

Topic: Exploratory Data Analysis (EDA)

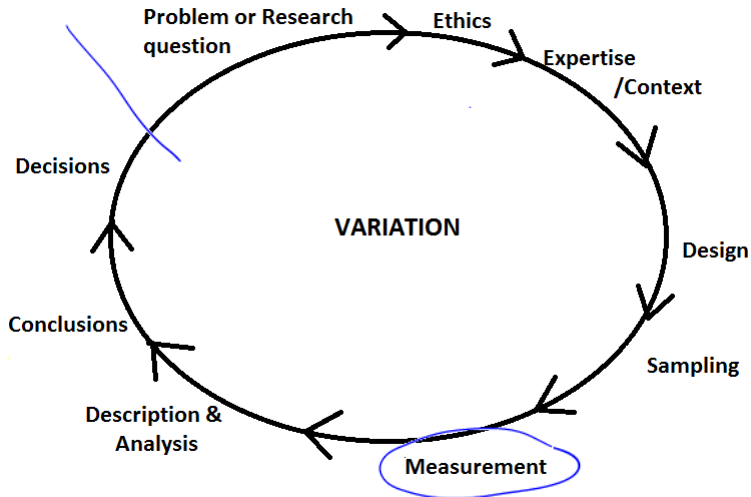
Measurement

School of Mathematics and Applied Statistics



UNIVERSITY
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Statistical Process or Problem Solving Process

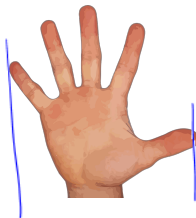


Measurement

May be

- **simple**

- measuring your
hand span



one dimension

- **complex**

- measuring the
spread/path of a bushfire,
heat, etc



Activity: Physical Measurement

Measurement Exercise: Estimate the width (in metres) of the room.

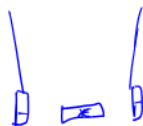
In a previous year, 2 volunteers were asked to estimate the width of the lecture theatre. *You might like to try this for the room you are currently in.*

Person 1 results:

- $< 9m$
- $\approx 9m.$

Person 2 results:

- $\approx 7m$
- $\approx 8m$



Discuss:

- What do you notice?
- How could the estimation be improved?
- What would be an appropriate measurement tool?



- 1) $9m\ 32cm$
- 2) $9m\ 46cm.$

Measurement cont.

In our estimation example:

- there needed to be better specifications
- We need to know where to start and where to finish.

Measurement considerations:

- Measurement may be a source of variation, usually called measurement error.
- There is variation between people measuring same quantity
- There is some variation within measurements taken by one person
- Variation between measurers is often greater than within one person's measurements

Units of Measurement

International System of Units

Unit name	Symbol	Quantity
metre	m	length
kilogram	kg	mass
second	s	time
Kelvin	K	thermo dynamic temperature
Ampere	A	electric current
Mole	mol	amount of substance
Candela	cd	luminous intensity

Source: <http://physics.nist.gov/cuu/Units/units.html>

Other types of Measurement

Educational and psychological measurement ✓

- There are many educational / psychological measures or scales
eg intelligence (eg. WISC), depression, anxiety, cognitive impairment
- Many employers use psychological measurement for selection purposes
- Needs to be **valid** - does the questionnaire measure what it says it measures?
 - Are the questions culturally / gender/ age appropriate?
- Needs to be **reliable** - would the same measure be obtained if the questionnaire was repeated?
- Standardised tests go through a rigorous procedure of development

Measuring uncertainty - probability //

Measurement by Estimation

- There is variation in estimates
- Individual estimates are often unreliable \Rightarrow repetition.
- However the centre of the distribution may provide a good estimate

This leads us to the different types of **summary statistics**