically acceptable. (E.g. saving in a tax-free ISA)
- \* Causing harm:
  - \* Some acts may cause harm to others but are not necessarily unethical. (E.g. trialing a new drug and finding it has nasty side effects)

# Some Important Distinctions

## \* Goals vs. actions:

- \* **The actions we take to achieve our goals should be consistent with our ethical constraints.** (E.g. “I want to get a promotion, but not by treading on my colleagues”).

## \* Personal preference vs. ethics:

- \* **Some issues we disapprove of because of our dislikes, rather than on ethical grounds.** (E.g. “I disapprove of homeless people; because they are so unsightly”)

## \* Law vs. ethics:

- \* **Some acts are ethical, but illegal; other acts are legal, but unethical.** (E.g. maybe assisted suicide/tax avoidance)

# 5. Professional Codes of Conduct

# Codes of conduct

- \* Your degree is accredited by British Computer Society (BCS) and Institute of Engineering and Technology (IET):
  - \* [BCS Code of Conduct](#)
  - \* [IET Code of Conduct](#)



(British Computer Society)



(Institution of Engineering and  
Technology)

# Codes of conduct

"The Code governs your personal conduct as an individual member of the BCS and not the nature of business or ethics of the relevant authority. It will, therefore, be a matter of **exercising your personal judgement in meeting the Code's requirements.**" (BCS code of conduct, p1)

"The IET promotes and encourages ethical behaviour in the practice of science, engineering and technology by all stakeholders. ...

**Responsibility for professional and personal decisions and actions rests with the individual member.** (IET, 2007)



# “A universal ethical code for scientists” \*

- \* Rigour, honesty and integrity:
  - \* Act with skill and care in all scientific work. Maintain up to date skills and assist their development in others.
  - \* Take steps to prevent corrupt practices and professional misconduct. Declare conflicts of interest.
  - \* Be alert to the ways in which research derives from and affects the work of other people, and respect the rights and reputations of others.
- \* Respect for life, the law and the public good:
  - \* Ensure that your work is lawful and justified.
  - \* Minimise and justify any adverse effect your work may have on people, animals and the natural environment.
- \* Responsible communication: listening and informing:
  - \* Seek to discuss the issues that science raises for society. Listen to the aspirations and concerns of others.
  - \* Do not knowingly mislead, or allow others to be misled, about scientific matters. Present and review scientific evidence, theory or interpretation honestly and accurately.

\* BERR, 2007, Rigour, respect and responsibility: A universal ethical code for scientists

# CyberEthics

- \* Ethics and CSEE
  - \* Special responsibilities face professionals and users
    - \* Maintaining relationships and responsibilities towards customers, clients, coworkers, employees, and employers.
    - \* Making critical decisions that have significant consequences for many people.
    - \* Determining how to manage, select, or use computers and other technologies in a professional setting.

# Is Professional Ethics enough?

- \* Some of the ethical issues raised by Cyber Technologies do not directly involve CSEE Professionals
  - \* Is it right to assume that users will abide by the same standards as the authors?
    - \* What if we create a P2P network that users use to distribute classified/copyrighted material?
    - \* Is facebook responsible for stopping user-harassment?

# Is Professional Ethics enough?

- \* Not all people who operate, in some respects, as professionals within the field are bound by the professional codes
- \* Anyone can call themselves a software developer
  - \* Unlike some other professions (e.g. Doctors, Architects)
  - \* Lack of regulation can lead to poor implementation, even to safety problems
  - \* E.g. London Ambulances in 1992 were dispatched incorrectly by a new automated system
- \* You can apply for Chartered IT Professional status (“CITP”) with BCS

# 6. The Free Software Foundation's view of Ethical Computing

# The Free Software Foundation's (FSF's) view

- \* For software to be ethical, it should not control the user in anyway.
- \* “Free Software” is defined to be software that grants the user 4 fundamental freedoms:
  1. The freedom to run the program as you wish, for any purpose
  2. The freedom to study how the program works, and change it so it does your computing as you wish.
  3. The freedom to redistribute copies so you can help your neighbour
  4. The freedom to distribute copies of your modified versions to others.
- \* Non-free software is *proprietary*, or “User subjugating” software

# The Free Software Foundation's (FSF's) view

- \* FSF was founded by Richard Stallman



1953-, US

- \* Richard Stallman claims that if the software is proprietary, then it adds too much temptation for the developer to add malicious features
  - \* That's why we find backdoors or secret data-harvesting features in so much software

# Gnu, Linux, and the FSF

- \* Richard Stallman created the Gnu project, and the FSF
- \* Richard Stallman was frustrated at copyright being used to stop tinkering or sharing software,
  - \* so he invented “copyleft” and the Gnu GPL (General Public License)
  - \* Licence allows the 4 freedoms, and stipulates that any derivative of this software must retain these same rights
- \* Linus Torvalds released the Linux kernel with the GPL
  - \* That's what allowed anyone to contribute to it, and made it grow so fast
  - \* Linux and Gnu are normally distributed together (E.g. Ubuntu is Gnu+Linux)

# “Free Software”?

1. How does “Free Software” differ from software that costs nothing?
2. How does free software differ from “Open Source”?
3. Given an option between otherwise-identical pieces of high-quality software,
  - \* assuming financial cost is no issue,
  - \* would you rather the software was Free Software or not?

# “Free Software” ethics?

- \* The FSF claims that
  - \* Proprietary software is unethical
    - \* Using it or creating it
  - \* To be ethical, schools and universities should not teach students with proprietary software.

# Further Study

- \* Ethics Quiz

- \* Due in 9 days, 25.11.2018

- \* Further information on the FSF:

- \* <https://www.gnu.org/philosophy/free-sw.html>

- \* Recommended viewing on Gnu/Linux origins: Revolution OS

- \* Course textbooks:

- \* "A Gift of Fire: Social, Legal, and Ethical Issues for Computers and the Internet, 2ed" (Baase 2003) (Baase & Clark 2003)

- \* "Ethics & Technology: Ethical Issues in an Age of Information and Communication Technology" (Tavani 2004)

- \* Next Lecture is on Organisations

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# CE29x Team-Project Challenge

## Organisations

Professor Anthony Vickers

Room: INW.3.17

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with acknowledgements to Keith Primrose, and Mike Fairbank

# Mastering Git Skills in CE29x

As you know it is a key objective of this module for you **all** to master Git and Jira.

By now you should be able to (roughly) do the basics on Git-clone, add, commit, push, pull; either from the command line, or from IntelliJ.

Git is a difficult skill so please persevere in mastering it. Future employers will value it.

You will all individually use Jira and Git again next year in CE301, so you are advised to bite the bullet and learn it now, when you can learn as a team.

And, as a final strong incentive, we will only be marking work for CE29x group projects that has been uploaded to Git, in the author's username. So it is essential you all put in the effort early this academic year to learn and use Git.

Git Example: [Erasmus Without Paper](#), [Open Flexure Microscope](#)

# Recap of previous lecture

- \* Communication
  - \* Project Stakeholders
  - \* Professional Email Etiquette
  - \* Communication within Projects
    - \* Communication plan
    - \* What if things go wrong?
- \* Change Management

# CE29x course so far

University Week Number	Lecture 1 (Friday 9am – UK time)	Lecture 2 (Friday 10am – UK time)
<b>Unit 1 Week 2</b>	Introductory lecture and Employability Preview	Team working
<b>Unit 2 Week 3</b>	Requirements in Agile & Task Estimation	Employability – Career Planning
<b>Unit 3 Week 4</b>	Critical Path Analysis	Keeping your Project on Track with Agile
<b>Week 5</b>	Employability - Narrowing down options	Risk Management
<b>Week 6</b>	Communications	Guest – Project Management
<b>Week 7</b>	Organisations	Ethics
<b>Week 8</b>	Employability – Getting Valuable Experience	Intellectual Property
<b>Week 9</b>	Privacy and Security	Financial Accounting 1
<b>Week 10</b>	Financial Accounting 2	Management Accounting
<b>Week 11</b>	Marketing	Contracts
<b>Week 16</b>	Challenge Week (Individual Project)	
<b>Week 17-18</b>	Entrepreneurship	Equality and Diversity
<b>Week 19</b>	CE301 project launch	
<b>Week 31</b>	Revision Lecture	

- DONE: All presentations relating to project management.
- TO DO: Presentations about business issues / industrial practice/CE301

# Today's Lecture: Organisations

1. What is an Organisation?
2. Management and Decision Hierarchies
3. Types of Organisations
4. Organisational Structures

# I. What is an Organisation?

# Organisation - Definitions

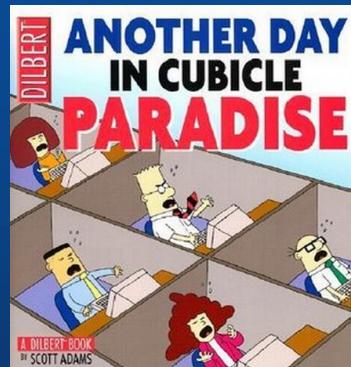
- \* A group of people working towards a common goal.
- \* “A human structure, such as a family, firm, government or university through which people may exchange goods and services” (Wiley 2002)

# Organisations

- \* Can take many forms
- \* Vary in size
  - \* from 2 people to 10s of thousands
- \* Have to make the same kinds of decisions

# Motivation

- \* You need to have an idea of how businesses are structured so that you can design IT solutions that fit the business's needs
- \* Also, you might want to have an idea of what goes on beyond the limited walls of your programming cubicle



## 2. Management and Decision Hierarchies

# Decision Hierarchy



The triangle takes a hierarchical view of management structure, with many operational decisions at the bottom, some tactical decisions in the middle and few but important strategic decisions at the top of the triangle. The higher in the triangle an item is, the more scope it covers and less precise it becomes. As items move down they become more detailed and apply more precisely. (Source: Wikipedia)

<sup>#</sup>Anthony, R N (1965). *Planning and Control: a Framework for Analysis*. Cambridge MA: Harvard University Press.

