RESEARCH PARADIGMS & METHODOLOGIES

By
René Pellissier

'Science is best defined as a careful, disciplined, logical search for knowledge about any and all aspects of the universe, obtained by examination of the best available evidence. And always subject to correction and improvement upon discovery of better evidence. What's left is magic. And it doesn't work.'

James Randi

PROGRAMME LAYOUT

• Day 1: Research design overview
• Day 2: Research paradigms and methods

Rene Pellissier
renepellissier@gmail.com
+27 82 887 1927
27 October 2010

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00</td>
<td><strong>SESSION 1: RESEARCH METHODS</strong></td>
</tr>
<tr>
<td></td>
<td><em>Overview of research strategies</em></td>
</tr>
<tr>
<td>10:30-11:00</td>
<td>Tea</td>
</tr>
<tr>
<td>11:00</td>
<td><strong>SESSION 2: RESEARCH METHODS</strong></td>
</tr>
<tr>
<td></td>
<td><em>Quantitative research methods</em></td>
</tr>
<tr>
<td>13:00-14:00</td>
<td>Lunch</td>
</tr>
<tr>
<td>14:00</td>
<td><strong>SESSION 3: RESEARCH METHODS</strong></td>
</tr>
<tr>
<td></td>
<td><em>Questionnaire design</em></td>
</tr>
<tr>
<td>15:15-15:30</td>
<td>Tea</td>
</tr>
<tr>
<td>15:30</td>
<td><strong>SESSION 4: RESEARCH METHODS</strong></td>
</tr>
<tr>
<td></td>
<td><em>Qualitative research methods</em></td>
</tr>
<tr>
<td>16:15</td>
<td>Closing day 2</td>
</tr>
</tbody>
</table>

**STRUCTURE**

- **Preamble**
- **Qualitative vs Quantitative**
  - Differences
  - Advantages
  - Disadvantages
- **Quantitative research methods**
  - Types
  - Statistical techniques
- **Questionnaire design**
- **Qualitative research methods**
WHY AM I DOING THIS RESEARCH?

personally

Qualitative designs

academically

Quantitative designs
career wise

interests

Mixed methods

problem mind

Quality of the research

HOW AM I DOING THIS RESEARCH?

Chain of reasoning for research
(Krathwohl, 1998)

1. Link to existing studies
2. Conceptual, operational, review, state of art
3. Design
4. Conduct findings, outline, development, data collection, data analysis
5. Interpretation
6. Conclusions
7. Links to and usage
8. Explanation or extension of next study

Note: A prototypical chain of reasoning.
RESEARCH QUESTION/STATEMENT/PROBLEM

MAIN

LIMITATIONS
RATIONALE/SIGNIFICANCE
CONTEXT/CONCEPTUALISATION

THEORY RELATING TO CONTENT

WHAT DOES THE LIT SAY?

PARADIGM

ETHICS
QUALITY

INSTRUMENTS

CONSTRUCTS

POPULATION
SAMPLING SCHEME

VARIABLES UNDER INVESTIGATION & UNIT OF ANALYSIS
UNIT OF INVESTIGATION

DELIMITATIONS

ASSUMPTIONS

RESEARCH PROPOSAL

RESEARCH PARADIGMS
Differences between research design and research methodology

<table>
<thead>
<tr>
<th>Research design</th>
<th>Research methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic – focuses on end-product and how elements fit together</td>
<td>Focuses on research process, tools and procedures</td>
</tr>
<tr>
<td>Research problem is central</td>
<td>Tasks performed to answer research question central</td>
</tr>
<tr>
<td>Overall logic of the research</td>
<td>Steps to be taken in the research</td>
</tr>
</tbody>
</table>

"... what scientists are supposed to do is to collect novel and interesting data, which other scientists can rely upon" (Morgan, p. 482).

1. Paradigms (assumptions adopted towards truth, reality, knowledge, and how knowledge is to be used)
2. Strategies (choices with respect to how disciplined inquiry is to proceed)
3. Methods (procedures for the collection of data)
4. Analysis (techniques for the analysis of data).

Paradigms Lost - Paradigms Regained
Dave Miller, 1999
FUNDAMENTALS

Research design onion

- Cross sectional
- Longitudinal
- Experiment
- Survey
- Case study
- Grounded theory
- Ethnography
- Action research
- Deductivism
- Inductive
- Positivism
- Realism
- Objectivism
- Functionalism
- Phenomenology
- Pragmatism
- Interpretive
- Humanist

Saunders et al, 2003

Data collection methods
- Time horizons
- Research strategies
- Research approaches
- Research philosophy
Approaches to research

**Positivist**

- Quantitative, Scientific, Experimentalist, Traditionalist
- Your research question: Confirmatory, Predictive
- Reality as a concrete process
- Reality as a concrete structure
- Deductive reasoning and statistics
- Technical, scientific writing
- Covers a lot of breadth

**Phenomenologist**

- Qualitative, Subjective, Humanistic, Interpretivist
- Your research question: Exploratory, Interpretive
- Reality as a projection of human imagination
- Reality as a contextual field of information
- Inductive reasoning and attention to detail
- Literary, narrative writing

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Research strategy circumplex (1)

**QUADRANT 1**: Field strategies based on observations
- Field study
- Comp simulation
- Formal theory
- Sample survey
- Abstract

**QUADRANT 2**: Experimental strategies
- Lab experiment
- Exp simulation

**QUADRANT 3**: Respondent strategies
- Judgment studies
- Obtrusive

**QUADRANT 4**: Theoretical strategies
- Unobtrusive

Runkel & McGrath
Research strategy circumplex (2)

Summary of different research methodologies

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>FORM OF RESEARCH QUESTION</th>
<th>REQUIRES CONTROL OVER BEHAVIOURAL EVENTS</th>
<th>FOCUSES ON CONTEMPORARY EVENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>How, Why</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Survey</td>
<td>Who, What, Where, How many, How much</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Archival analysis</td>
<td>Who, What, Where, How many, How much</td>
<td>No</td>
<td>Yes/No</td>
</tr>
<tr>
<td>History</td>
<td>How, Why</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Case study</td>
<td>How, Why</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(Yin, 1995)
## Summary of current research strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Generalisability and Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judgment tasks</td>
<td>Participants judge or rate behaviours. Sampling is systematic rather than representative and the setting is controlled.</td>
<td>Moderately high on population generalisability and precision of measurement but lower on realism of context.</td>
</tr>
<tr>
<td>Computer simulations</td>
<td>Involves artificial data creation or simulation of a process. An example is the Monte Carlo simulation technique that estimates a parameter obtained by random sampling. Often used when it is difficult to obtain an analytical solution.</td>
<td>Moderately high on population generalisability and realism of context, but lower on precision of measurement.</td>
</tr>
<tr>
<td>Experimental simulation</td>
<td>Refers to the situation contrived by the researcher in which there is an attempt to retain some realism of context through the use of simulated situations and scenarios.</td>
<td>Moderately high on precision of measurement and realism of context, but low on generalisability.</td>
</tr>
<tr>
<td>Field studies</td>
<td>Investigates behaviour in its natural setting. Observant primary data collections involve data that are collected by researchers.</td>
<td>Maximises realism of context since it is conducted in a field setting, but it can be low on precision of measurement and control of behaviour variables since there is a lack of experimental control. Can also be low on generalisability to the population since the study population need not be representative of the target population (e.g., use of secondary data, collected by an outside person).</td>
</tr>
<tr>
<td>Field experiments</td>
<td>Collection of data in a field setting but manipulating behavioural variables.</td>
<td>Moderately high on precision of measurement and control variables and realism of context, but low on generalisability.</td>
</tr>
</tbody>
</table>

## Formal theories

**These include literature reviews and inductive as well as deductive reasoning. Researchers summarize existing works in order to conceptualize new models and hypotheses for subsequent empirical testing. They then do to build and explain models for development.**

Precision is traded for generalisability. Formal theories maximize on population generalisability but are low in context and precision of experiment.

