聖若瑟大學
UNIVERSITY OF SAINT JOSEPH

Alignment, fitness for purpose, and fidelity in planning, conducting, and reporting research

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THE PROBLEM FOR THE RESEARCH TO ADDRESS

- Young teenagers are being increasingly drawn into using illicit drugs. A research study is commissioned by the local government's Social Services Department, with a small team of researchers to plan, conduct, and report the research and its findings.

THE PURPOSES OF THE RESEARCH

1. To make recommendations for interventions that can be used to address the problem.
2. To set out the contents of the interventions and how they will address the problem.

DEVISE AND WRITE THE MAIN RESEARCH QUESTION FOR THIS RESEARCH.

- The research question – the main question that the research seeks to answer – must be actionable, concrete, focused, specific, answerable, and serve/address/answer the purposes and 'deliverables' of the research. It makes the research purposes concrete, researchable, realizable, practicable, and direct. It requires answers that address the research purposes and 'deliverables'.

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THE MAIN RESEARCH QUESTION THAT SOME STUDENTS WROTE

1. What are the perceptions of young teenagers regarding illicit drug use?
2. What are the main factors that make teenagers increasingly drawn into using illicit drugs?
3. How have the current situation and trends of drug abuse among teenagers changed in the past 5 years?
4. What are the effectiveness and shortcomings of the intervention measures on youth drug abuse by the local government and relevant local social service providers?
5. How do young teenagers perceive and experience the influences that contribute to their engagement in illicit drug use?
6. What is the major age level taking illicit drugs?

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PROBLEMS WITH THE STUDENTS' RESEARCH QUESTIONS
MISALIGNMENT, UNFIT FOR PURPOSE

1. The research questions did not address the research purposes, objectives, and 'deliverables'; they did not address the recommendations for interventions and their content.
2. The research questions were not sufficiently open, i.e. the focus was too selective and did not cover the scope of the purposes sufficiently or comprehensively.
3. The research questions addressed possible causes and contexts, not recommendations.
4. The research questions made unproven assumptions.

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ALIGNMENT, FITNESS FOR PURPOSE, AND FIDELITY, IN PLANNING, DOING, MAKING CLAIMS FROM, AND REPORTING RESEARCH

All components and stages of research.

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RESEARCH QUESTIONS ARE IMPORTANT DRIVERS OF THE RESEARCH

- Research questions are the concrete questions to address the research objectives and purposes, to operationalize the research (to make it 'actionable'), and to provide concrete answers which address the research objectives, purposes, and 'deliverables'.
  ALIGNMENT, FITNESS FOR PURPOSE, & FIDELITY
- They are a bridge between, the aims, objectives, purposes, 'deliverables' and making the research feasible and actionable.
- They inform, give direction to, and drive components and stages of the research.
- They stem from the overall research purposes, objectives, and 'deliverables'.
- They look in two directions:
  - Backwards to the research purposes, objectives, and 'deliverables'.
  - Forwards to operationalize the research and make it actionable, researchable, and achievable.