# Strategic Management

(that is the top level of Anthony's triangle)



- \* Responsible for establishing:
  - ❖ The long term goals of the organisation
  - ❖ major marketing, organisational and investment decisions
- \* Informed by management information on:
  - ❖ Organisational performance
  - ❖ Organisational finance
  - ❖ Competitors
  - ❖ Trends in the economy and society

# Tactical Management

(that is the middle level of Anthony's triangle)



- \* Implementing company policy at departmental level and dealing with issues as they arise
- \* Informed by management information on:
  - ❖ Departmental performance
  - ❖ Departmental finance
  - ❖ Operational metrics

# Operational Staff

(Bottom level of triangle)



- \* The level where the day to day activities of the company occur
- \* Perform the public or customer interface
- \* Informed by management information on:
  - ❖ Specific cases and events that need attention
- \* This is positioned at the bottom level of Anthony's triangle
  - \* also it is the widest level of triangle (most workers involved here)

# Characteristics of Information at Management Levels



	Strategic	Tactical	Operational
Time Horizon	long term	medium term	immediate
Level of detail	summaries	categories	specific cases
Source	Mainly external	Internal	Departmental
Frequency	annual / monthly	monthly / weekly	weekly / daily

# Structured Decisions



- \* Operational level decisions tend to be structured:
  - \* There are clear rules
  - \* The information is clear and available
  - \* The information requires no interpretation
- \* Structured decisions are repeatable
- \* Problems tend to be well defined

# Unstructured Decisions



- \* Strategic level decisions tend to be unstructured:
  - \* There are no clear or complete rules
  - \* The information is incomplete and uncertain
  - \* The information requires interpretation.
- \* Unstructured decisions will not be repeatable
- \* Problems tend to be ill-defined

# 3. Types of Organisations

# Incorporated Organisations

- \* In the UK, incorporation means some kind of company formation
- \* An Incorporated body would be e.g. a Plc, Ltd or a CoOperative
- \* The body is a separate legal entity from its members

# Incorporated Organisations

- \* Benefits of incorporation
  - \* “Limited Liability”: In the event that the company incurs debts or other legal liabilities:
    - \* The owners of the company have no obligation to pay these
    - \* The most that shareholders stand to lose is the money they paid for their shares
  - \* The company may own property and enter into contracts in its own right
  - \* Risk is more equal. All members are treated the same
    - \* Unless some other arrangement is agreed

# Incorporated Organisations

- \* Disadvantages of incorporation
  - \* There are start-up costs and annual fees
  - \* On-going records must be kept and filed with the appropriate registry (e.g. Companies House). This information becomes public.
    - \* This is how other parties can assess the reliability of your company to see if they are viable to enter a contract with.
  - \* Certain details e.g. governing body members' addresses must be on public record.

# Incorporated Organisations

- \* Companies have directors and shareholders
- \* Company ownership is divided into a number of “shares”
  - \* Shareholders “own” divided up portions of the company
- \* Directors are subject to obligations, e.g.
  - \* Act in good faith towards company
    - \* e.g. not to take business away from company for yourself
  - \* Use skill and care in carrying out duties
    - \* E.g. A court might punish a negligent director to pay damages back to their company
  - \* Disclose conflicts of interest

# Incorporated Organisations

## Private Limited Companies (Ltd):

- \* If you become a freelance programmer, you will generally operate under your own Ltd company.  
(Tax advantages; limited liability)
- \* Has a “director”, and shareholders
  - \* Shares cannot be sold to public (see PLC for that)
- \* For the duties of a director of a Ltd, see  
[www.gov.uk/running-a-limited-company](http://www.gov.uk/running-a-limited-company)

# Incorporated Organisations

Public Limited Companies (Plc):

E.g. Barclays Bank PLC

- \* Shares can be sold to the public
  - \* E.g. in London Stock Exchange, FTSE100
- \* Generally much larger than private limited companies
- \* Also limited liability

# Unincorporated Organisations

- \* An unincorporated body does not exist as a separate unit.
  - \* e.g. a partnership
  - \* Or sole trader
- \* Benefits
  - \* No administration required by law (unless a charity)
  - \* Complete privacy (ditto)
  - \* No or limited start-up costs
- \* Disadvantages
  - \* The people involved hold the legal responsibilities and risks:
    - \* All members are jointly and severally liable for any outstanding debts
    - \* Contracts can not be entered in the name of the organisation

# Sole Trader

- \* A sole trader is an individual who runs their own business
- \* No legal formalities required
- \* All personal assets (including your home) are at risk if the business fails
- \* Must register with HMRC for VAT if business income is large enough

# Partnership

- \* Partnership: A group of people work together to make a business, without forming a limited company
- \* No legal formalities required
- \* Common for doctors, lawyers, accountants to work as partnership

Note that a “Limited liability partnership (LLP)” is something different:

- \* a limited-liability version of a partnership
- \* introduced in Limited Liability Partnership Act 2000

# Ownership

- \* We need to consider who ‘owns’ an organisation:
  - \* Public or Private
  - \* Small or Large
- \* Different types of ownership affect the publishing obligations and rights of access to information

# Privately Owned Organisations

- \* The main forms of private ownership are:
  - \* The Public Company (plc): quoted on the stock market. (Confusingly this is not a “public” organisation – see next slide)
  - \* The Private Company (ltd): owned by individual(s).
  - \* Professional Partnerships: doctors, lawyers and accountants.
  - \* Cooperatives / Mutual Organisations: owned by participants.
  - \* Sole Traders: One-man bands
- \* The largest companies tend to be PLCs – but that is not always the case.

# Publicly Owned Organisations

- \* The main forms of public ownership are:
  - \* Public Administration: government departments and local authorities.
  - \* Public Services: schools, universities, hospitals, prisons, courts, police and armed services.
  - \* Public Enterprises: e.g. The BBC. National Rail. The Post Office was in this category (but has recently been privatised).
- \* And a rather different category of:
  - \* Non-Governmental Organisations. Examples include charities, think-tanks, petition groups, and many others
  - \* The much maligned “quasi-autonomous non-governmental organisation” (“QuANGO”)

# Stakeholder Organisations

- \* A concept of corporate responsibility that is less divisive.
- \* Recognises the interests, contribution or stake of:
  - \* Shareholders
  - \* Customers / clients.
  - \* Managers and workers.
  - \* Local community.
  - \* Society.

# Large Organisations

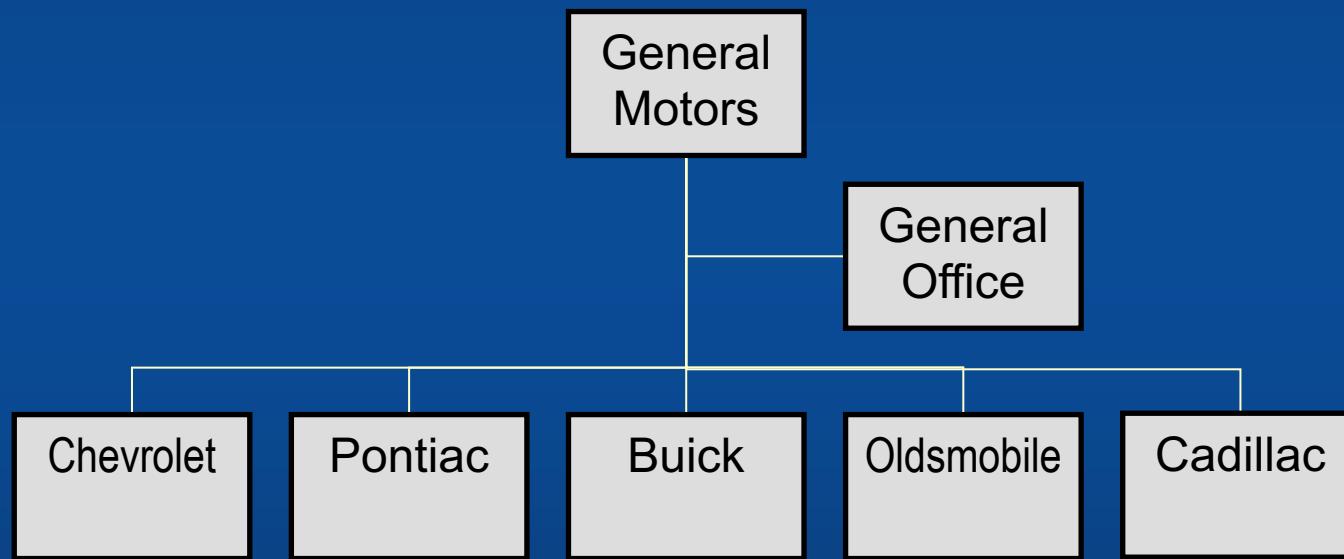
- \* Large organisations have similarities whether private or public:
  - \* Run by professional managers.
  - \* Have to account for income and expenditure.
  - \* Hire labour from the same employment market.
  - \* Use IS (Information Systems) and IT (Information Technology)

# 4. Organisational Structures

# Organisational Structure

- \* Organisations, irrespective of the model of ownership, need a management structure.
  - \* Small company - can be informal.
  - \* Larger organisation - formal structure.
- \* Various models of organisation exist with different characteristics, advantages and disadvantages.

# Divisional Organisation



# Divisional Organisation

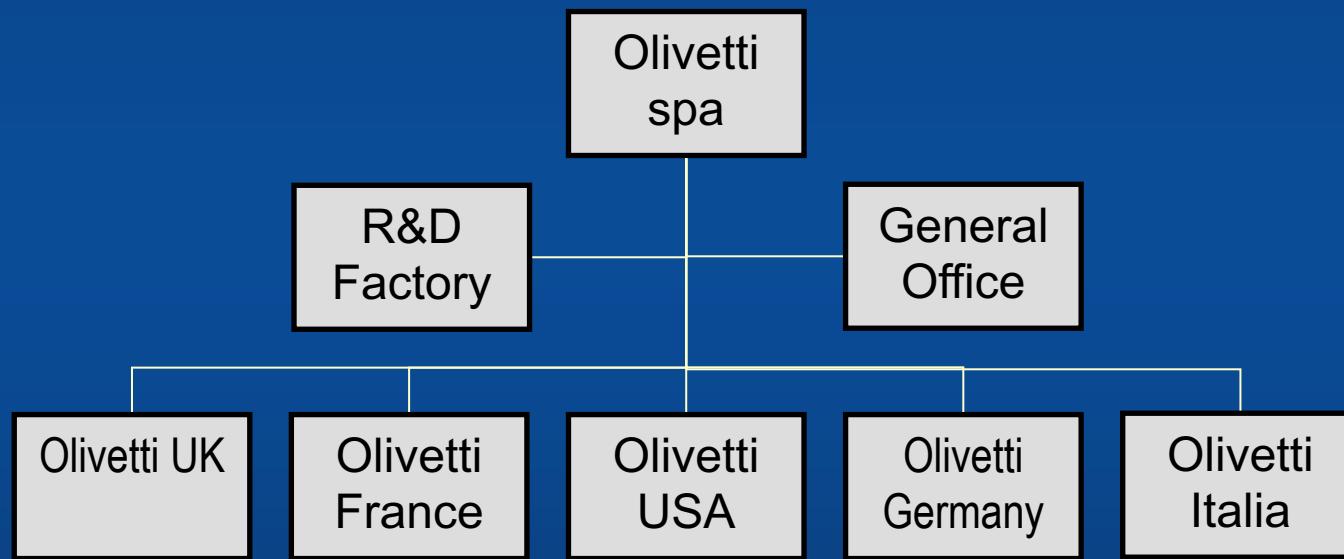
- \* Advantages:

- \* Clear accounting for success of unit.
- \* Encourages entrepreneurship.