## Sampling and surveys

Maximises representivity from population. Respondents are required to comment on behaviours unrelated to the context within which they are elicited.

Maximises population generalisability, but difficult to present a truly representative sample and substantial size sample, since the population has to be very clearly defined beforehand. Low on realism of context and precision of measurement.

## Laboratory experiments

Introduces participants into artificial setting for research purposes. One usually tries to create a universal setting that will not significantly influence results.

Maximises precision in measurement behaviour. Trade offs are low generalisability and low realism of context.
Types of research

Quantitative research design stresses manipulation, control, and causal/deterministic reasoning, and for some areas of study these may be either inappropriate, or unethical. Clearly, there is a wide range of human phenomena that may be very difficult to measure, so psychologists simply end up studying what is easy to study. Often what is most interesting about people cannot be measured. The simpler issues are examined at the expense of the more complex. Important areas of research are deferred. Typically, measurements are devised to suit some a-priori hypothesis, while other possible measurements and data collection are completely overlooked.

Qualitative research differs from experimental/quantitative research in several key respects. There is a deliberate attempt to collect data in the form of descriptions and meanings, especially in a way that is phenomenologically sensitive, honouring the experiential component of all knowledge, participation and observation. Qualitative research often utilizes triangulation (Janesick, 1994), and the concepts of validity and reliability need to be replaced with: credibility, transferability, dependability and confirmability (Robson, 1993). Researcher bias can be a problem, but it is dealt with by being brought out into the open and acknowledged. Research is recognized as involving co-operative inquiry (Reason, 1988, 1994; Heron, 1996), in which data observations are not collected on human subjects, but with human co-researchers. A grounded theory approach may be adopted, in which theory follows data collection rather than theory driving data collection through hypothesis and prediction (Strauss & Corbin, 1998).

What is less obvious is that there is nothing to rule out using both quantitative and qualitative approaches within the same study, and that the comparison involves more than differences in methodology. It does not take too much reflection to realize that much of the discussion on research methodology in psychology is quite redundant, and this is largely due to the failure to make a very practical distinction between the necessarily basic components of any research activity. These are outlined in the discussion of a revised model of disciplined inquiry below.
### Selecting the approach to use

<table>
<thead>
<tr>
<th>Use this approach if:</th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>You believe that:</td>
<td>There is an objective reality that can be measured</td>
<td>There are multiple possible realities constructed by different individuals</td>
</tr>
<tr>
<td>Your audience is:</td>
<td>Familiar with/supportive of quantitative studies</td>
<td>Familiar with/supportive qualitative studies</td>
</tr>
<tr>
<td>Your research question is:</td>
<td>Confirmatory, predictive</td>
<td>Exploratory, interpretive</td>
</tr>
<tr>
<td>The available literature is:</td>
<td>Relatively large</td>
<td>Limited</td>
</tr>
<tr>
<td>Your research focus:</td>
<td>Covers a lot of breadth</td>
<td>Involves in-depth study</td>
</tr>
<tr>
<td>Your time available is:</td>
<td>Relatively short</td>
<td>Relatively long</td>
</tr>
<tr>
<td>Your ability/desire to work with people is:</td>
<td>Medium to low</td>
<td>High</td>
</tr>
<tr>
<td>Your desire for structure is:</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>You have skills in the area(s) of:</td>
<td>Deductive reasoning and statistics</td>
<td>Inductive reasoning and attention to detail</td>
</tr>
<tr>
<td>Your writing skills are strong in the area of:</td>
<td>Technical, scientific writing</td>
<td>Literary, narrative writing</td>
</tr>
</tbody>
</table>

### Distinguishing characteristics

<table>
<thead>
<tr>
<th>Question</th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the purpose of the research?</td>
<td>To explain and predict</td>
<td>To describe and explain</td>
</tr>
<tr>
<td>What is the nature of the research process?</td>
<td>Focused</td>
<td>Holistic</td>
</tr>
<tr>
<td>What are the data like, and how are they collected?</td>
<td>Interval/Ratio data</td>
<td>Textual and/or image-based data</td>
</tr>
<tr>
<td>How are data analyzed to determine their meaning?</td>
<td>Statistical analysis</td>
<td>Search for themes and categories</td>
</tr>
<tr>
<td>How are the findings communicated?</td>
<td>Numbers</td>
<td>Words</td>
</tr>
</tbody>
</table>

- For more details, refer to the diagram on page 27.
Data

- Primary data
- Secondary data

Data closest to the truth are the primary data - in the literature this is what a research reports directly. Secondary data are further away from the truth - in the literature this is what other researchers report about the original researcher's work.

Data are not an absolute reality! Data are manifestations of a reality. Research tries to discover underlying truths. Data are a link between Absolute Truth and the researchers’ inquiring mind.
DATA COLLECTION

1. Get permission from institution
2. Decide on data type
3. Decide on where to get data
4. Data collection should be clear and easy to use
5. Back-up data file
6. Train people to do data collection so that they know what you want
7. Project manage where and when of data
8. Interviews:
   a. Do not influence the behaviour to be observed
   b. Bias
   c. Boredom
   d. Stick to definition and predetermined focus

MEASUREMENT SCALES FOR DATA

<table>
<thead>
<tr>
<th>NOMINAL DATA</th>
<th>ORDINAL DATA</th>
<th>INTERVAL DATA</th>
<th>RATIO DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes/no responses to questions</td>
<td>Level of skin burns, e.g. 1st, 2nd, 3rd degree burns indicate seriousness</td>
<td>Temperature, e.g. increase in centigrade scale: 40°C is not twice as hot as 20°C, but both have value relative to 0°C</td>
<td>Any numerical value that has meaning on its own</td>
</tr>
<tr>
<td>Hair colour (brown, black, blond)</td>
<td>Likert scale responses</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Nominal scale** - no quantitative meaning. MODE, FREQUENCY TABLES.

**Ordinal scale** - rank ordering, MODE, MEDIAN, PERCENTILES.

**Interval scale** - equal units measured and zero point is arbitrary (Likert scales)(MEANS, STDEV, CORR COEFF).

**Ratio scale** - equal units measured and zero point is absolute (Can express values in multiples that make sense).
Experimental designs
Variables and data

- Dependent variable - the variable that is influenced by something else
- Independent variable - the variable that causes something else
- Continuous, discrete variables
- Control variables - keep some things constant

Data

- Quantitative
- Qualitative
- Categoric

Continuous
- Discrete
- Ratio
- Interval
- Ordinal
- Nominal

Data and methodology

- To get meaning from the data we use research methodology
- Different questions yield different types of information
- Different research problems lead to different research designs and methods leads to collection of different types of data and different interpretation of those data
- Sometimes data dictate the research method
QUANTITATIVE RESEARCH METHODOLOGIES

• **Cross-sectional studies:** Designed to obtain information on variables in different contexts, but at the same time.

