It is amazing that a person’s life can be changed by a simple change in attitudes of the mind.
Case Study 1: Orbital Engine

• Revolutionary engine designed by Ralph Sarich. Better fuel efficiency, more power.

• Original venture in 1973. Thirty four years later, Orbital still has not hit the market in a big way.

• One incident: Form Australia ordered engines from Orbital and Germany. The German engines arrived early while Orbital was three months late. Ford chose to go with the German engines.
Effect on Market

• Orbital’s share price fell from a high of $25 to just over $0.08 in June 2006.
• Currently they are trading around 0.325
Case Study 2: Gourmet Gardens

- A range of fresh herbs and spices in tubes.
- Gourmet Gardens, the retail arm of Botanical Foods Company (Qld).
- Marketing in major UK and US supermarket chains. In the US a major competitor dropped out of the market.
Gourmet Gardens

Steps to success:

• Market research.

• Product research. How to keep herbs and spices fresh? No processing involved – herbs freshly harvested, pulped and packed. New tube design.

• Good marketing.

• Good product.
Statistics and Business

Business increasingly depends on collecting and analysing data on:

- Market share
- Market perception
- Interest rates
- Unemployment
Statistics in Business

- Demand
- Product quality
- Consumer profile
- Consumer confidence
- .......
Example
Consider the following example. Given a tax regime, find the number of hours one should work to optimise income?
Our Situation

In this case it is clear what the optimum is. Easy here because the relationship between income and hours is known – deterministic.

In this course we deal with uncertain phenomenon.
Examples

For Example:

• Will the new sleek design of our new model car be popular?

• How many pies will a fast food sell on Anzac day?

• When do I sell my shares for maximum returns?

• What will the power demand be in January 2008 in Perth? Depends on the weather.
Aim of Course

- We need to model these are other such situations.
- The aim is to use available (useful) information to answer relevant questions, to make better, informed decisions, so business performance can be improved.
- Basis of decisions is evidence = data.
Data Analysis

Data analysis is, broadly speaking, a two step process:

1. **Exploratory Data Analysis (EDA):** plots, graphs, summary statistics are used to get a “feel” for the data.

2. **Inference:** The data is used to make decisions and draw broad conclusions.
Course Overview

• **Uncertain events** can only be described in terms of **probabilities**. Thus we will need to cover some probability.

• This will then be used in **data modelling and analysis**. Relevant examples and case studies from business will be presented.
Introduction to Excel
What is Excel?

• Excel is a Microsoft Office product. It is a spreadsheet package.
• It consists of a grid of rows and columns.
• It is an environment suited to number and data manipulations and graphics.
• It makes repetitive calculations easier.
Basics of a Spreadsheet

Spreadsheets are made up of
• columns
• rows
• and their intersections are called cells
  In each cell there may be the following types of data
• text (labels)
• number data (constants)
• formulae (mathematical equations that do all the work)
Columns

In a spreadsheet the COLUMN is defined as the vertical space that is going up and down the window. Letters are used to designate each COLUMN'S location.

In the above diagram the COLUMN labelled C is highlighted.
Rows

In a spreadsheet the **ROW** is defined as the horizontal space that is going across the window. **Numbers** are used to designate each **ROW**'s location.

In the above diagram the **ROW** labelled 4 is highlighted.
Cells

In a spreadsheet the **CELL** is defined as the space where a specified row and column intersect. Each **CELL** is assigned a name according to its **COLUMN letter** and **ROW number**.

In the above diagram the **CELL** labelled **B6** is highlighted. When referencing a cell, you should put the column first and the row second.
Types of Data

In a spreadsheet there are three basic types of data that can be entered.

<table>
<thead>
<tr>
<th>data types</th>
<th>examples</th>
<th>descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LABEL</td>
<td>Name or Wage or Days</td>
<td>anything that is just text</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>5 or 3.75 or -7.4</td>
<td>any number</td>
</tr>
<tr>
<td>FORMULA *</td>
<td>=5+3 or = 8*5+3</td>
<td>math equation</td>
</tr>
</tbody>
</table>

*ALL formulae MUST begin with an equal sign (=).*
Labels in Excel

Labels are text entries. They do not have a value associated with them. We typically use labels to identify what we are talking about.

One use of labels is for column names.

We use labels to help identify what we are talking about. The labels are NOT for the computer but rather for us so we can clarify what we are doing.
Constants

Constants represent fixed number data. They may be different types of numbers.