- \* Disadvantages:

- \* Controlling and paying for central services.
- \* Transfer pricing.
- \* Duplication of effort / infrastructure.
- \* Diversity / loss of focus.
- \* Multiple external identities and interfaces.

# Regional Organisation



# Regional Organisation

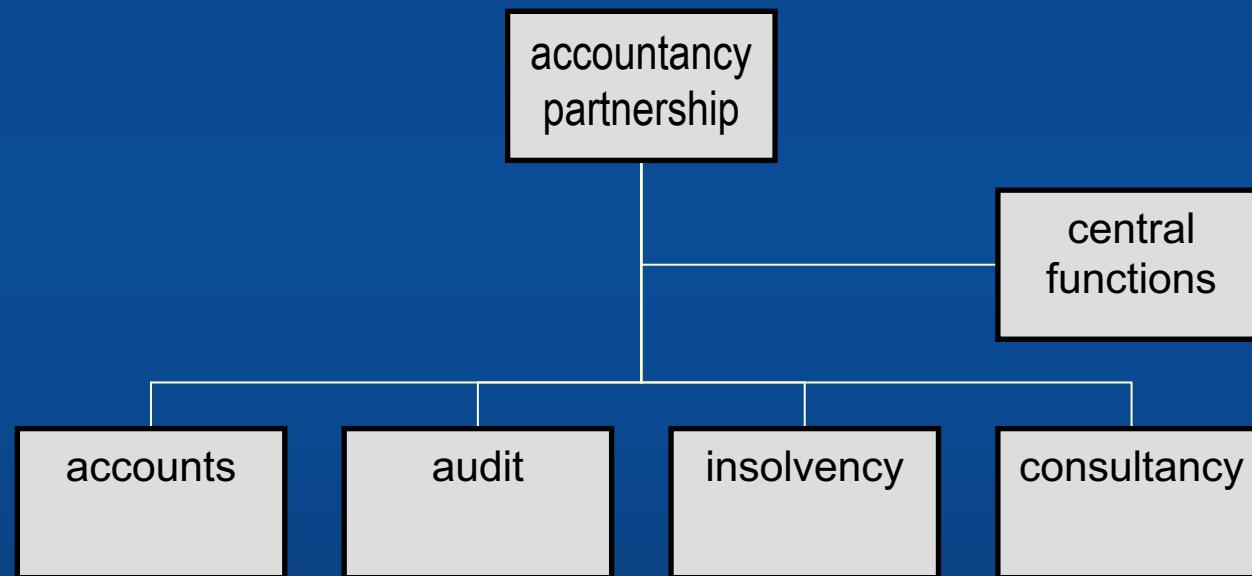
- \* Advantages:

- \* National identities can be created.
- \* Encourages entrepreneurship.

- \* Disadvantages:

- \* Transfer pricing.
- \* Unclear accounting for success of each region
- \* Duplication of effort / infrastructure.
- \* Different market conditions.

# Functional Organisation



# Functional Organisation

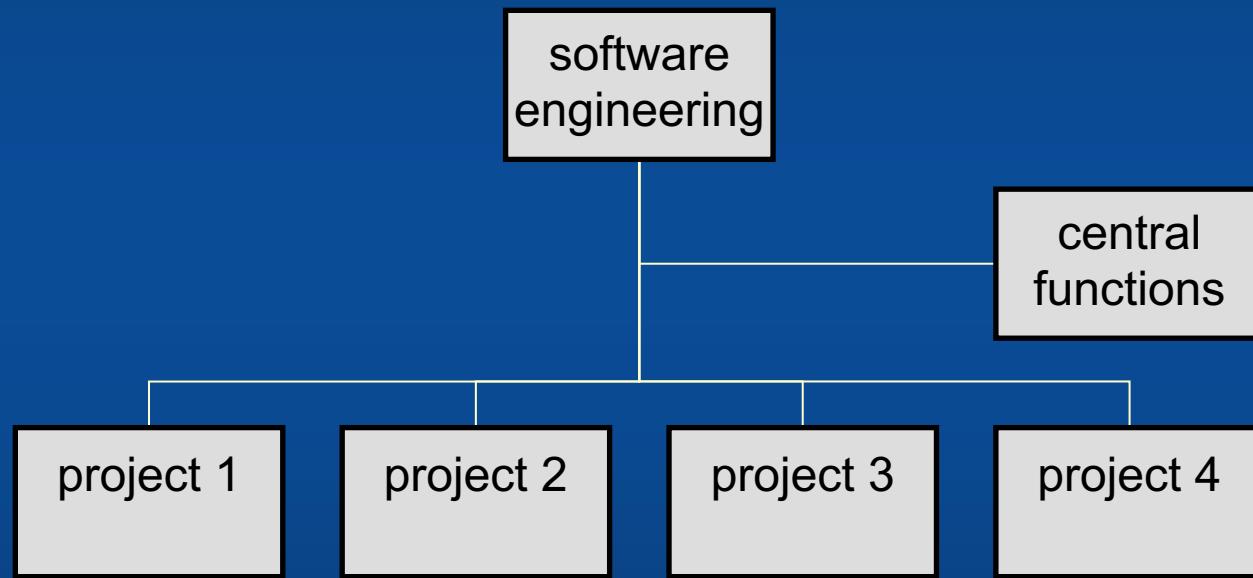
- \* Advantages:

- \* Reinforces professionalism.
- \* Makes good use of skills.

- \* Disadvantages:

- \* Conflicting departmental objectives.
- \* Lack of customer focus.
- \* No one department with overall responsibility for the product or service.

# Project Organisation



# Project Organisation

- \* Advantages:

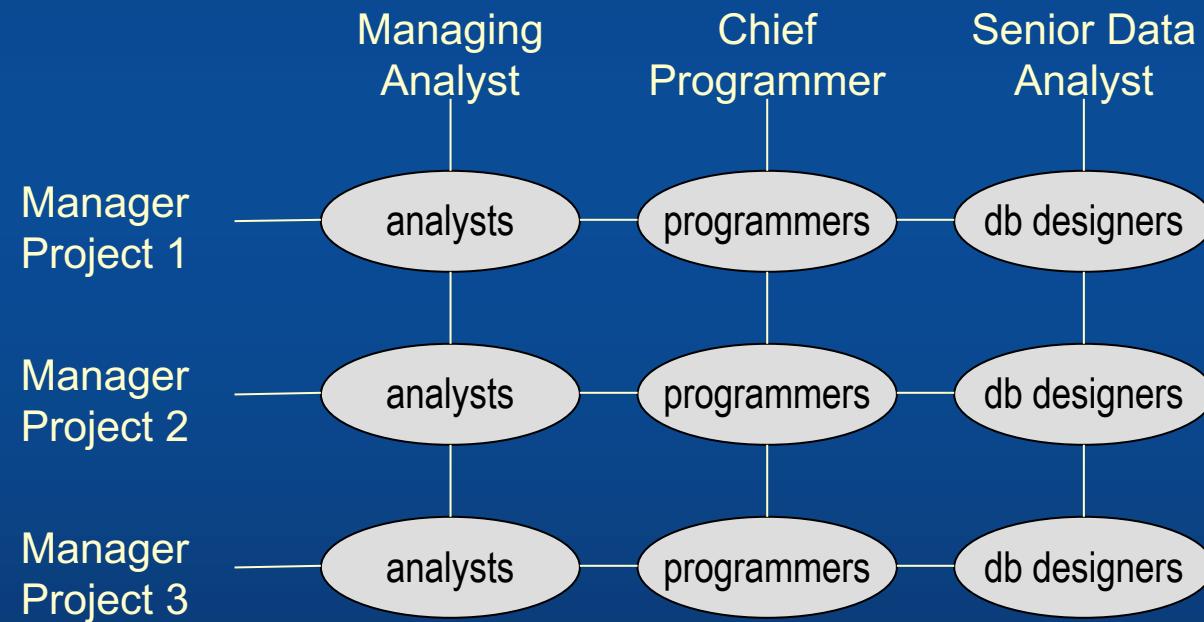
- \* Focuses on a one off task – delivery on time, to budget and of required quality.

- \* Disadvantages:

- \* Jobs are transitory.
  - \* There is no functional home for team members.
  - \* Specialist staff may not be fully utilised.
  - \* There is a disincentive to standardisation.

# Matrix Organisation

\* functional specialism combined with project teams



# Matrix Management

- \* Advantages:

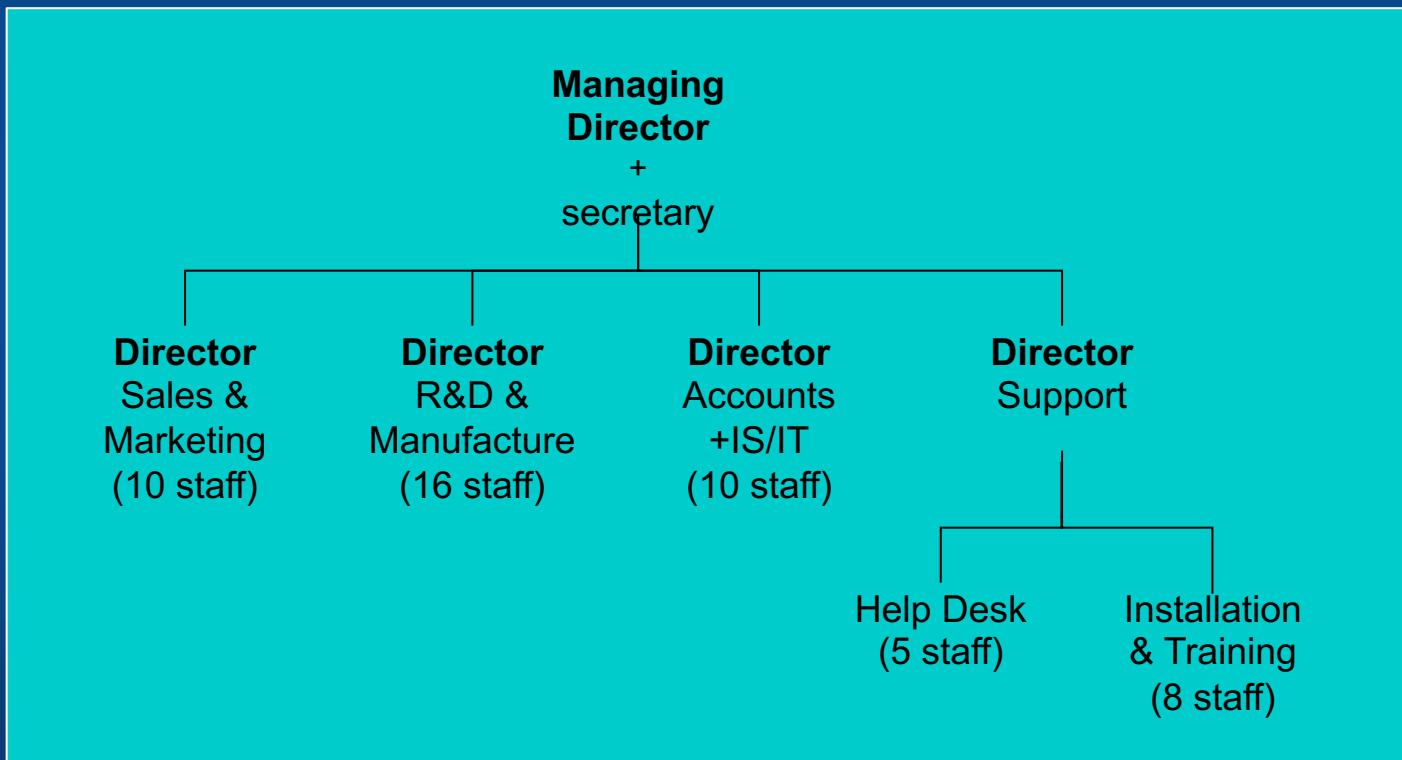
- \* Get the best of all structures (one hopes!)