• **Experimental studies:** Allows for the manipulation of the independent variable, in order to observe the effect on the dependent variable.

• **Longitudinal studies:** The study of a problem over a period of time.

• **Surveys:** A sample of subjects is drawn from a population and studied to make inferences about the population.
Types of quantitative design

<table>
<thead>
<tr>
<th>Design</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive/Survey</td>
<td>Describes current conditions</td>
</tr>
<tr>
<td>Correlations, dependency</td>
<td>Investigates relationships</td>
</tr>
<tr>
<td>Causal comparative</td>
<td>Studies cause and effect</td>
</tr>
<tr>
<td>Experimental</td>
<td>Studies cause and effect</td>
</tr>
<tr>
<td>Forecasting</td>
<td>Identifies trends and looks for patterns</td>
</tr>
</tbody>
</table>

Descriptive/survey

- **Purpose**: to describe current conditions and characteristics of a population

- **Examples**
  1. How many students drop out of school in Ethiopia?
  2. What are the attitudes of parents, students, and teachers to an longer school year?
  3. What kinds of activities typically occur in grade 6 science classes, and how frequently does each occur?
  4. What have been the reactions of principals to innovations in teaching physical science?
Designing survey/descriptive research

Survey:
collect data from members of a population (group of people) to determine their current status regarding one or more variables

Descriptive/survey

• Types of surveys
  – Cross-sectional
  – Longitudinal
    • Trend
    • Cohort
    • Panel
Descriptive/survey

• Characteristics
  • Use of large samples
  • Use of statistical tests, questionnaires, and surveys
  • Focused on information related to preferences, attitudes, practices, concerns, or interests
  • Statistical analysis of numerical data

• Potential problems
  • Instrument development
  • Low response rates
  • Honest responses from subjects

Correlation research

• Characteristics
  ▫ Measurement with a correlation coefficient
  ▫ One group of subjects measured on two variables
  ▫ Use of instruments to measure variables
  ▫ Focused on the nature of the relationship
  ▫ Predicted score is never exact – therefore standard error of mean is used.
  ▫ Sample size minimum acceptable is 30 participants

  ▫ Regression: Looks at the direction of the relationship
### Correlation research

#### Interpretation of correlation

<table>
<thead>
<tr>
<th>Value of correlation coefficient</th>
<th>What it says about the linear regression line</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>perfect positive linear relationship</td>
</tr>
<tr>
<td>≈ 1</td>
<td>positive relationship</td>
</tr>
<tr>
<td>0</td>
<td>no linear relationship</td>
</tr>
<tr>
<td>≈ -1</td>
<td>negative relationship</td>
</tr>
<tr>
<td>-1</td>
<td>perfect negative linear relationship</td>
</tr>
</tbody>
</table>

### Causal-comparative research

#### Purpose

- To explore relationships among variables that cannot be actively manipulated or controlled by the researcher.
- Attempts to determine cause or consequences of differences existing between or among groups of individuals.
Causal-comparative research

Data analysis
– Frequency polygons
– Means and std dev (if continuous variables)
– Most common inference test is T-test (for difference between means)
– ANOVA

Experimental research

• Purpose – to establish cause and effect relationships between variables

• Unique – only research that directly attempts to influence a particular variable

• One of strongest available to determine cause and effect
Experimental research

• Examples
  • Examine the effect of teaching with a 1) co-operative groups strategy or 2) traditional lecture approach on student’s achievement
  • Examine the effect of teaching with manipulatives or a traditional algorithm approach on the test scores of algebra students

• Characteristics
  – Stringent procedures for selecting subjects and assigning them to groups
  – Manipulation of the causal variable
  – Control of extraneous variables
  – Statistical analysis of numerical data
SIMPLE DATA ANALYSES

Two sides to data analyses

- **Descriptive** statistics – summarise general nature of the data
  - Mean, mode, median, stddev, range, correlations
  - Frequencies

- **Inferential** statistics – generalise data to the universum

  Descriptive
  - Location
  - Spread
  - Symmetry
  - Kurtosis
  - Percentiles, quartiles, deciles
  - Correlation and regression.
Population and sampling
(items measuring a construct)

The population

<table>
<thead>
<tr>
<th>POPULATION CHARACTERISTIC</th>
<th>EXAMPLE OF POPULATION TYPE</th>
<th>APPROPRIATE SAMPLING TECHNIQUE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Population is generally a homogeneous group of individual units.</td>
<td>A particular variety of flower seeds, which a researcher wants to test for germination potential.</td>
<td>Simple random sampling</td>
</tr>
<tr>
<td>2: Population contains definite strata that approximately equal in size.</td>
<td>A school with six grade levels: kindergarten, first, second, third, fourth, and fifth.</td>
<td>Stratified random sampling</td>
</tr>
<tr>
<td>3: Population contains definite strata that appear in different proportions within the population.</td>
<td>A community in which residents are Catholic (23%), Protestant (45%), Jewish (15%), Muslim (5%), or nonaffiliated (10%).</td>
<td>Proportional stratified sampling</td>
</tr>
<tr>
<td>4: Population consists of discrete clusters with similar characteristics. The units within each cluster are as heterogeneous as units in the overall population.</td>
<td>Travelers in the nation’s 20 leading air terminals. (All air terminals are similar in atmosphere, purpose, design, etc.; the passengers who use them differ widely in such characteristics as age, gender, national origin, socioeconomic status, and belief system, with such variability being similar from one airport to the next.)</td>
<td>Cluster sampling</td>
</tr>
</tbody>
</table>
Sampling

- **Census** - obtain data from every member of the population
- **Sample** - subset of the population of interest
- **Sampling involves 2 issues:**
  - representative of the population
  - use to estimate characteristic of interest

**Sampling frame:**

- list of all directions that constitute the target population

Examples:
- list of telephone numbers,
- list of names and addresses,
- voters’ role

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**Probability sampling**

1. Identify sample frame = complete list of all cases
2. Decide on a suitable sample size
3. Select the most appropriate sampling technique
4. Check the sample is representative of the population
Probability sampling

**Advantages**
Researcher gets information from a representative cross-section of the population
Sampling error can be calculated
Results are projectable to the total population

**Disadvantages**
Expensive
Takes more time to design + execute than non-probability

Probability sampling issues

1. Procedures for each sampling unit has a known probability of being selected
2. Margin of error: reflects how confident the researcher is that all of the target population were surveyed
3. Confidence interval: a range or interval established by the sample results in which the true population value is thought to lie
4. Researchers can predict voting behaviour and accurately measure consumer options:
   1. Before the sampling takes place, it is possible to specify every potential sample of a given size
   2. Every sample unit has a known, nonzero chance of being selected
Non probability sampling

- Non-probability – no way of guaranteeing that each element of the population will be represented
  - Convenience – takes people that are readily available
  - Quota – respondents selected in the same proportion as found in the population, but not randomly
  - Purposive – respondents chosen for a purpose
  - Snowball – interviewees lead you to other interviewees

Non-probability sampling contd.