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Concrete
Specific
Focused
Achievable/ Answerable
Significant
Researchable
Important
Original
Relevant
Feasible
Strong research question
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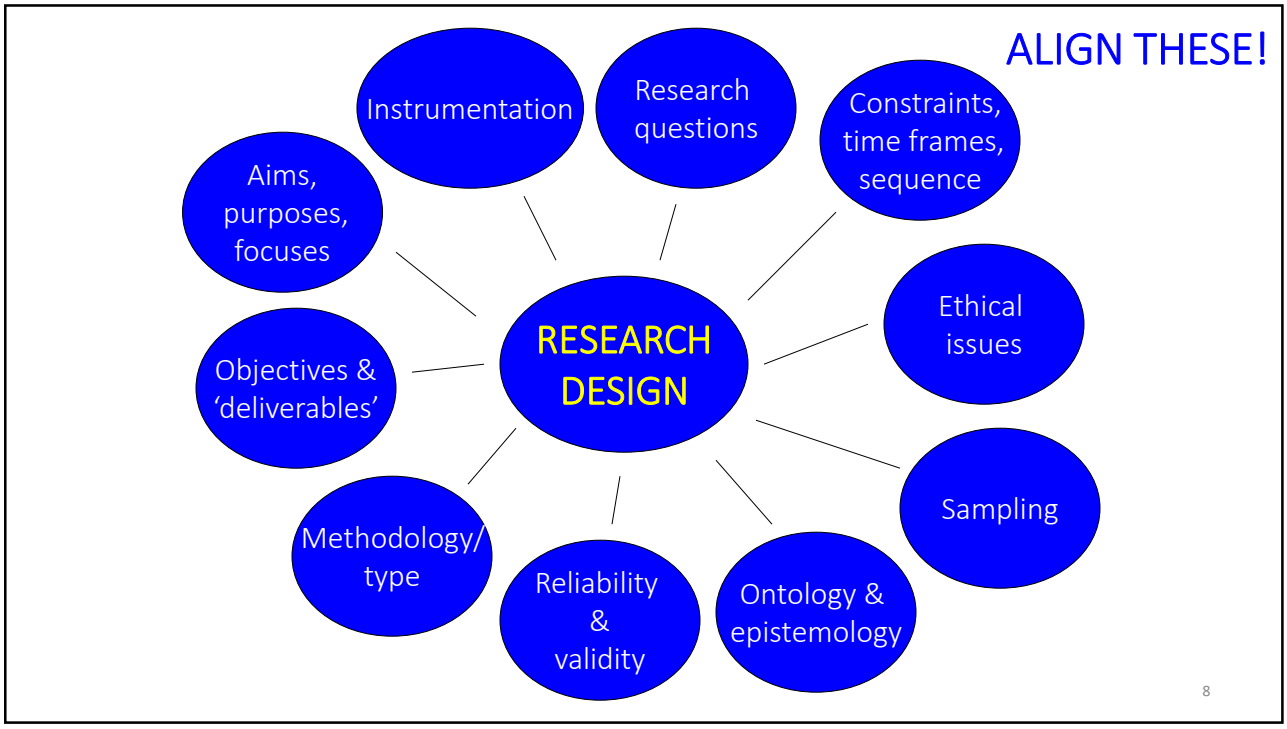
ALIGN THESE!
Instrumentation
Research questions
Constraints, time frames, sequence
Aims, purposes, focuses
Ethical issues
RESEARCH DESIGN
Objectives & 'deliverables'
Sampling
Methodology/ type
Reliability & validity
Ontology & epistemology
8

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THE LOGIC OF ALIGNMENT AND FITNESS FOR PURPOSE IN PLANNING AND CONDUCTING THE RESEARCH

1. Aims of research → Objectives/purposes → 'Deliverables' of the research →
2. ← Research questions (to operationalize the research) →
3. ← Constraints on the research/feasibility of the research →
4. ← Ontology of research →
5. ← Epistemology of research →
6. ← Methodology (e.g. survey, experiment, case study, action research, observational study) → Design
7. ← Ethics of the research →
8. ← Sample/group →
9. ← Instrumentation (data types, contents, methods, instruments) →
10. ← Data collection →
11. ← Data processing → Data analysis →
12. ← Findings → Explanations/interpretations →
13. ← Conclusions →
14. ← Claims →
15. ← Reporting

Questionnaire
Interview
Observation
Test/experiment
Documents

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COMMON ERRORS OF ALIGNMENT, FITNESS FOR PURPOSE, & FIDELITY

1. The logic, alignment, and fitness for purpose in the research and its design, conduct, and reporting are absent, unclear, incomplete, selective, weak, too limited, or simply wrong.
2. The research is weakly, selectively, incompletely and/or wrongly operationalized, e.g. the research questions do not serve the scope and necessary coverage of the aims, objectives, and deliverables of the research.
3. The methodology is weak, incomplete, selective, and/or unsuitable, a poor match for addressing the aims, objectives, ontological and epistemological foundations of the research, its deliverables and research questions.
4. The sampling and data collection instruments and data collection methods are weak, selective, incomplete, and/or unfit for purpose, and a poor match to the aims, objectives, deliverables, research questions, methodology, research design of the research.