- \* Disadvantages:

- \* Endless meetings and possibly arguments.

# Typical Structure Chart

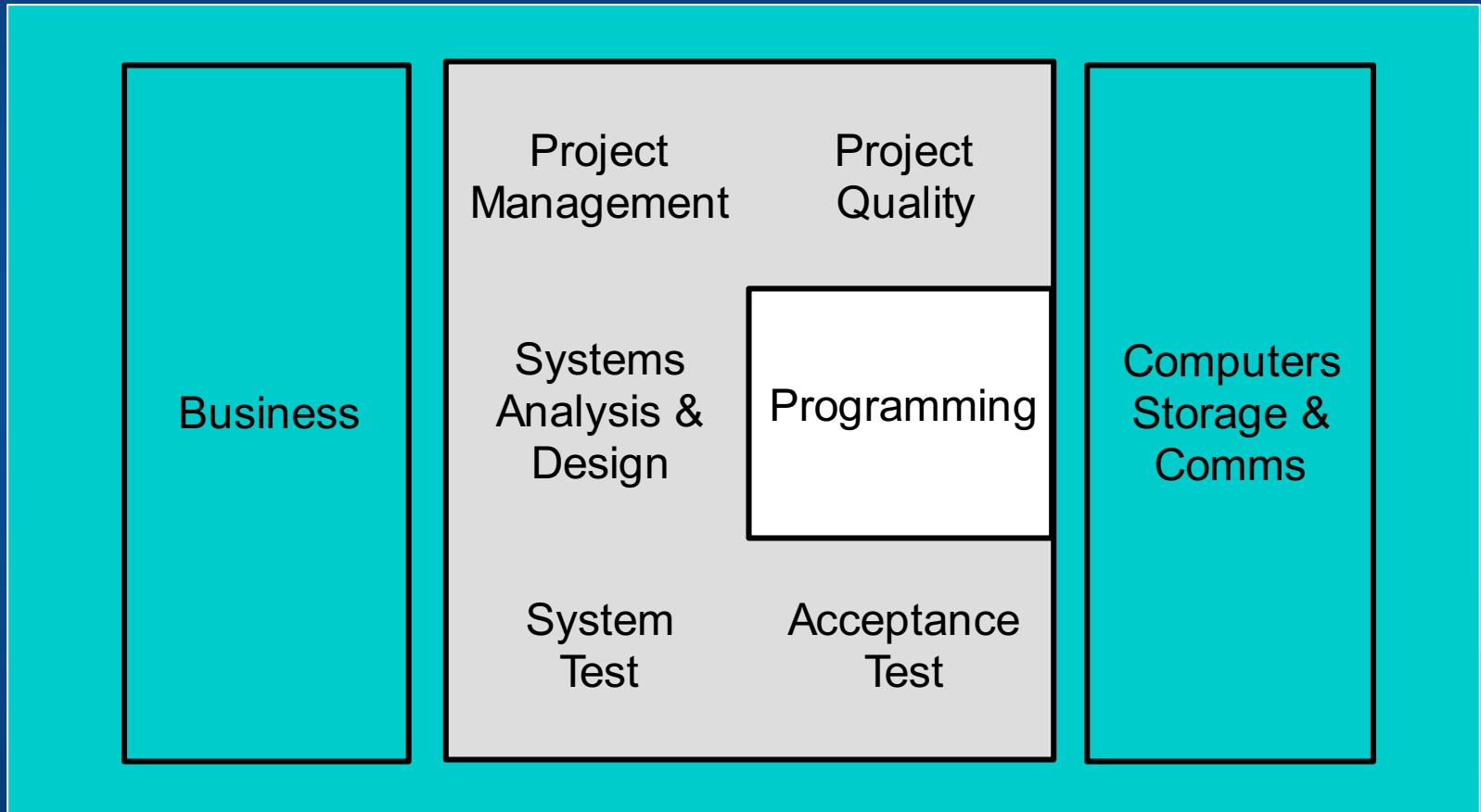
\* Kinda-Soft Ltd



# Structures

- \* You can have a “Hierarchical Structure”, which features:
  - ❖ Many management layers
  - ❖ Strict reporting channels
- \* Or a “Flat” structure:
  - ❖ Few layers
  - ❖ “Open door” approach

# IS&IT in Organisations



The IS/IT Function in an Organisation

# Further Study

- \* Chapters 3-5 of Bott, F. 2014. “Professional Issues in Information Technology”, Second Edition (e-book in library)
  - \* Includes info on financing a start-up company
- \* Quiz on Organisations on Moodle
- \* Next Lecture: Ethics – “Would you tell your mother”

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accessed November 2020

# CE29x Team-Project Challenge

## CSEE and the Law: I. Intellectual Property Laws

Professor Anthony Vickers

Room: INW.3.17

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with acknowledgements to Keith Primrose, and Michael Fairbank

# This Lecture

- \* British Law (Introduction)
- \* Intellectual Property

# Why Does It Matter To Me?

- I. You will likely be creating IP you want to protect
2. You will likely be writing software that holds client information – you have legal obligations to keep that data private and secure

# Why Does It Matter To Me?

3. You have to know about these things:
  - \* Ignorance is no defence under the law.
4. Explicitly mentioned in the BCS code of conduct:
  - \* “... *You shall ensure that within your professional field/s you have knowledge and understanding of relevant legislation, regulations and standards, and that you comply with such requirements.*”

# British Law

# British legal systems

- \* Britain has three / four legal systems:
  - \* England and Wales
    - \* Originally is based on 'common law' = judge-made law
    - \* Now mainly developed from parliamentary legislation
    - \* Adversarial approach
      - \* Rival cases are presented in front of a judge / jury to decide
  - \* Scotland
    - \* Mixed legal system – different approaches to person and communities
    - \* Similarities with many common law systems but also some key differences: borrowed from romano-germanic systems (France).
  - \* Northern Ireland
    - \* Some procedural differences from English system
- \* Most laws apply to the whole of the UK (but note that Scottish devolution gave more powers to Scottish Parliament)

# Sources of law

- \* English Parliament
  - \* Started making laws in 13th century
  - \* A Bill is a proposal for a new law or change of law, to be debated in Parliament.
  - \* Once voted on, a bill becomes “an Act” of Parliament, i.e. law
  - \* Acts are also called “statutes” (types of laws)
  - \* Legislation increasing dramatically: estimated 3,500 Acts
- \* English Government:
  - \* Statutory Instruments - laws
  - \* 10,000 Statutory Instruments in force

# Sources of law (2)

- \* European Union - EU (former European Community: EC)
  - \* UK has to comply with European Law
  - \* **EU Directives:**
    - \* Member States need to transpose, i.e. to vote legislation/ a statute, for the Directive to be applicable
  - \* **EU Regulations** (former Council Framework Decisions):
    - \* Directly applicable – no specific statute to transpose

# Two Systems

- \* In many jurisdictions there are two different areas of law:
  1. **Criminal Law**
    - \* The state (in the UK 'The Crown') has the right to prosecute citizens for those breaches of Law deemed crimes
      - \* E.g. crimes the police would take notice of (theft, violence)
  2. **Civil Law**
    - \* In civil law there is no state prosecution.
    - \* Civil law cases include legal disputes between 2 individuals or companies.
    - \* One party - called the plaintiff - applies to the court for their case to be heard.
    - \* The other party - called the defendant - is the person or other legal entity from whom the plaintiff requires redress (i.e. some form of compensation).
    - \* The state provides the courts and the judge but does not take sides.
- \* For information: <https://www.judiciary.gov.uk/you-and-the-judiciary/>

# Intellectual Property

# Intellectual Property (IP)

## What is IP?

- \* Intangible creative work
  - \* not necessarily the physical form on which it is stored or delivered
  - \* E.g. software, hardware designs
- \* Theft of IP is different from theft of a tangible object
  - \* The IP owner is not deprived of their IP, if it is copied
  - \* But if you spend 10 years developing some software you plan to sell, what can you do to prevent hackers from copying it and selling it?
  - \* Note that IP can travel across the world faster than a tangible object

# Intellectual Property (IP)

- \* Software can be expensive to develop
  - \* And valuable
- \* It can be protected by IP rights, e.g.
  - \* Copyright
  - \* Confidential information
  - \* Patents
  - \* Trademarks

# IP Infringement

- \* Infringement of patent or copyright normally falls under civil law
- \* However, some forms of infringement may also be criminal e.g.
  - \* Marketing, distributing or selling pirate material
- \* Other offences may be involved e.g.
  - \* Forgery, trade descriptions, theft

# Intellectual Property (IP)

- \* IP rights are a “property”, that can be
  - \* bought and sold outright,
  - \* or for a defined period of time
  - \* or on a renewable licence basis.
- \* Income to the owner of the IP can thus accrue as
  - \* one-off payments,
  - \* or periodic royalties
  - \* or per-use payments.

# Intellectual Property (IP)

We will look at four methods of IP protection:

1. Copyright
2. Confidential Information
3. Patents
4. Trade Marks

# I. Copyright

# Copyright

- \* Copyright is associated with the right to copy a piece of “work”.
- \* The work must be one of:
  1. Original literary, dramatic, musical or artistic work
    - \* Includes Software
  2. Sound recordings, films, broadcasts
  3. The typographical arrangement of published editions

# Copyright

- \* Copyright comes into existence when the work is written down/recorded in some way
- \* Draw attention to your copyright by writing “(C) Author Name 2017”
- \* Work must be *original*
  - \* you’re not breaking copyright by reusing “ $i=i+1$ ”
- \* Copyright for software and literary works
  - \* lasts for author’s lifetime + 70 years.