**Advantages**
- Generally cost less than probability
- Can be gathered more quickly

**Disadvantages**
- Results cannot be projected to total population
- Sampling error cannot be computed
- Researcher does not know degree to which the data is representative
Descriptive measures

1. Measures of location
   - Mean
   - Median
   - Mode

2. Measures of spread
   - Range
   - Standard deviation
   - Variance
   - Quantiles

3. Measures of kurtosis
   - Leptokurtic
   - Platokurtic

Example
Set 1: 10, 50, 90; mean = 50
Set 2: 49, 50, 51; mean = 50

Example
Set 1: \( \sum \text{(deviations from mean)} = 0 \)
Set 2: \( \sum \text{(deviations from mean)} = 0 \)

BUT
Set 1: \( \sum \text{(deviations from mean)}^2 = 0 \)
Set 2: \( \sum \text{(deviations from mean)}^2 = 0 \)

Variance = mean of deviations

4. Symmetry

Symmetry

Positively skewed

Negatively skewed
AVERAGES:
innovator 12
broker 8.7
producer 13
director 11
coordinator 11
monitor 8.3
facilitator 11
mentor 9.6
THE STATISTICAL HYPOTHESES

The Null Hypothesis: \((H_0)\)
no movement, or the status quo remains

The Alternative Hypothesis: \((H_a)\)
there is some association (positive or negative) between variables identified

- Null Hypotheses are never proved.
- When data run contrary to a particular hypothesis, the researcher rejects that hypothesis and turns to others as being more likely explanations of the phenomena in question.

How is this different from a research hypothesis?

Descriptive hypotheses
\(H_0:\)
\(H_a:\)

Relational hypotheses
Correlational hypotheses
Explanatory hypotheses

\(H_0:\)
\(H_a:\)

Here are the criteria we want to apply to a "good" hypothesis:

1. A good hypothesis is stated in declarative form, not as a question. Hypotheses are most effective when they make a clear and forceful statement.
2. A good hypothesis posits an expected relationship between variables. The example hypothesis clearly describes the relationship between after-school child care, the parents' attitude, and the absentee rate. These variables are being tested to determine whether one (enrollment in the after-school program) has an effect upon the others (absence rate and attitude).
HYPOTHESIS TESTING

• Research question leads to hypothesis
• Hypothesis testing steps:
  – Formulation of hypothesis
  – Selection of statistical test
  – Fix the level of significance
  – Calculate the sample statistic
  – Compare with table value or p value

STATISTICAL TOOLS IN INFERENTIAL STATISTICS

1. Cross tabulation and chi squared test - test of association/independence, goodness of fit
2. Univariate / Bivariate analysis
3. Hypothesis testing for differences between two sample means - Z test / student t test
4. ANOVA - To test whether there is any difference between means of various samples - variability within sample and variability between samples are compared using the F-test
5. Correlation - To study whether two variables are related and the strength of relationship
6. Regression analysis - Using strength of relationship to predict - independent and dependent variable
## Actions to be taken

<table>
<thead>
<tr>
<th>ACTION</th>
<th>STATE OF NATURE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H₀ true</td>
<td>H₀ false</td>
</tr>
<tr>
<td>Do not reject H₀</td>
<td>Correct ☺</td>
<td>Type II error ☹</td>
</tr>
<tr>
<td>Reject H₀ in favour of Hₐ</td>
<td>Type I error ☹</td>
<td>Correct ☺</td>
</tr>
</tbody>
</table>

## Statistically significant

1. It gives a signal that merits further investigation. One can never be a 100% sure.
2. A statistically significant result is one that is probably true, i.e. not due to chance.
3. If a test of significance reports a p value of ≤ α, then H₀ is rejected and this result is then referred to as being statistically significant.
Sampling errors and trade offs

Rejecting $H_0$ when it is indeed true (call this the Type I error) or not rejecting $H_0$ when it is actually not true (call this the Type II error). In Statistics, we measure these in terms of their respective probabilities and thus refer to the $P($Type I error$)$ and $P($Type II error$)$. Thus we write $P($Type I error$) = P($reject $H_0$ and $H_0$ is true$)$ and $P($Type II error$) = P($do not reject $H_0$ and $H_0$ is not true$)$.

That is, they predetermine the probability to make this error on the research statement under $H_0$. $\beta$ is dependent upon the difference between the hypothesized and actual values of the population parameter. Since large differences are easier to find, if the difference between the sample statistic and the corresponding population parameter is large, $\beta$ is likely to be small. Normally we chose $\alpha = .01$ or .05 thus restricting this error; $\beta$ is computed using the value of $\alpha$, the hypothesized parameter being tested and various theoretical alternatives to $H_0$. Because of this inverse relationship between $\alpha$ and $\beta$, the value of $\beta$ increases by restricting $\alpha$ beforehand.

Ideally one should reduce both errors, but there usually is a trade off between them. This can be achieved using as big a sample as possible as larger sample sizes will permit us to detect even small differences between the sample statistics and the population parameter. Alternatively, $\alpha$ should be chosen as large as one can tolerate to ensure low $\beta$ values. In practice, one should look at the cost of a Type I error vs the cost of a Type II error. For example, if it were very costly to change the status quo, the researcher should be very sure that a change will be beneficial – thus the risk of a type I error becomes important and should be kept small.

On the other hand, if you want to be very certain of detecting changes from the hypothesized value, the risk of a Type II error should be important and one will select a higher $\alpha$. It becomes a strategic decision that you as researcher in the business sciences will have to make. Note for the purists: serious pure statisticians will never accept $H_0$ as they will point out that there may always be some other $H_0$ that may be more appropriate or another sample that may negate the findings. They thus reject or do not reject $H_0$, but will refuse to accept $H_0$. No measure has perfect validity and reliability, yet some are more so than others. Use as large a sample as possible. Use parametric rather than non parametric tests where possible. Finally, $\beta = P($type II error$) = P($do not reject $H_0$ and $H_0$ is true$) = 1 - P($reject $H_0$ and $H_0$ is true$) = 1 - \alpha$.

POINT AND INTERVAL ESTIMATE

Point estimate

Provides a single statistic that is taken as a reasonable estimate of the corresponding (unknown) population parameter. The point estimate will not typically respond to the true unknown population parameter as it is based on the sample values alone. An example would be the sample mean as an unbiased point estimate of the population mean.

Confidence interval

- provides a range of possible values that the unknown population parameter can take on and a corresponding indication of the mistake made in this by providing the level of accuracy to make such a prediction.

Alternatively phrased, it is a set of consecutive values, called a confidence interval, used to estimate an unknown population parameter with a degree of certainty.
ESTIMATE PARAMETER OF INTEREST

• Use **sample information** to make inferences about population

• A mean or proportion from the sample will not be equal to the population value. Why?

• Provide a **confidence interval** instead of relying on a specific sample-based estimate when making inferences about the parameter of interest in the population

• Confidence intervals are ranges in which the “true” population parameter is assumed to lie

Sample size determination

• Desired degree of precision = maximum difference between real mean and estimated one

• The critical value of Z for the stated confidence level

• The estimate of the population standard deviation. (This can be based on prior studies or on small-scale pilot study.)