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COMMON ERRORS OF ALIGNMENT, FITNESS FOR PURPOSE, & FIDELITY

5. The data are not fit for purpose.
6. The content and methods of data analysis are weak, incomplete, inappropriate, unfit for purpose, selective, and/or simply wrong.
7. There is a weakness or failure to analyze, explain, discuss, evaluate, interpret the data and to conclude from the data. Researchers wrongly believe that the data are self-explanatory; they are not.
8. Conclusions and recommendations do not follow from the data and evidence provided.
9. Claims made from the findings are overstated, incorrect, and/or non-sequiturs.
10. Reporting is selective, incomplete, biased, unfaithful to the findings, conclusions, and claims, i.e. misaligned and unfit for purpose.

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ALIGNMENT/FIDELITY TO THE **ONTOLOGY** OF RESEARCH (THE NATURE OF REALITY) VERSION ONE

- Objective, external reality, facts, and laws exist independent of humans.
- Reality is single, tangible, and fragmentable.
- Facts are value-free, neutral, and can be proven and measured.
- If something exists, then it can be observed and measured scientifically to discover and disclose what it is.
- Empirical knowledge (from sensory observation) can be used to discover the reality.
- Cause, effect, and laws exist and can be **proven**.
- Phenomena can be understood by analyzing **numerical data** on mathematically-based methods, particularly statistics.

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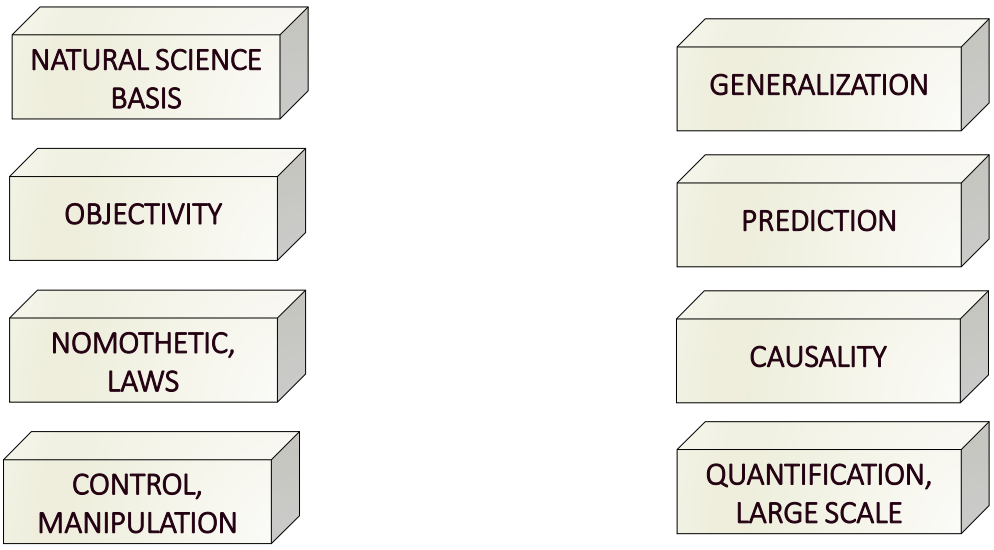
IMPLICATIONS OF VERSION ONE (MACRO)



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ALIGNMENT/FIDELITY TO THE **ONTOLOGY** OF RESEARCH (THE NATURE OF REALITY) VERSION TWO

- People are deliberate, intentional, agentic, and creative in their actions, and meaning arises out of social situations, interactions, **experiences of phenomena,** and negotiations.
- Meanings used by participants to interpret situations are **context-bound**, and there are multiple realities, not single truths in interpreting a situation.
- Realities are **constructed**, capable of sustaining multiple interpretations, including those of all parties involved. People, situations, events and objects and **unique** and have meaning conferred upon them rather than possessing their own intrinsic meaning.
- Social research must examine situations through the eyes of the participants, e.g. in **interpretive phenomenological research**.
- Phenomena can be understood by analyzing **qualitative** data.
- The attribution of meaning is **constructed,** continuous and evolving over time.