# Copyright

- \* Copyright normally belongs to the work's creator
  - \* but can be sold
    - \* Author retains moral right for recognition
- \* Copyright belongs to your employer if the work was created as part of your job
  - \* Unless you have an explicit written agreement to say otherwise
  - \* This only affects employees
    - \* not to independent contractors
    - \* (The copyright of commissioned work belongs to the author, unless the commissioner stipulates for it in the contract)

# Copyright Usage

- \* Copyright law usually grants the copyright holder several exclusive rights:
  - \* to make copies
  - \* to issue copies to the public (with or without payment)
  - \* to import or export the work
  - \* to adapt the work (e.g. to translate it)
  - \* to perform or display the work publicly
  - \* to rent or lend the work to the public
  - \* to transmit or display by radio or video
  - \* to sell or cede these rights to others
- \* No one can do any of these things without the copyright owner's permission

# Copyright Usage

- \* Copyright does not protect you if someone else produces an identical work, if they can show they did not produce it by copying the original work
  - \* Programmers don't need to worry if they inadvertently produce identical code
  - \* Proving theft of code can be quite difficult
    - \* So authors sometimes aid proof-of-theft by inserting redundant LOCs
    - \* `i++; i--`

# Copyright Usage

The Copyright (Computer Programs) Regulations 1992:

- \* If you use copyright work, you are allowed to
  - \* Make a single personal backup copy
  - \* Decompile the program in order to
    - \* correct errors
    - \* discover how to create a program which interoperates with it
- \* Sell your rights to use the program
  - \* But you have to remove your own copy

# Copyright Law – databases

- \* Databases may receive copyright protection for the selection and arrangement of the contents.
- \* Also database copyright may exist in the data itself.
- \* Database right lasts for 15 years from the making but, if published during this time, then the term is 15 years from publication.

Full UK copyright law summary:

<https://www.copyrightservice.co.uk/ukcs/docs/edupack.pdf>

# Copyright Law – Computer Generated work

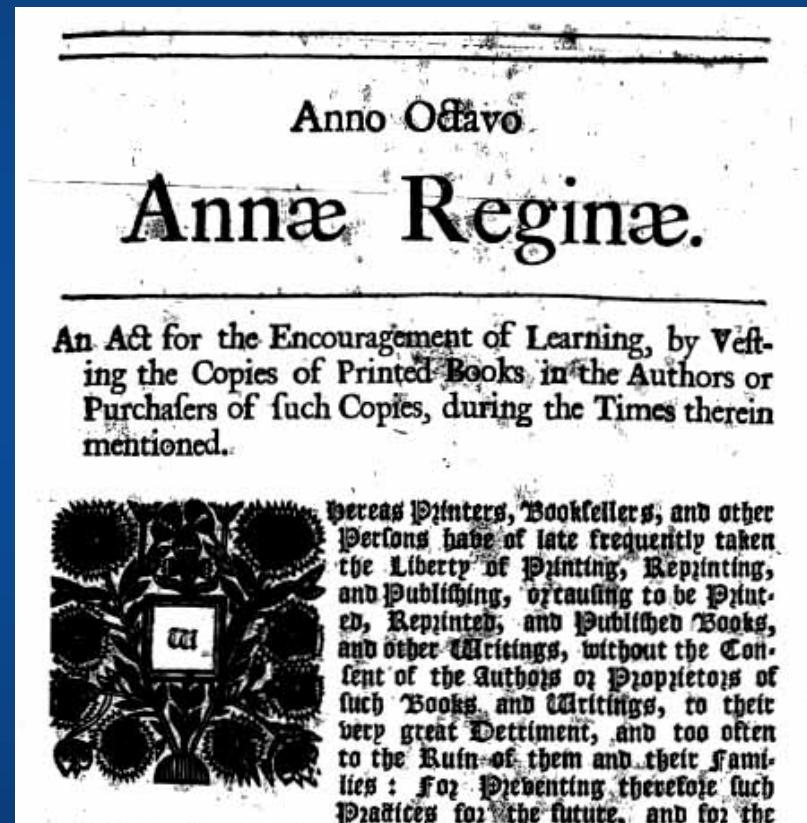
- \* Computer generated works can also be covered:
  - \* Copyright is granted to the person who undertakes “the arrangements necessary for the creation of the work”,
  - \* This person is recognised as the author.
  - \* For these works, Copyright lasts for 50 years, from the creation date.

# Copyright Law – Computer Generated work

- \* Where computer generated work is concerned the author is
  - \* The person who was using the computer to generate the work
  - \* Or the person who owned the computer which produced the work
- \* Consider a piece of computer generated art:
  - \* The company that wrote the software that generates the art own copyright in that software
  - \* The computer artist or his/her employer who used the software to generate a new and unique work would hold copyright in that work
  - \* Even if the work of art was generated from a series of random sequences of numbers produced by the program

# Copyright Laws

- \* First copyright act in the world was 1710:
  - \* Statute of Anne
- \* This made new concepts:
  - \* Author is the owner
  - \* Fixed term of protection
  - \* Libraries must have a copy



# Copyright Laws

- \* Principle not internationally agreed until the 1886 International Copyright Act – The Berne Convention
  - \* Last revised in 1979
  - \* 121 signatory countries
  - \* Details vary slightly between countries
    - \* e.g. may differ in duration of copyright



Countries in blue have signed up to  
Berne convention

# Copyright infringement

- \* The author can pursue pirates to regain lost royalties, and impound the copies
- \* **Primary infringement** is when any of the exclusive rights of the owner are breached
  - \* Civil case:
    - \* Claim for damages;
    - \* injunction to refrain from the activity
- \* **Secondary infringement** is when a primary infringement occurs *in a business or commercial context*
  - \* E.g. trading in pirated software
  - \* E.g. using pirated software in a business
  - \* Criminal case:
    - \* Fines, imprisonment, civil damages, confiscation of equipment

# Copyright infringement



- \* Usually up to the copyright owner to police software theft (can be costly)
- \* You are helped by FAST and BSA organisations to do this
  
- \* FAST & the BSA encourage employees to expose employers using pirate software.
- \* The Federation Against Software Theft (FAST) was set up by the British Computer Society (BCS) in 1984.
- \* They represent UK s/w publishers and have been successful in getting UK Law changed.
- \* They provide education programmes, consultancy and certification services for s/w licence compliance for audit purposes.
  
- \* Note that copyright infringement is also prohibited by University of Essex IT-usage regulations

# Copyright infringement



- \* Business Software Alliance (BSA) is the foremost organisation dedicated to promoting a safe and legal digital world.
- \* BSA is the voice of the world's commercial software industry, and their hardware partners, before governments and in the international marketplace.
- \* BSA educates consumers on software management and copyright protection, cyber security, trade, e-commerce and other Internet-related issues.
- \* Established in 1988, by Microsoft, BSA has programmes in more than 60 countries worldwide.

# Copyright infringement

- \* Software may be protected from copying
  - \* E.g. with a hardware device
  - \* E.g. difficult to reverse-engineer code
  - \* E.g. publishing code as “Software as a service” (SaaS)
    - \* E.g. OneDrive, Dropbox, Google Docs, Gmail
    - \* Wolfram Alpha, Paywalls to Newspapers
    - \* Cloud computing ([explainer video](#))
  - \* E.g. Use of “Digital Rights Management” (DRM)
    - \* Not popular with users – too restrictive
    - \* iTunes and google music downloads are now advertised as “DRM free”





Richard Stallman,  
Founder of the FSF

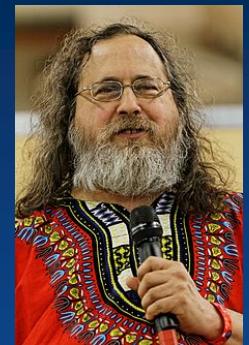
# Copyright infringement

- \* FSF's views on DRM and SaaS.
  - \* Can you guess?
  - \* On DRM, Free Software Foundation's views:
    - \* DRM=“Digital Restrictions management”
    - \* “Defective by Design” stickers placed on new computers to deter purchase
- \* Cory Doctorow:

*“Digital rights management always converges on malware. ... In one famous incident, Sony loaded covert rootkit installers on 6 million audio CDs.”*



# Copyright infringement



\* FSF's views on DRM and SaaS.

\* On SaaS:

*“With SaaS, the users do not have even the executable file that does their computing: it is on someone else's server, where the users can't see or touch it. Thus it is impossible for them to ascertain what it really does, and impossible to change it.*

*... This has the same effect as spyware: the server operator gets the data—with no special effort, by the nature of SaaS”*

\* Source: [Free Software Foundation, “Who does that server really serve?”](#)

# Offences - Piracy

- \* The Video industry advanced the law to combat pirates. Losing millions to video pirates they used an obscure case brought by Anton Piller to gain entry into premises without notice.
- \* The “Anton Piller” orders are now known as “search orders” in England and Wales.

In the 1975 English case of Anton Piller KG v Manufacturing Processes Limited, dealing with the theft of trade secrets.

# Search orders (Anton Piller case precedent)

- \* The plaintiff seeks an ex parte\* order to gain entry
  - \* once inside they seek evidence to incriminate the pirates.
- \* The argument is that if the pirates were given notice the evidence would be removed from the premises prior to entry.
- \* Later an asset-freezing injunction (“Mareva Injunction”) was added
  - \* which stops the defendants moving their assets to a foreign country.
- \* If a pirate refuses to comply with the order they can be committed to prison for contempt of court, with remarkable speed and lack of formality.

\*An ex parte decision is one decided by a judge, without requiring all involved parties to be present

# Norwich Pharmacal Orders: Forced disclosure of documents

- \* Norwich Pharmacal\* orders:
- \* A court order for the disclosure of documents or information
  - \* Where the information is necessary to identify wrongdoers
  - \* Granted against an (innocent) third party who hold details on those involved in illegal activities, particularly IP violations
- \* Used against ISPs to identify users which have allegedly engaged in wrongdoing.