• (max – min)/6

• The projected resources, especially time and money
NORMAL APPROXIMATION RULE

Central limit theorem
No matter what the shape a probability distribution assumes, the sampling distribution of the mean has an approximately normal distribution as the sample increases

<table>
<thead>
<tr>
<th>TYPE OF ANALYTICAL TECHNIQUE</th>
<th>SAMPLE</th>
<th>EXPLANATION AND/OR EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Comparison of means</td>
<td>Random</td>
<td>E.g. ANOVA, ANCOVA, MANOVA, MANCOVA, T-tests.</td>
</tr>
<tr>
<td>2. Regression analysis</td>
<td>Random</td>
<td>Any type of linear or logistic regression.</td>
</tr>
<tr>
<td>3. Correlation analysis</td>
<td>Random</td>
<td>Any type of correlation.</td>
</tr>
<tr>
<td>4. Nonparametric analysis</td>
<td>Random</td>
<td>Any type of nonparametric statistical technique. Used in the case of small samples where no assumptions can be made about the underlying distribution of the data. E.g. Sign test, Wilcoxon signed rank test, Wilcoxon rank sum test, Spearman’s rank correlation coefficient, Kolmogorov-Smirnov test, Mann-Whitney test, Kruskal-Wallis test, Friedman test.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Topic</th>
<th>Probability / Non-Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Descriptive statistics</td>
<td>Measures of location: Arithmetic mean, Geometric mean, Median, Mode, Quantiles.</td>
</tr>
<tr>
<td></td>
<td>Measures of spread: Range, Interquartile range, Quartile deviation, Standard deviation, Variance.</td>
</tr>
<tr>
<td></td>
<td>Measures of symmetry and kurtosis: Pearson coefficient of skewness, Bowley’s coefficient of skewness, Coefficient of kurtosis.</td>
</tr>
<tr>
<td>Exploratory data analysis: Stem-and-leaf display, Box-and whisker plot.</td>
<td></td>
</tr>
<tr>
<td>6. Analysis of contingency tables</td>
<td>Random</td>
</tr>
<tr>
<td></td>
<td>E.g. Linear models, Log-linear analysis, Chi-Square independence test, Chi-Square goodness-of-fit test (large samples), McNemar’s test.</td>
</tr>
<tr>
<td>7. Factor-analytic and clustering techniques</td>
<td>Random</td>
</tr>
<tr>
<td></td>
<td>E.g. Exploratory Factor Analysis (EFA), Principal Component Analysis (PCA), Cluster Analysis, Multidimensional Scaling, Discriminant Analysis, Correspondence Analysis.</td>
</tr>
<tr>
<td>8. Structural equation modelling (SEM) and path-analytic techniques</td>
<td>Random</td>
</tr>
<tr>
<td></td>
<td>LISREL (Linear Structural Relationships), Path Analysis. Software package: AMOS</td>
</tr>
<tr>
<td>9. Time-dependent techniques</td>
<td>Random</td>
</tr>
<tr>
<td></td>
<td>Techniques for analysing data at different points in time or over a specified time period. E.g. Time-series analysis, Survival Analysis, Change-point Analysis, Sensitivity Analysis.</td>
</tr>
<tr>
<td>10. Computer simulation</td>
<td>Probability</td>
</tr>
<tr>
<td></td>
<td>E.g. simulation, Linear programming.</td>
</tr>
<tr>
<td>11. Quality control techniques</td>
<td>Probability</td>
</tr>
<tr>
<td>12. Validity - and reliability tests</td>
<td>Probability / Non-Probability</td>
</tr>
<tr>
<td></td>
<td>Types of reliability: Inter-Rater/Inter-Observer, Test-Retest, Parallel-Forms, Internal Consistency.</td>
</tr>
<tr>
<td></td>
<td>Internal consistency measures: Cronbach’s Alpha, Average Inter-item Correlation, Average Item-total Correlation, Split-Half Reliability.</td>
</tr>
<tr>
<td>13. Analysis</td>
<td>Probability</td>
</tr>
<tr>
<td></td>
<td>Meta-analysis is a statistical technique for summarising and reviewing previous quantitative research. Selected parts of the reported results of primary studies are entered into a database, and this “meta-data” is “meta-analyzed” in similar ways to working with other data by using descriptive and then inferential statistics to test certain hypotheses. The robustness of the main findings can be explored using sensitivity analysis. E.g. Mantel Haenszel analysis, Pareto analysis.</td>
</tr>
<tr>
<td>14. Subject-related techniques</td>
<td>Probability/Non-Probability</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Techniques used exclusively in specific subjects</td>
<td>E.g. Boisot’s I-space model in Knowledge Management, Logistics Cost Model (LCM) in Logistics Management, Johansen Multivariate Co-integration in Econometrics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15. Qualitative techniques</th>
<th>Probability/Non-Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Techniques used in qualitative research</td>
<td>E.g. Content analysis, Matrix analysis, Conceptual framework</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16. Other inferential statistics</th>
<th>Random</th>
</tr>
</thead>
<tbody>
<tr>
<td>Techniques which do not fall under numbers 1 to 16 above</td>
<td>E.g. Confidence intervals, Estimation methods</td>
</tr>
</tbody>
</table>

**DATAMINING**

Descriptive methods, cross-tabulations, regression & correlation, predictive

**Factor analysis** – studies interrelationships among variables. Large set of variables can be reduced to a smaller set of new variables (factors) that are more basic in meaning but contain most of the info of original set

**Cluster analysis** – each of many individuals/objects is represented by a set of measurements/variables, then categorizes individuals/objects into groups where members tend to be similar. E.g. categorize consumers into groups (market differentiation)

**Discriminant analysis** – identifies variables that best separate members of 2 or more groups. Can also be used to predict group membership on the basis of variables that have been measured/observed

**Multidimensional scaling** – based on ranking that reflects extent to which various pairs of objects are similar/dissimilar. Maps the location of objects in a perceptual space according to dimensions that represent important attributes of objects. Biggest challenge is interpretation of what dimensions mean
CONJOINT ANALYSIS

1. The objective of conjoint analysis: to determine what combination of a limited number of attributes is most preferred by respondents.

2. It is used frequently in testing customer acceptance of new product designs and assessing the appeal of advertisements.

3. Used in product positioning, but there are some problems with this application of the technique.

4. Based on those factors strategic company decisions can be made ensuring the full benefit of conjoint analysis.

1. Information collection
   Respondents are shown a set of products, prototypes, mock-ups or pictures.
   Each example is similar enough that consumers will see them as close substitutes, but dissimilar enough that respondents can clearly determine a preference. Each example is composed of a unique combination of product features. The data may consist of individual ratings, rank-orders, or preference among alternative combinations.
   The latter is referred to as "choice based conjoint" or "discrete choice analysis."

2. Analysis
   Any number of algorithms may be used to estimate utility functions. The original methods were monotonic analysis of variance or linear programming techniques, but these are largely obsolete in contemporary marketing research practice.
   Far more popular are Hierarchical Bayesian procedures that operate on choice data. These utility functions indicate the perceived value of the feature and how sensitive consumer perceptions and preferences are to changes in product features.

Advantages

- able to use physical objects
- measures preferences at the individual level
- estimates psychological tradeoffs that consumers make when evaluating several attributes together

Disadvantages

- only a limited set of features can be used because the number of combinations increases very quickly as more features are added.
- Information gathering stage is complex
- difficult to use for product positioning research because there is no procedure for converting perceptions about actual features to perceptions about a reduced set of underlying features
- respondents are unable to articulate attitudes toward new categories

PCA

- Principal Components Analysis (PCA) is a technique for simplifying a data set, by reducing multidimensional data sets to lower dimensions for analysis.