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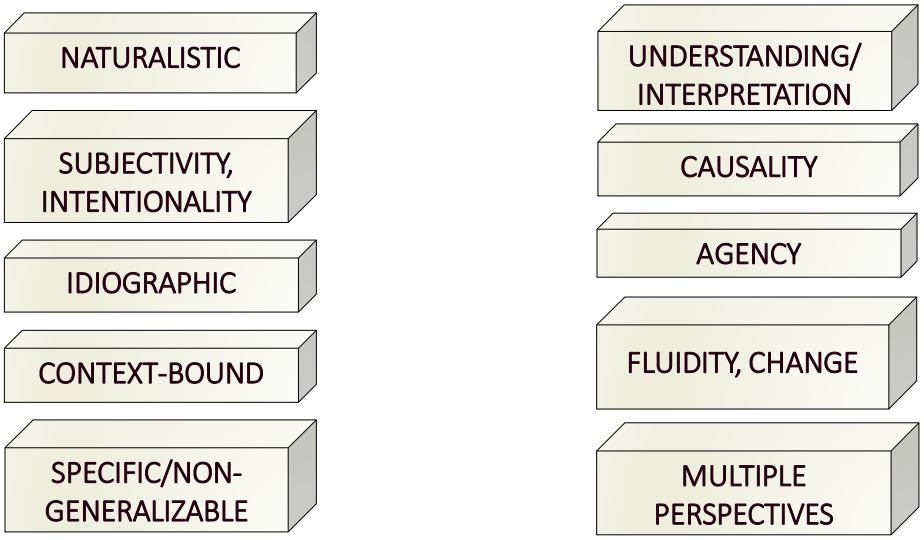
IMPLICATIONS OF VERSION TWO (MICRO)



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ALIGNMENT/FIDELITY TO THE **EPISTEMOLOGY** OF THE RESEARCH

How we know reality (the nature of knowledge and how to justify knowledge)

- An **objectivist**, 'etic' view of knowledge. Knowledge is independent of, and outside of, the researcher. Researchers are outside what is being investigated; they cannot influence or be influenced by what is being investigated. Controls in the research (e.g. disturb the context).
- A **subjectivist**, 'emic' view of knowledge. Knowledge is the construct of the participants. Reality exists inside the individual, is socially constructed and mind-dependent; people create and understand it only through their perceptions, interpretations, and interactions. Natural context (e.g. do not disturb the context).

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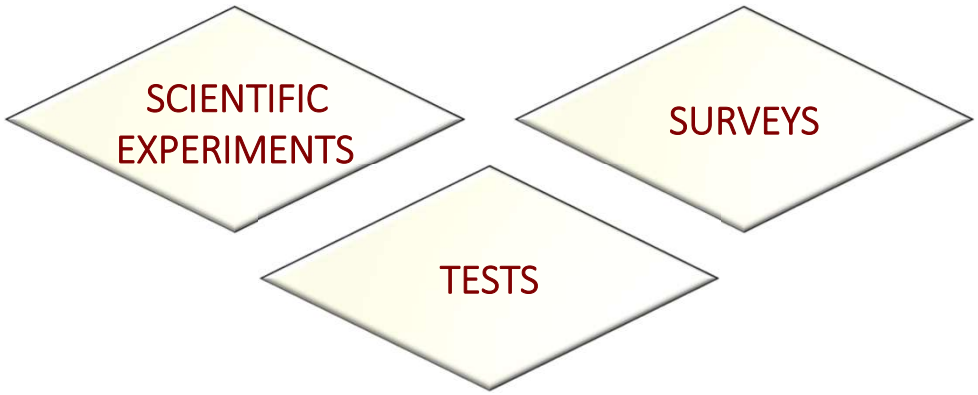
VERSION ONE 'SCIENTIFIC' METHODOLOGIES