In this example, the constants represent money and interest rates.
Formulae

*Formulae* are entries that have an equation that calculates the value to display. We DO NOT type in the numbers we are looking for; we type in the equation. This equation will be updated upon the change or entry of any data that is referenced in the equation.
Using Cell Referencing in Formulae

• If you use constants in formulae then the results cannot be automatically updated when the numbers change.

• If your formula refers to data in the worksheet then the results are automatically updated when you update the formula.
Example

The Annual Interest has been computed by a formula, using cell referencing. Thus if the interest rate changes, all we have to do is update the interest rate, and the Annual Interest is automatically re-calculated.
Basic Arithmetic

+ = addition
- = subtraction
* = multiplication
/ = division
^ = power
Built-in Functions

Go to Insert -> Function or click on Functions Wizard to see the selection of functions available in Excel.
Common Functions

• Sum
• Average
• Stdev
• Max
• Min
• Count
• sqrt
Arguments to Functions

• You can type in the cells that contain the data to be used by the function.
• Alternatively, you can click on the cells to select them as arguments to the function.
Copying Formulae

- You can copy formulae to other cells by using Fill Down and Fill Right.
- Less common is to use Fill Up and Fill Left.
- These are available from the menu Edit -> Fill.
- Alternatively, select the cell containing the formula, and position the cursor on the bottom right of the cell. The cursor will turn into a cross. Now simply drag the cursor to select the cells into which you want to fill the formula. The formula will be copied into these cell.
Example

In the loans example, the formula for Annual Interest was filled down.

Demonstrate
Cell Formatting

From the menu *Format* -> *Cells* various cell formats can be selected. Also under *Format* are various row, column and Worksheet formatting options.
Example: Number

Various number formats are available, including Time, Date and Currency. You can display numbers to a specified number of decimal places.

Once the cells are correctly formatted, arithmetic can be performed on the numbers giving the correct results.

For example, note that in the Loans example, we had the Interest Rates as %. 

![Format Cells dialog box with General category selected]
Inserting Columns, Rows, Cells and Worksheets

- Excel organises data in Workbooks. Each Workbook can contain several Worksheets.
- Use the menu *Insert* and choose to insert a column, row, cells or a worksheet.

**Demonstration:** In the Loans data file, insert a column before the first column, and three rows before the first row.
Repeating the last command

Use either:

\emph{Edit} -> \emph{Repeat} ...

Or \emph{Ctrl y}

Demonstration: Repeat the last command in the Loans data file.
Naming Worksheets

Right click on the Sheet1 tab on the bottom left hand side, and select Rename. Note that you can also delete and insert worksheets this way.

If you re-position worksheets in the workbook by simply dragging and dropping using the mouse.
More About Cell Referencing

The full power of Excel can be harnessed by correct referencing of cells in formulae.

Absolute reference: $A$1 refers to that specific cell.

Relative reference: $A$1 refers to the column A but the row reference is relative
A$1 refers to row 1 but the column reference is relative
A1 has both the column and row reference as relative
Demonstration

For the loans data, we want to compute the annual interest payments for various interest rates. What formula do we enter?
Defining Constants

Using constants makes typing formulae easier – we do not need the cell reference for the constant, just its name. To define a constant, select the cell that contains the constant. Then click on the Name Box on the top left hand corner of the worksheet. Enter the name for the constant in that cell and hit Enter. The name now refers to the data in that cell, and can be used in formulae.
Defining Names

Any subset of the worksheet can be given a name. Just highlight the cells, go to **Insert -> Name -> Define**

Enter a name for these cells, then click on **Add**. Note that names can also be deleted in this way – select the name and click on **Delete**.
Demonstration

We can define names for the interest rates in the loans data file. Then we can use these names to compute annual interest payments.
Tables

Use the menu *Insert -> PivotTable* to prepare tables of counts of data. The following dialogue box appears, which needs to be filled in.
Select Table Columns and Rows

Now Excel prompts the user for the categories that define the columns and rows, and the data that goes into the body of the table – the *Data Area*.

You will get different counts in the table according to your choice of the data that goes in the Data Area! Make sure that you interpret the table correctly!
Demonstration

For the survey data on working women, prepare a table of the number of women against the number of children.
Transposing Data

Sometimes data that is in rows need to be in columns. To transpose data in Excel, simply copy the required area of the worksheet, then select *Paste Special*. One of the options at the bottom right hand of the dialogue box is *Transpose*.