- PCA is an orthogonal linear transformation that transforms the data to a new coordinate system such that the greatest variance by any projection of the data comes to lie on the first coordinate (called the first principal component), the second greatest variance on the second coordinate, and so on.

- PCA can be used for dimensionality reduction in a data set while retaining those characteristics of the data set that contribute most to its variance, by keeping lower-order principal components and ignoring higher-order ones. Such low-order components often contain the "most important" aspects of the data.
TIME SERIES ANALYSIS

CHANGE POINT ANALYSIS
QUALITATIVE RESEARCH
METHODS

QUALITATIVE RESEARCH DESIGNS

• Case study
  – Intrinsic
  – Instrumental
  – Collective
  – Single
  – Multiple
• Action (improve and change)
• Participatory action research (empowerment, social change)
• Historical research
• Concept analysis
• Ethnography (shared culture)
• Critical ethnography
• Auto-ethnography (personal self to the broader cultural context own – explore a number of features of self – not only self but also significant others)
• Ethno-methodology (conversations)
• Feminist study (critical)

• Biographies (their words, life stories)
• Autobiography (my own life story)
• Life history (30 years of education)
• Narrative design (teacher stories)
• Mixed method design (concurrent, sequential, nested)
• Developmental case study; design research (intervention; no improvement)
• Phenomenological (own lived experience - philosophical)
• Phenomenography (experience and perceptions of others or of something)
• Document analysis study
• Qualitative clinical study (health)
• Grounded theory design (theory building)
• Discourse analysis (journalism, media, texts etc)
• Evaluation (proactive; clarification; interactive; monitoring; impact)
THE NATURE OF QUALITATIVE RESEARCH (1)

• Useful for describing and answering questions about participants and contexts

• Examine participant’s perspectives of events, beliefs, or practices: from their point of view

• Levels of meaning: levels of listening and looking

• Explore complex research areas and understand groups or phenomena

• Viable, alternative approach to questions that are not quantitative in nature

THE NATURE OF QUALITATIVE RESEARCH (2)

“The professional stranger”

• For deeper understanding: through first hand understanding

• Emphasises participants’ voices and settings: meaning emerges and is constructed by the participants (not subjects) in natural settings

• Researcher is method/instrument
KEY CHARACTERISTICS: DISCERNING SHARED PATTERNS

- A shared pattern is a common social interaction that stabilises as tacit rules and expectations of the group
  - Behaviour: action taken by an individual in a cultural setting
  - Belief: how an individual thinks or perceives things in a cultural setting
  - Language: how an individual talks to others in a cultural setting

- Types of patterns
  - Ideal: What should have occurred
  - Actual: What did occur
  - Projective: What might have occurred

DIFFERENT DESIGNS

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>PURPOSE</th>
<th>FOCUS</th>
<th>METHODS OF DATA COLLECTION</th>
<th>METHODS OF DATA ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASE STUDY</td>
<td>To understand one person or situation (or perhaps a very small number) in great depth</td>
<td>One case or a few cases within its/their natural setting</td>
<td>Observations, Interviews, Appropriate written documents and/or audiovisual material</td>
<td>Categorization and interpretation of data in terms of common themes. Synthesis into an overall portrait of the case(s)</td>
</tr>
<tr>
<td>ETHNOGRAPHY</td>
<td>To understand how behaviours reflect the culture of a group</td>
<td>A specific field site in which a group of people share a common culture</td>
<td>Participant observation, In-depth, unstructured interviews</td>
<td>Search for “meaning units” that reflect various aspects of the experience. Integration of the meaning units into a typical experience</td>
</tr>
<tr>
<td>PHENOMENOLOGICAL STUDY</td>
<td>To understand an experience from the participants’ point of view</td>
<td>A particular phenomenon as it is typically lived and perceived by human beings</td>
<td>Interviews, Any other relevant data sources</td>
<td>Prescribed and systematic method of coding the data into categories and identifying interrelationships. Continual interweaving of data collection and data analysis. Construction of a theory from the categories and interrelationships</td>
</tr>
<tr>
<td>GROUNDED THEORY STUDY</td>
<td>To derive a theory from data collected in a natural setting</td>
<td>A process, including human actions and interactions, and how they result from and influence one another</td>
<td>Tabulation of the frequency of elements or variables, or related to any other theoretical analysis based on the research question</td>
<td></td>
</tr>
<tr>
<td>CONTENT ANALYSIS</td>
<td>To identify the specific characteristics of a body of material</td>
<td>Any verbal, visual, or behavioural form of communication</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CASE STUDY RESEARCH

1. A case study is an empirical enquiry that investigates a contemporary phenomenon within a real-life context.
2. Case study research aims not only to explore certain phenomena, but also to understand them in a particular context.
3. ‘How’ and ‘Why’ questions are used in case study research.
4. The case study as a research strategy comprises an all-encompassing method, thus a comprehensive research strategy.
5. Case study research uses multiple methods for collecting data, which may be both qualitative and quantitative in nature.
6. A case study is typically used when contextual conditions are the subject of research.

DATA ANALYSIS FOR CASE STUDIES

1. Organise details/facts of the case in logical/chronological order
2. Categorise data – cluster data into meaningful groups
3. Interpret single instances
4. Identify patterns – scrutinise data for underlying themes that characterise data more broadly
5. Synthesis + generalisation – overall portrait of the case constructed, conclusions drawn that may have implications beyond the specific case studied
CASE STUDY RESEARCH - TYPES

Case studies are often described as exploratory research used in areas where there are few theories or a deficient body of knowledge:

1. **Descriptive Case Studies**: Where the objective is restricted to describing current practice.
2. **Illustrative Case Studies**: Where the research attempts to illustrate new and possibly innovative practices adopted by particular companies.
3. **Experimental Case Studies**: Where the research examines the difficulties in implementing new procedures and techniques in an organization and evaluating the benefits.
4. **Explanatory Case Studies**: Where existing theory is used to understand and explain what is happening.
5. **Single case**
6. **Multiple case**

CASE STUDY RESEARCH

IMPORTANT COMPONENTS OF DESIGN

‘Research design’, is especially important for case studies:

1. **Study Questions**: Likely to be ‘how’ and ‘why’ questions.
2. **Study Propositions**: There must be a specific ‘reason for the study’.
3. **Unit of Analysis**: Should the case study involve a specific person being studied, say a person with a rare medical problem, the individual being studied is the primary unit of analysis?
4. **Linking data to proposition**: ‘Pattern matching’ is suggested whereby several pieces of information from the same case may be related to some theoretical proposition.
5. **Criteria for interpreting findings**: If the different ‘patterns’ are sufficiently contrasting, the findings can be interpreted in terms of comparing at least two rival propositions.
**ACTION RESEARCH**

*Action Research is:*
- A method of doing case study research.
- A type of applied research, designed to find an effective way of bringing about a conscious change in a partly controlled environment.
- Conducted within a single organisation.
- An approach to enter into a situation and to bring about change and monitor the results.

**ACTION RESEARCH**

- Takes action.
- Goals:
  - To solve a problem.
  - To contribute to science.
- Is interactive.
- Is applicable to the understanding, planning and implementation of change in organisations.
- Requires pre-understanding of the research environment
- Is conducted in real-time.
The research question determines the research design, methodology & method.