\* Named after a 1974 legal case of *Norwich Pharmacal Co. v Customs and Excise Commissioners*

# Specific UK Copyright Laws

- \* In UK, relevant laws are:
  - \* Copyright, Design and Patents Act, 1988
  - \* Copyright (Computer Programs) Regulations, 1992
  - \* Copyright and Rights in Databases Regulations, 1997
  - \* Copyright, etc. and Trade Marks (Offences and Enforcement) Act 2002
  - \* Copyright and Related Rights Regulations 2003
  - \* Digital Economy Act 2017
- \* Directive 2004/48/EC of the European parliament and of the council of 29 April 2004, on the enforcement of intellectual property rights
- \* UK law broadly complies with EU regulations on copyright

# Copyright, etc. and Trade Marks (Offences and Enforcement) Act 2002

Described at

<http://www.legislation.gov.uk/ukpga/2002/25/crossheading/amendment-of-the-copyright-designs-and-patents-act-1988>

This act has three main powers:

- \* Increases the penalties for the offence of copyright theft to 10 years to match trade mark law, so it is no longer a low risk option for organised crime.
- \* Strengthens search warrant provisions
  - \* to make it easier to expose counterfeiting and piracy – i.e.: search orders (Anton Piller orders).
- \* Gives greater powers to allow rights owners to obtain forfeiture of infringing material
  - \* to reduce the current potential return for criminals – by asset freezing (a.k.a. Mareva Injunctions#)

#after the case *Mareva Compania Naviera SA v International Bulkcarriers SA*, which resulted in asset-freezing

# Copyright and Related Rights Regulations (2003)

Described at

<http://www.legislation.gov.uk/uksi/2003/2498/contents/made>

- \* The Regulations exist to address the issues raised by information technology in business.
- \* Addresses deficiencies brought about by the ease of transfer of information
- \* Creates clarity for legal protection of copyright assets in today's environment.
- \* Brings legal protection up-to-date within the digital environment
  - \* making copyright protection technology neutral
  - \* no longer relying on artificially fitting infringing activity into one of the exclusive rights in the Copyright, Designs & Patents Act 1998.

# Copyright and Related Rights Regulations (2003)

- \* Circumventing copy protection systems, or digital rights management software is now an infringement of copyright.
  - \* This also applies to service providers who are aware that their services are being used to infringe copyright.
- \* This opens Internet Service Providers to liability when they are put on notice that their customers use their services to infringe copyright material.
- \* This whole area is being heavily debated within the Industry and Government and (undoubtedly) a legal Test Case will be needed to establish precedence.

## 2. Confidential Information

# Confidential Information

- \* Obligations of confidence

- \* Implicit:

- \* for employees not to reveal confidential information about the company
      - \* Trade secrets
      - \* Or sales negotiations
    - \* Employment contracts might include long tie-ins (gardening leave)

- \* Explicit:

- \* Non-disclosure agreement (NDA)

## 3. Patents

# Patent

- \* A patent is an exclusive right to exploit an invention
  - \* For a limited period of time
  - \* In return for which the patent holder must publish details
  - \* You have to apply for a patent and prove that your invention is new, useful and non obvious.
- \* To use someone else's patented invention you need to have their agreement and often a contract with them

# Patent Law

- \* A patent may be granted only for an invention in respect of which the following conditions are satisfied, that is to say:
  - \* the invention is new;
  - \* it involves an inventive step;
  - \* it is capable of industrial application;
- \* A patent covers the “idea”.
  - \* E.g. once the idea is protected, it doesn’t matter if someone uses different methods to reimplement the idea- they are still not allowed to do so.
  - \* More powerful than copyright in this sense

# Patent Law

- \* It is not patentable in the UK, if it consists of:
  - \* a discovery, scientific theory or mathematical method;
  - \* a literary, dramatic, musical or artistic work or any other aesthetic creation whatsoever;
  - \* a scheme, rule or method for performing a mental act, playing a game or doing business, or a program for a computer;
  - \* the presentation of information;
- \* This makes it very difficult to patent pure software in the UK (An algorithm is equivalent to a mathematical method)
- \* US Patent Laws have allowed software patents though

# Patent Law

- \* Patents cost money to file, and renew
  - \* E.g. with UK patent office
  - \* <https://www.gov.uk/topic/intellectual-property/patents>
- \* If several people invent the same idea
  - \* IP rights go to the first person to file the patent
- \* Keep your idea secret until filed.
  - \* If you need to discuss your idea with someone, use a NDA

# Patent Law

- \* Patent must describe product correctly
  - \* Worth getting a patent lawyer to help
  - \* <https://www.gov.uk/guidance/why-you-should-use-an-ip-attorney>
- \* Each patent only covers a given country (or region)
  - \* You have to pay for patent protection in each region you think is worth paying for
    - \* E.g. EU + US ?
- \* You also have to pursue offenders and pay to prosecute them
  - \* Patent lawyer can help

# Patent Law

- \* To show how complex things can become, here is a section from a UK government web site<sup>1</sup> regarding patents:
- \* "This is an unofficial consolidation of the Patents Act 1977, as amended up to and including 1 October 2011. This consolidation therefore includes (amongst other changes) the amendments to the 1977 Act made by:
  - \* the Copyright, Designs and Patents Act 1988
  - \* the Patents and Trade Marks (World Trade Organisation) Regulations 1999
  - \* the Patents Regulations 2000
  - \* the Enterprise Act 2002
  - \* the Regulatory Reform (Patents) Order 2004
  - \* the Patents Act 2004,
  - \* the Medicines (Marketing Authorisations etc.) Amendment Regulations 2005
  - \* the Intellectual Property (Enforcement, etc.) Regulations 2006
  - \* the Patents (Compulsory Licensing and Supplementary Protection Certificates) Regulations 2007
  - \* the Legal Services Act 2007, and
  - \* the Patents Act 1977 (Amendment) Regulations 2011"

<sup>1</sup> HMG., 2011, "The Patents Act 1977 (as amended) An unofficial consolidation produced by Patents Legal Section" available from: <http://www.ipo.gov.uk/patentsact1977.pdf>, accessed 10<sup>th</sup> Jan 2012

# Problems with patents

- \* Patents can be granted on broad ideas that might be considered as obvious, i.e. creating absurd patents
  - \* Particularly in the US where patents on software are much easier to grant than in the UK
- \* Patent Trolls are people/business who buy up ownership of lots of patents, including absurd ones
- \* They then litigate against small businesses or users who've accidentally infringed their patent catalogue, intimidating those businesses to pay up, or fold
- \* Large IT companies have to build up huge patent portfolios themselves
  - \* so they are ready to counter-sue anyone who tries to sue them
- \* Free Movie: Patent Absurdity

# Patent wars

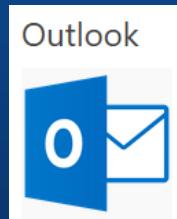
- \* Patent wars are an ongoing phenomenon between tech companies
- \* Apple vs. Samsung was a recent case over smartphone designs
  - \* Each party claimed \$billions damages from the other
- \* Patents included:
  - \* You pick up your smart phone with its curved sides ([US Patent No. D618,677](#)),
  - \* Swipe your finger across the screen to unlock it ([US Patent No. 8,046,721](#)),
  - \* Check email that was “pushed” to the phone without a request to the server ([US Patent No. 6,272,333](#)),
  - \* Type a text message using only a few touches as the phone automatically completes each word you start to spell ([US Patent No. 8,074,172](#))

\*Source: [Navigating the smartphone patent thicket](#)

## 4. Trade Marks

# Trade Marks

- \* Trade Marks Act 1994, protects
  - \* Any sign capable of being represented graphically which is capable of distinguishing goods or services of one undertaking from those of other undertakings.
  - \* Includes words, designs, letters, numerals, shapes of goods and packaging



# Trade Marks

- \* Aims to stop bogus or counterfeit goods



- \* Register trade marks with UK Intellectual Property Office (UKIPO)

# Lecture Summary

- \* IP laws are designed to protect your work as a software developer + inventor (to some extent)
- \* A constant battle goes on between people who want to monetise their creations/IP, and those who want to use it without paying (or “share”)
- \* Quiz: Intellectual-Property
- \* Quiz: Allocating resources
- \* Next lecture: Privacy and Security followed by Financial accounting I

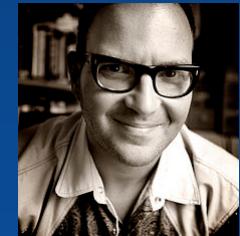
# Further reading

- \* F. Bott, *Professional Issues in Information Technology*, 2<sup>nd</sup> edition:
  - \* Chapter I: “Law and Government”
  - \* Chapter III: “Intellectual Property Rights”
- \* <https://www.gov.uk/government/organisations/intellectual-property-office>
- \* Full UK copyright law summary:  
<https://www.copyrightservice.co.uk/ukcs/docs/edupack.pdf>

# Further reading

Another critical view of DRM:

Cory Doctorow's Lockdown: The coming war on general-purpose computing:



- \* Refers to Intel's Management Engine, a MINIX OS *within the processor*, which acts as a potential gatekeeper/gateway for malware

# CE29x Team-Project Challenge

CSEE and the Law:

## 2. Privacy and Security Laws

Professor Anthony Vickers

Room: INW.3.17

e-mail: vicka

with acknowledgements to Keith Primrose, Michael Fairbank and  
Dr Audrey Guinchard of University of Essex Law Department

# Lecture outline

- \* Last lecture
  - \* British Legal system
  - \* IP laws
- \* This lecture: look at other laws that affect CSEE, e.g.
  - \* Privacy Laws
  - \* Security Laws
  - \* Plus, some other relevant laws

# Privacy Laws

# Privacy Laws

These are described in the following slides:

1. Data Protection Act 1998
2. EU General Data Protection Regulation 2016
3. Freedom of Information Act (2000)
4. Privacy and Electronic Communications Regulations (2003)

# I. Data Protection Act 1998

# Data Protection Acts 1984 & 1998

- \* Applies to electronic and (since 1998) manually stored personal data (data allowing a person to be identifiable).
- \* DPA gives living, identifiable, individuals the right to know what information is on record and to challenge it if appropriate.
- \* Each organisation is a **Data Controller**, i.e. is responsible for compliance.
- \* The people who's data is stored and used are called "**data subjects**"
- \* See <https://www.gov.uk/data-protection>

# Data Protection Act

- \* Everyone responsible for using data has to follow strict rules called 'data protection principles'.
- \* Eight Principles - Personal data must be:
  1. Obtained and processed 'fairly and lawfully'
    - Must be with consent of the **data subject**
    - E.g. now have to be notified to accept cookies
  2. Used for limited, specifically stated purposes
    - Data controllers must notify the Information Commissioner (a government body) of the personal data they are collecting and the purposes for which it is being collected

# Data Protection Act

3. Used in a way that is adequate, relevant and not excessive
  - E.g. don't ask for customer's address or marital status etc, if that's not explicitly needed
4. Accurate
  - Kept up to date
  - But this can be impractical

# Data Protection Act

5. Kept for **no longer** than is absolutely necessary
  - It is necessary to establish how long each item of personal data needs to be kept.
    - E.g. Financial data is kept for seven years for auditing
    - It is appropriate to keep some personal data indefinitely (e.g. university records of graduating students).
  - In all cases, the purpose for which the data is kept must be included in the purposes for which it was collected;
  - Procedures to ensure that all data is erased at the appropriate time are needed, and this must include erasure from backup copies.