**Tests:** instruments that distinguish among people w.r.t. reaction time, agility, strategy

**Good tests:** differentiate people reliably based on true scores

**Purposes:**
- Measure the nature and extent of individual differences
- Assess outcomes, categorise/classify
RESEARCH QUESTION HIERARCHY

1. **Management questions** - the dilemma that needs to be resolved
2. **Research question(s)** - fact-based translation of question that will contribute to solution of management question
3. **Investigative question(s)** - specific questions researcher must answer to provide sufficient detail and coverage of research question
4. **Measurement question(s)** - questions participants must answer if researcher is to gather information and answer management question
5. **Scale** - what type of scale is required to perform desired analysis?

QUESTIONNAIRES

- Structured and focused questions
- Saves time
- Could be self administered
  - Survey broad geographical area using web and email
  - Cheaper than one on one interviews
  - Confidentiality can be higher
A GOOD QUESTIONNAIRE

BASIC ASSUMPTIONS
• The questionnaire does not make unreasonable demands upon the respondent
• The questionnaire does not have a hidden purpose
• The questionnaire requests information that respondents presumeable have

THE QUESTIONS
• The questionnaire contains questions that can be answered
• The questionnaire contains questions that are straightforward

THE FORMAT
• The items and the questionnaire are presented in an attractive, professional, and easy-to-understand format
• All questions and pages are clearly numbered
• The questionnaire contains clear and explicit directions as to how it should be completed and how it should be returned
• The questions are objective
• The questions are ordered from easy to difficult and from easy to specific
• Transitions are used from one topic to the next
• Examples are given when necessary

FORMAT OF THE QUESTIONNAIRE

1. Detailed instructions on how to answer
2. Introduction on what you are doing
3. Group items that belong together
4. Number pages and questions
5. Tell respondents exactly what to do and how to do it
6. Use a cover letter and show support from study leader/institution
7. Do not lead the respondents
8. Be careful of undesired responses
9. Initial questions should warm up respondents = relatively simple, non-threatening, easy to answer
10. “Thank you for answering these questions about yourself. Now we would like to ask you to share your experience. Why...?”
11. Become more complicated
12. Make it easy to score using categories
13. Open-ended and closed questions

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FUNDAMENTALS OF A QUESTIONNAIRE

1. Reasonable demands on time, expense and effort to respondents
2. Avoid unreasonable, too personal or questions phrased in the wrong way
3. Design to accomplish goal not to collect data on implicit topic
4. Respondents must have relevant knowledge to share on specific topic
5. Be encouraging by asking interesting and engaging questions
6. Use other sources than questionnaires too, e.g. interviews
7. Define the topics, areas of investigation clearly to avoid misunderstanding
8. Be reasonable when planning the what, when, where and how of research plan

MEASUREMENT CONCEPTS

• The process of assigning numbers/labels - to represent, measure magnitude/level, rate/rank
• Rules for measurement:
  – Define concepts/constructs to be measured
  – Determine variables
  – Development of scale
CONSIDERATIONS IN SELECTING A SCALE

• Balanced vs Unbalanced scale
• Number of categories
• Odd or even number of scale categories
• Forced or unforced choice

Design a questionnaire - identifying a concept, construct, variables, using a suitable scale for measuring attitudes

PROPERTIES OF MEASUREMENT SCALES

• Order: the numbers assigned produce an ordering with respect to a characteristic
• Distance: the differences between the numbers assigned produce an ordering w.r.t. a characteristic
• Origin: the number zero indicates the true absence of a characteristic
TYPES OF ATTITUDE SCALES

Single item scale
1. Itemized category scale
   *Highly satisfied* *satisfied* *dissatisfied* *highly dissatisfied*
2. Rank order scale – Rank the brands based on criterion
3. Paired Comparison scale
4. Constant sum scale – Please give each criterion points based on importance assigned so that the sum is 100
5. Pictorial scale
6. Continuous scale

<table>
<thead>
<tr>
<th>Brand</th>
<th>Price</th>
<th>mileage</th>
<th>General value for money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaguar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercedes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMW</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Paired Comparison scale
3. Constant sum scale - Please give each criterion points based on importance assigned so that the sum is 100

4. Pictorial scale
5. Continuous scale

TYPE OF ATTITUDE SCALES (2)

Multi item scale
1. Semantic differential scale - used to describe a set of beliefs/attitudes - bipolar adjectives
   e.g. newspaper ratings
   Contemporary --------- old fashioned
   Comprehensive --------- limited coverage
   Editorial (good) --------- bad editorial

2. Stapel scale - An adjective placed in the centre with even numerical values on either side
   -1 -2 -3 -4 -5 friendly cabin crew 1 2 3 4 5
   -1 -2 -3 -4 -5 accurate timings 1 2 3 4 5
### SUMMARY OF SCALE TYPES

<table>
<thead>
<tr>
<th>TYPE</th>
<th>RESTRICTIONS SCALE ITEMS SCALE POINTS</th>
<th>DATA TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Category Scale</td>
<td>Needs mutually exclusive choices</td>
<td>Nominal</td>
</tr>
<tr>
<td>Multiple choice Single-Response Scale</td>
<td>Needs mutually exclusive choices; may use exhaustive list or “other.”</td>
<td>Many</td>
</tr>
<tr>
<td>Multiple Choice Multiple-Response Scale Checklist</td>
<td>Needs mutually exclusive choices; needs exhaustive list or “other.”</td>
<td>Many</td>
</tr>
<tr>
<td>Likert Scale</td>
<td>Needs definitive positive or negative statement with which to agree/disagree.</td>
<td>One or more</td>
</tr>
<tr>
<td>Likert-type Scale</td>
<td>Needs definitive positive or negative statement with which to agree/disagree.</td>
<td>One or more</td>
</tr>
<tr>
<td>Semantic Differential Scale</td>
<td>Needs words that are opposites to anchor the graphic space.</td>
<td>One or more</td>
</tr>
<tr>
<td>Numerical Scale</td>
<td>Needs concepts with standardized or defined meaning; needs numbers to anchor the end-points or points along the scale; score is a measurement of graphical space from one anchor.</td>
<td>One or many</td>
</tr>
<tr>
<td>Multiple Rating List Scale</td>
<td>Needs words that are opposites to anchor the end-points on the verbal scale.</td>
<td>Up to 10</td>
</tr>
<tr>
<td>Fixed Sum Scale</td>
<td>Participation needs ability to calculate total to some fixed number, often 100.</td>
<td>Two or more</td>
</tr>
<tr>
<td>Stapel Scale</td>
<td>Needs verbal labels that are operationally defined or standard</td>
<td>One or more</td>
</tr>
<tr>
<td>Graphic Rating Scale</td>
<td>Needs visual images that can be interpreted as positive or negative anchors; score is a measurement of graphical space from one anchor.</td>
<td>One or more</td>
</tr>
<tr>
<td>Ranking Scales:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paired Comparison Scale</td>
<td>Number is controlled by participant's stamina and interest.</td>
<td>Up to 10</td>
</tr>
<tr>
<td>Forced Ranking Scale</td>
<td>Needs mutually exclusive choices.</td>
<td>Up to 10</td>
</tr>
<tr>
<td>Comparative Scale</td>
<td>Can use verbal or graphical scales.</td>
<td>Up to 10</td>
</tr>
</tbody>
</table>

### QUESTIONS

1. No double-barreled questions: ‘and’
2. Ensure questions can be answerable
3. Be straightforward and simple
4. Leave space for justification
5. Cover all possibilities
6. Test the questionnaire
7. Pilot study, focus group
QUESTIONS (2)

1. Administrative questions: identify participant, interviewer, location, conditions

2. Classification questions: Socio-demographic variables and allow answers to be grouped to reveal patterns

3. Target questions (structured and unstructured) – investigative questions of study

**Question content:**
- Should this question be asked?
- Is the question of proper scope and coverage?
- Can the participant adequately answer this question if asked?
- Will the participant willingly answer the question if asked?

**Question wording:**
- Sharing of common vocabulary
- Vocabulary has single meaning?
- Question contains unsupported or misleading assumptions?
- Question correctly personalised?
- Are adequate alternatives presented within a question?

**Question types:**
- Free response question – open question
- Dichotomous question – suggest opposing responses
- Multiple choice questions – more than two alternatives. Rate the questions
- Double-barreled questions –
- Rating questions -

COMPUTERISING DATA COLLECTION IN DESCRIPTIVE RESEARCH

1. Directly enter data on computer
2. Use tape recorder
3. Use computer to record
4. Look for peripheral devices to aid in data collection
5. Administer questionnaire on a website
6. Use computer to clean up data
7. Online surveys:
   1. SurveyMonkey ([www.surveymonkey.com](http://www.surveymonkey.com))
   2. Zoomerang
COVER LETTER

1. Essential part of questionnaire
2. Helps set the scene of what to come, especially if questionnaires are web-based or emailed
3. Official letterhead
4. Dated recently thus indicating urgency of request
5. Personalised
6. Clearly states participant – ‘Dear participant’, but ‘Dear Mr Blah’
7. Clearly states purpose of questionnaire
8. Gives time estimate
9. Promises confidentiality and ensures how this will be achieved
10. Makes participants feel part of project
11. Thank participants
12. Sign the questionnaire

PROBLEMS WITH QUESTIONNAIRES

1. Low response rate
2. Respondents not necessarily representative of originally selected sample
3. Use checklists and rating scales

Checklists – list of behaviours, characteristics or other entities that the researcher is investigating Participants merely checks whether each item is observed/present/true
Rating scales – Useful when behaviour, attitude, or other phenomenon of interest needs to be evaluated on a continuum, e.g. inadequate to excellent; never to always, strongly disapprove to approve.
MAXIMISING RETURNS

1. Timing of research
2. Make a good first impression
3. Motivate potential respondents
4. Include a self-addressed envelope with return postage
5. Make them ready, work up interest
6. Be gently persistent
7. Keep a log of returns

INTERVIEWS

Quantitative study – more structured
1. Identify questions in advance
2. Consider how participants’ cultural backgrounds might impact responses
3. Find suitable location
4. Get written permission
5. Establish and maintain rapport
6. Focus on actual and not abstract/hypothetical
7. Record responses verbatim
8. Keep reactions to yourself
9. Modify questions to quantify them
10. Ask qualitative questions too
11. Pilot test questions
12. Restrict each question to a single idea
13. Save controversial questions for later
14. Seek clarification where necessary

Qualitative study
Unisa CE&O Project Database

ICT satisfaction survey

USB 2010 Alumni Association Survey

Focus Staff Newsletter Survey

Employee satisfaction Survey

Unisa Service utilisation and satisfaction Survey 2008

THE ELEMENTS OF doog tgiirgn
A bad paper will:

A bad paper will not:

PROPOSAL

• A planning document which outlines your thinking about the research problem and describes what will be studied and how;
• Serves as a blueprint for the project that facilitates execution on time, within budget, meeting quality standards
• Proposed research laid out for inspection by academic/research community
• Role players' interests
Student: ensures focus and demonstrates to Supervisor: adequate thinking and preparation for study that is indeed feasible
Academic community: link to ongoing debate in literature
• Matters to be addressed (M & D brochure) - Focus; understanding of topic; study properly demarcated; relevant and significant; feasible; manageable; problem neatly defined; argument properly developed; relevant sources consulted; academic writing
• Serve to evaluate proposal
REFERENCING

It is a way to demonstrate that you have extended your learning.

Three reasons for referencing:
• To let the reader know whose ideas you are using
• To enable your reader to check your information
• To provide information for your reader.

TERMINOLOGY:
A citation is a reference to a document. It should include all the bibliographic details needed to trace the document.

Footnotes are listed at the bottom of the page on which a reference or citation occurs in the text. A number is placed in the text to indicate the cited work and again at the bottom of the page in front of the footnote. Footnotes are used when only a small number of references need to be made.

A reference list is the list of citations (material cited) in a written work. It shows the authority on which you base statements in the text, shows how well acquainted (how widely read) you are with the subject, and is a starting point for anyone else wanting to find out about the subject.

A bibliography is a list of documents (books, articles, papers) read for a specific essay or assignment. All these references are not necessarily included in the list of references.
<table>
<thead>
<tr>
<th>Dimension</th>
<th>1</th>
<th>2</th>
<th>JOURNAL</th>
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<th>4</th>
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<td>Survey or survey combined with other</td>
<td>Conceptual</td>
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<td>CS</td>
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</table>
1. Purpose not clearly stated, hence it is not clear whether the design and methodology were in accordance with the purpose.

2. Population not mentioned.

3. Sampling procedure and technique not specified.

4. Domain not specified (e.g., IT, Marketing, HR etc.).

5. In minority of cases authors mention the time frame e.g., cross sectional survey.

6. In a limited number of cases authors mention that the study is quantitative/qualitative. In a few cases we question the explicitly mentioned option as the ‘content’ does not correspond to the option.

7. In a number of cases the authors indicate that the purpose is to test for relationships. As such probability sampling is required to do inferential statistics. Though they use non-probability sampling such as purposive or convenience sampling and if they do not explicitly state, it is implied that they generalise their findings.

8. Only one case highlighted that a convenience sample was used and non-parametric statistics, but the findings were not generalised since a non-probability sample was used, prohibiting generalisations.

9. The titles of the articles and the content did not correspond.

10. The title and hypotheses tested did not correspond.

11. The analytical technique applied did not achieve the required outcomes.

12. The authors used populations and applied inferential statistics.

### South Africa: Output and Impact by Field

(Ranked by percent share of Thomson Reuters-indexed papers, 2004-08)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Field</th>
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<th>Number of papers, 2004-08</th>
<th>Citations per paper</th>
<th>Relative impact vs. world (%)</th>
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<td>1</td>
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</table>

Source: Thomson Reuters National Science Indicators
ISI journal elements

**Impact factor**
- Journal Impact Factor
- 5-Year Journal Impact Factor
- Aggregate Impact Factor
- Journal Cited Half-Life
- Aggregate Cited Half-Life

**Immediacy factor**
- Journal Immediacy Index
- Aggregate Immediacy Index

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**MAIN RESEARCH QUESTION/STATEMENT/PROBLEM**

Limitations
Rationale/Significance
Context/Conceptualisation
Theory relating to content
What does the lit say?
Paradigm
Assumptions

Ethics
Instruments
Population Sampling scheme
Delimitations
Constructs
Variables under investigation & Unit of analysis

Data type and measurement scale
Analysis techniques

shift
CONCLUSION
There are more men ennobled by study than by nature
Cicero

My mental model is:

........................
........................
........................
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