# Data Protection Act

6. Handled according to people's data protection rights
  - E.g. data subjects have the right to receive:
    - a description of the personal data being held;
    - an explanation of the purpose for which it is being held and processed;
    - a description of the people or organisations to which it may be disclosed;
    - an intelligible statement of the specific data held about them;
    - a description of the source of the data.
  - The 1998 Act also gives data subjects the right:
    - to prevent processing likely to cause damage and distress;
    - to prevent processing for the purposes of direct marketing;
    - to compensation in the case of damage caused by processing of personal data in violation of the principles of the Act.

# Data Protection Act

## 7. Kept safe and secure

- Need access control
  - (through passwords or other means)
- backup procedures
- integrity checks on the data
- vetting of personnel who have access to the data
- Keep laptops secure from theft

# Data Protection Act

8. Not transferred outside the UK without adequate protection
  - Data cannot be sent outside the European Economic Area, unless there is a guarantee that the data will receive adequate levels of protection.
  - Think before you upload clients' data to “the cloud”
  - US does not count as safe, however:
    - Certain US companies are certified under the **“Safe Harbour Privacy Principles”**
    - allows individual American companies to register their compliance with the EU requirements.

# Data Protection Acts 1984 & 1998

- \* There is stronger legal protection for more sensitive information, such as:
  - \* ethnic background
  - \* political opinions
  - \* religious beliefs
  - \* health
  - \* sexual health
  - \* criminal records

# Data Protection Acts 1984 & 1998

- \* The Data Protection Act gives you the right to find out what information the government and other organisations stores about you.
- \* Write to the organisation and ask for a copy of the information they hold about you.
  - \* If you don't know who to write to, address your letter to the company secretary.
- \* The organisation is legally required to give you a copy of the information they hold about you if you request it.
  - \* But they can charge you for the admin costs

# DPA Exceptions

- \* There are general exceptions covering
  - \* Data related to national security
  - \* Data used for domestic or household purposes
- \* There are also explicit exceptions both for the data controller and the data subject
  - \* Controller must reveal data relevant to criminal investigations to the relevant authority
  - \* Subject has no right to see data:
    - \* that might result in infringing someone else's right
    - \* that consists of a reference regarding the subject
    - \* that is recorded by candidates during an academic, professional or other examination

# Data Protection Acts 1984 & 1998

- \* DPA is administered by the Information Commissioner's Office (formerly known as the Data Protection Registrar)
  - \* which reports to Parliament.
  - \* Regulates compliance with the Act (and the FOIA, but for Scotland, FOIA is the Scottish Commissioner)
  - \* Imposes fines on organisations that fail to comply with the Act\*
- \* In the news this week:
  - \* Uber fined £385,000 for losing UK customer data

\* See p 152 F.Bott, Professional Issues in IT, 2<sup>nd</sup> ed. for examples of fines

# Data Protection Acts 1984 & 1998

- \* DPA 1998 replaced DPA 1984
- \* GDPR (next slide) and DPA 2018 replace the above

## 2. EU General Data Protection Regulation 2016 (GDPR 2016)

# EU General Data Protection Regulation 2016

- \* In force in UK from 25 May 2018
  - \* UK pledged to apply it after BREXIT
- \* Will AUTOMATICALLY repeal (nullify) the DPA 1998
- \* Unchanged:
  - \* The core definitions and principles for processing personal data
  - \* 8 Principles of DPA remain
- \* BIG Changes:
  - \* Making compliance visible: certification schemes with technical standards; data protection officer within organisations
  - \* sanctions: BIG FINES

# EU General Data Protection Regulation 2016

\* See <https://gdpr-info.eu/>

**The EU General Data Protection Regulation  
(GDPR) is the most important change in data  
privacy regulation in 20 years.**

The regulation will fundamentally reshape the way in which data is handled across every sector, from healthcare to banking and beyond.



# Processing as defined by DPA

- \* Obviously, the DPA (and GDPR) will likely affect you in your CSEE career
- \* The definition of processing data about individuals is very broad. It includes:
  - \* Obtaining, recording, or holding the data
  - \* Carrying out any operations on the data including:
    - \* Organisation, adaptation or alteration
    - \* Retrieval, consultation, or use
    - \* Disclosure by transmission, dissemination, or otherwise making available
    - \* Alignment, combination, blocking, erasure, or destruction

# Data subjects' Rights under GDPR

- \* DPA gave 8 principles
- \* GDPR strengthens these further:

# Data subjects' Rights under GDPR

- \* Right to be forgotten/erasure: confirmed
  - \* see Google Spain case:
    - \* It held that an Internet search engine operator is responsible for the processing that it carries out of personal information which appears on web pages published by third parties
    - \* It enforces “right to be forgotten”
  - \* Right to have transparent and clear privacy policies

# Data subjects' Rights under GDPR

- \* Right to ask for human intervention in automatic decision-making process with legal consequences
  - \* E.g. HMRC website has a questionnaire that decides if you are self-employed or employed-
    - \* And its decision is legally binding!
    - \* GDPR will mean individuals have right to object if information chatbots present is wrong – and to insist that a human reviews the case
  - \* Machines could otherwise make decisions that affect us (credit scores, legal decisions...)

# Data subjects' Rights under GDPR

- \* Right to data portability (Article 20 GDPR):
  - \* individuals can ask for the details of their data to be transferred (E.g. in CSV format) to prevent lock-in to one vendor
    - \* allows social media data or energy data to be transferred to a different platform
    - \* or to be sold by individual
    - \* so you can access your Facebook data and remove it

# Data subjects' Rights under GDPR

- \* Websites etc must clearly separate “Right to consent to processing” and “right to consent to contract”:
  - \* Prohibition of "click-wrap mechanisms"
    - \* Prevents bundling of a click "I agree" with right to access a website with at the same time forcing you to forfeit your privacy rights
  - \* Effective right to withdraw consent to processing

# Obligations of data controllers

- \* Data controllers = the organisation processing the data
  - in effect, you will be involved in the decisions to fulfil the organisation's obligations
- \* Obligation to inform:
  - \* Use of privacy policies. ATTENTION: the GDPR changes the game played.  
Transparency and clarity
- \* Obligation to secure BY DESIGN:
  - \* Think: cybersecurity special skills – worth paying a specialist if you don't have the skills as a software developer

# Obligations of data controllers

- \* Obligation: PRIVACY BY DESIGN (Article 25 GDPR)
- \* Obligation to provide a trail of decisions made
- \* Auditing mandatory
- \* Certification schemes with data seals to guarantee privacy and security
- \* Obligation to have a data protection officer independent and impartial within organisation

# Obligations of data controllers

- YOU will have to
  - keep track of any discussion and of any decision made,
  - so you can PROVE you created software and systems that
  - implement privacy and security by design
- \* Failure to meet any of those obligations
  - \* See <https://gdpr-info.eu>, <https://gdpr.eu>
  - \* BIG Fines (GDPR) for your organisation
- \* Cloud servers will not be exempt from GDPR enforcement

# Obligations of data controllers

- \* BIG Fines (GDPR) for your organisation:
  - \* 4% of worldwide turnover, or €20m (whichever is greater) for not having sufficient customer consent to process data or violating the core of Privacy by Design concepts
  - \* Or 2% of worldwide turnover, or €10m (whichever is greater), for
    - \* for not having their records in order (article 28),
    - \* not notifying the supervising authority and data subject about a breach
      - \* Uber says 2.7m Brits hit by breach that was covered up
      - \* But only fined £385,000 under old DPA laws

# Obligations of data controllers

- \* What matters for compliance is that:
  - \* You instigated privacy and security by design from the outset
  - \* That you assessed the risks to privacy, equality (avoid discrimination, direct or indirect), political rights etc...
  - \* That you were reasonable in your approach, including asking for advice to the Information Commissioner Office
- you can get the decision wrong, but you need the trail of paperwork to show you were not negligent

# Personal data - anonymisation

To keep clients' data safe, you may try to “anonymise” it.

Definitions:

\* Anonymisation:

- \* only if re-identification is impossible (risk = zero), is data said to be anonymised.

- \* DPA and GDPR would not apply

\* Pseudonymisation: defined in Article 4(5) GDPR. Any data which can be re-identified with additional information.

- \* DPA and GDPR apply – Article 25 GDPR

- \* Even if the risk is of one per cent.

- \* = pseudonymisation is no escape to data protection compliance

# Difficulties with the DPA

- \* Difficulty in trading across international boundaries:
  - \* EU regulations place strict controls on the transfer of personal data to organisations based outside of the EU.
  - \* SAFE HARBOUR has been cancelled in GDPR
  - \* Privacy shield tries to provide better safeguards between EU and US; but it's criticised
    - Think regional: can I store data in the EU, or Canada, not the US?

# Difficulties with the DPA

- \* Lack of clear guidance:

- \* Many organisations have found it difficult to incorporate new data protection legislation into existing company policies and procedures.
- \* Consult website of INFORMATION COMMISSIONER AND ARTICLE 29 Working party
  - \* they have detailed guidance with specific, practical examples
  - \* This working party makes recommendations that effectively become law

### 3. Freedom of Information Act

# Freedom of Information Act 2000

- \* The Act gives members of the public the right to access information held by public authorities.
  - \* For example these include:
    - \* Government departments and local authorities;
    - \* Schools, colleges and universities;
    - \* Local Education Authorities; health trusts, publicly funded museums
    - \* And thousands of other organisations.
- \* From 1 January 2005, public authorities must reply in writing within 20 working days to specific requests for information, declaring whether they hold information of the kind requested. If so, they must then respond appropriately.

# Scenario

## \* A prominent journalist writes to a University:

"Dear Sirs

I am making an application under the Freedom of Information Act for information on all your courses in the 'Department of David Beckham Studies'. Please supply me with the following:

1. A list of all courses and all modules taught within each course
2. Details of the fees charged for each course
3. The number of students enrolled on each module
4. The contact details of all the students enrolled on each of the courses

Yours A. Nosey-Parker"

## \* How should the university reply?

# 4. Privacy and Electronic Communications Regulations (2003)

# Privacy and Electronic Communications Regulations (2003)

- \* Came into force in December 2003
- \* Brought the UK into compliance with the rest of the European Union regarding issues such as e-mail marketing and telesales.
- \* Regulates the use of publicly available electronic communications services for direct marketing purposes.

# Privacy and Electronic Communications Regulations (2003)

- \* Also covers unsolicited direct marketing activity by telephone, fax, e-mail and automated calling systems and even text messages.
  - \* Now requires consent (opt-in) and opt-out:
  - \* Organisations cannot merely add people's details to their marketing database and offer an opt out after they have started sending direct marketing.
- \* Includes requirement to accept or decline cookies
  - \* Must still be able to access the site if you decline cookies
    - \* ...although maybe with reduced features

# Security Laws

# Security Laws:

These are described in the following slides:

- I. Computer Misuse Act (1990) – updated 2006 and 2015
  - I. Police and Justice Act (2006)
  2. Serious Crime Act 2015
2. Electronic Communications Act (2000)
3. Regulation of Investigatory Powers Act (2000)
4. Investigatory Powers Act 2016 (dubbed the snooper charter)

# I. Computer Misuse Act (1990)

# Computer Misuse Act (1990)

- \* Abbreviated CMA 1990

- \* Three offences were originally recognized:

- Section 1: “Unauthorized Access”

- Section 2: “Unauthorized Access with Intent”

- Section 3: “Unauthorized modification”

# Computer Misuse Act (1990)

\* Since CMA 1990 creation, it was modified by:

- \* The Police and Justice Act 2006:
  - \* Modified s1 CMA: sanction increased to one year
  - \* Modified s3 CMA: the definition of the offence and the penalties increased
  - \* Added new s3A CMA: misuse of tools
- \* The Serious Crime Act 2015:
  - \* Modification of s3A CMA
  - \* Added new offence of s3ZA CMA: it's s3A but for critical infrastructures.

# SI of CMA: “Unauthorised access”

- \* Any conduct or action which would enable access without authorisation.
- \* Up to 12 months imprisonment.
- \* Extradition is possible.
  - \* See Lauri Love case
    - \* Computer activist alleged to have stolen huge amounts of data from US agencies
  - \* or Gary McKinnon case
    - \* Alleged to have broken in to US military; he claimed to be looking for UFO cover-ups
    - \* Both threatened with extradition to USA for trial

# SI of CMA: “Unauthorised access”

- \* Authorisation:

- \* Express: you've been permitted to access
- \* Implied: you've been permitted to access BUT implicitly only for a specific purpose.
  - \* E.g.: you're a police officer; you have access to the Police National database; implicitly, you don't have access to the database to check personal matters

# SI of CMA: “Unauthorised access”

- \* Even guessing a password *wrongly* is an offence!
  - \* You do not need to obtain access
  - \* You type a password to gain access, knowing you have no authorisation
  - \* = you commit the offence
- \* The only exclusion is roughly, reading something on a screen that is left open.
- \* But as soon as you move the mouse or use the keyboard, you commit the offence.

# SI of CMA: “Unauthorised access”

- \* Scanning for vulnerabilities:
  - \* You are in tricky territory if you have not expressly discussed the matter with the target
- \* Technically, port-scanning, fuzzing, etc.. can fall within the scope of criminal law as soon as your target has not authorised you.
- \* Recently some CSEE students reported a network vulnerability, and although our admins and university were grateful, the students technically broke the law!
- \* Read A Cormack, Can CSIRTs lawfully Scan for vulnerabilities? Scripted 2014, vol 11(3), 308 at <https://script-ed.org/wp-content/uploads/2014/12/cormack.pdf> (open access)

# S2 of CMA: “Unauthorised access with Intent”

- \* There must be intent to gain access to make a more serious crime
  - \* E.g. to gather data to blackmail, to steal confidential data, to cause disruption
- \* S2 of CMA has same rules as S1 of CMA
  - \* but penalties higher if intent is proven:
    - \* £ unlimited
    - \* and/or 5 years imprisonment

# S3: “Unauthorised act with intention to impair or damage”

- I. Any action which can result in:
    - \* Impairment (= damage)
    - \* Prevent or hinder access (= denial of service attack)
    - \* Impair reliability of data (= data is modified, deleted, added...)
  - 2. No need of result (no need of damage for example)
  - 3. Any above action with:
    - \* Intention
    - \* Recklessness (= a form of negligence)
- \* = committing an offence under s3 CMA  
\* £ unlimited fine  
\* and/or 10 years imprisonment

# s3A CMA: “Misuse of Tools”

- \* The Police and Justice Act 2006 added new s3A CMA:  
“misuse of tools” offence
  - \* (see <http://www.legislation.gov.uk/ukpga/1990/18/contents> )
- \* Covers three types of actions:
  - \* Creating or adapting tools to commit the previous offences
  - \* Supplying or offering for sale the tools
  - \* Obtaining for use or for supply the tools
- \* Tools = any software or data!
  - \* VERY BROAD

# s3A CMA: “Misuse of Tools”

## What does it mean?

- \* if you use Nmap, Metasploit, Burp Suite, SQL injection etc.,
  - \* And you have not sought authorisation from target,
  - \* You may be guilty of ‘obtaining’ the tool, in addition to being liable for s1 CMA.
- \* Even the use of a VPN to cover one’s track can fall within the scope of the offence, if you commit s1 or s3 CMA!!!
- \* The Serious Crime Act 2015:
  - \* Introduces modification of s3A CMA
  - \* Added new offence of s3ZA CMA: same as s3A, but for critical infrastructures.
- \* See <http://www.legislation.gov.uk/ukpga/1990/18/contents>

# CMA and theft

- \* Theft Act 1968 not applicable, but:
- \* “Computing theft” can mean the *theft of services*,
  - \* such as the *unauthorised use* of a company’s information systems.
    - s1 CMA offence
- \* Software theft (software piracy), involves making unauthorised copies of software applications
  - copyright offence

# CMA and theft

- \* Data theft:
  - \* Stealing sensitive information:
    - \* could be a s55 DPA 1998, or bring penalties under the GDPR;
    - \* Would breach civil law: confidentiality, trade secrets...
  - \* making unauthorised changes to computer records = section 3 CMA (even if you have good ‘intentions’ – a motive at law is not accepted)
- \* Theft can also involve altering computer records to disguise the theft of money or data = s3 CMA

# NO PUBLIC INTEREST DEFENCE

- \* You cannot claim a public interest defence under the CMA
- \* See R v Cuthbert 2005:
  - \* Cuthbert was a founding member of Open Web Application Security Project (OWASP)
  - \* He checked the security of a charity website he donated to
    - \* His check tripped some intrusion detection software
    - \* When interviewed by police, he panicked, and said the intrusion was caused by “the action of a proxy server”
    - \* This lack of initial clarity motivated the CPA to prosecute him
  - \* He was found guilty of s1CMA,
    - \* to the great regret of the judge.
- \* Always seek clarification if you’re in doubt
  - \* The law does not care

## 2. Electronic Communications Act (2000)

# Electronic Communications Act (2000)

- \* The Act creates a legal framework for electronic commerce, both in the private and public sectors, It:
  - \* Clarifies legal status of e-signatures
  - \* Allows government to update legislation
  - \* Ensures quality of e-signatures

### 3. Regulation of Investigatory Powers Act (2000)

# Regulation of Investigatory Powers Act (2000)

- \* The Act introduced measures that allow electronic communications to be monitored by government agencies.
- \* Many people felt that the Regulation of Investigatory Powers Act (2000) – known as the RIP Act, or RIPA – would have a profound effect on business organisations
- \* Its impact has not been as serious as predicted.
- \* The government's monitoring of electronic communications is not something new . . .

# Project Echelon



- \* Computer monitoring: The use of computer and communications technology to monitor the activities of individuals.
- \* In existence, in various forms for over 60 years, Echelon is a global surveillance system that monitors communications around the world.
- \* The project is operated by the USA, UK, Canada, Australia and New Zealand.
- \* Each day, millions of telephone calls, faxes and e-mail messages are intercepted and scanned for key words and phrases.
- \* Messages matching the search criteria used are collected and sent to the United States for further analysis.
- \* The EU Parliament asked in July 2001 the UK to explain its mass surveillance programme. Meeting was scheduled in September 2001. With 9/11, it never took place.

## 4. Investigatory Powers Act (2016)

# Investigatory Powers Act 2016

- \* In November 2016, the UK parliament passed the new Investigatory Powers Act.
- \* This is the infamous “Snooper’s charter”

# Investigatory Powers Act 2016

- \* Requires ISPs to keep a record of all websites numbers you've visited
- \* Pros:
  - \* Designed to protect us against terrorism
- \* Cons:
  - \* Privacy concerns.
  - \* If a malicious government took power, then they could identify and oppress opposition supporters
- \* Any more pros/cons?

# Investigatory Powers Act 2016

- \* Gives the government wide-ranging surveillance powers
  - \* including the ability to intercept and hack into millions of ordinary citizens' communications.
  - \* They were doing this already, with questionable legality, before this law was passed.

# Investigatory Powers Act 2016

- \* Snowden revelations of PRISM surveillance program showed what techniques were already being used, e.g. unencrypted emails were being intercepted and searched.
- \* More damaging claims included
  - \* EU offices bugged to give US advantage in trade negotiations
  - \* Merkel phone calls 'intercepted'

Source: [BBC News article](#)



Edward Snowden  
1983-

# Other Relevant UK Laws:

# Other Relevant UK Laws

- \* The Health & Safety (Display Screen Equipment) Regulations 1992
- \* Health & Safety at Work Act (1974)
- \* The Consumer Protection Act 1987 (Product Liability)
- \* The Trades Description Act (1968)
- \* Trade Marks Act (1994)
- \* Sale of Goods Act (1979)
  - \* See lecture on Contracts
- \* Companies Consolidation Legislation (1987)
  - \* See lecture on Financial Accounts
- \* The Anti-terrorism, Crime and Security Act (2001) was introduced after the 9/11 terrorist attacks in the US
  - \* To strengthen existing legislation.
  - \* It requires companies:
    - \* to retain data on consumers' Internet and telephone activities
    - \* to make sure the data is searchable.
    - \* e.g.: guidelines suggest that Telcos / ISPs should keep telephone & call information for 12 months, e-mail data for 6 months, and web activity information for 4 days.

# Lecture summary

- \* To be an effective CSEE worker, there is a lot of legislation you must be aware of
- \* Most important is probably data-protection act and its replacement GDPR
- \* Privacy and Security needs building in by design
- \* Quiz on Privacy and Security Laws

# Further reading

- \* Charities fined by Information Commissioner
  - \* RSPCA fined £25000
  - \* British Heart Foundation fined £18000
  - \* Information Commissioner said fine was greatly reduced because these were charities.

# Further reading

- \* Course textbook, F. Bott, *Professional Issues in Information Technology*, 2<sup>nd</sup> edition:
  - \* Chapter 13: “Data Protection, Privacy and Freedom of Information”
  - \* Chapter 14: “Internet Issues”
  - \* Chapter 15: “Computer Misuse”
- \* Careers at GCHQ: <https://www.gchq-careers.co.uk>
- \* Next lecture: Financial Accounting