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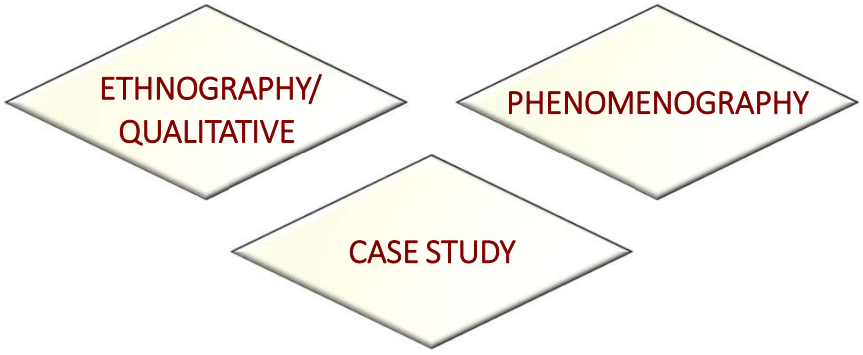
VERSION TWO INTERPRETIVE METHODOLOGIES



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ALIGNMENT/FIDELITY TO THE **METHODOLOGY** OF THE RESEARCH

QUANTITATIVE APPROACHES	QUALITATIVE APPROACHES
i. Empirical	i. Interpretive
ii. Independence of facts and theories, researchers	ii. Facts are always theory-laden
iii. Independence of facts and values	iii. Interdependence of facts, values, researcher
iv. Hypothesis testing	iv. Hypothesis generation
v. Positivist, proof, prediction	v. Understanding insider/different subjective perspectives
vi. Testing predefined theory	vi. Emergent theory: theory generation
vii. Experiments ('true'/quasi'), surveys, tests	vii. Understanding, emergent understandings over contexts (time, settings, locations etc.)
viii. Statistical analysis	viii. Rich/'thick descriptions'
ix. Isolation, control, manipulating variables	ix. Inclusion of all variables
x. Reliability (consistency, replicability), validity (construct, content)	x. Authenticity, honesty, dependability, credibility, confirmability, transferability
xi. Generalizability, 'laws', patterns	xi. Uniqueness
xii. Stability of findings	xii. Findings change ongoingly by time/contexts

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ERRORS IN DECIDING **METHODOLOGY & METHODS**
ERRORS OF FITNESS FOR PURPOSE AND ALIGNMENT

1. **Methodology,** e.g. the type of research (e.g. survey, experiment, case study, action research, ethnography), is decided by the researcher's **preference, expertise, prior experience**, instead of by the research purposes, research questions, and 'deliverables'.
2. The research **methodology** is incapable of meeting the research purposes, objectives, 'deliverables', and research questions, and does not follow from, or align with, the ontology and epistemology of the research.
3. The **methods** of the research (e.g. instrumentation, sampling, data collection, data types, data processing, data analysis), are decided by the researcher's **preference, expertise, prior experience**, instead of by the research purposes, research questions, and 'deliverables'.
4. **Sampling** is not appropriate and/or is weak: sampling type, sample size; sampling error; statistical power, sample representativeness; access to the sample.
5. **Instrumentation** for data collection and their contents/areas of focus are not fit for purpose, risk ethical breaches, under-address risk analysis and safeguarding.
6. **Data types, data collection, data processing, data analysis**, are incapable of meeting the research purposes, objectives, 'deliverables', and research questions.

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FIDELITY, ALIGNMENT, FITNESS FOR PURPOSE AND JUSTICE TO THE **ONTOLOGY/IES, EPISTEMOLOGY/IES AND METHODOLOGY/IES** OF RESEARCH

- Be faithful to the tenets of the ontologies, epistemologies, and methodologies of the research paradigm(s), and do justice to them, i.e. address them sufficiently.
- What research paradigm do you need to address the aims/purposes/objectives/research questions, and why?
- How faithful are the components of your research design to the paradigms and principles that you have decided to use?
- What kind of data do you need to address the aims/purposes/objectives/research questions/contents, and why?
- What kinds, contents, and methods of data collection, processing and analysis do you need to be faithful to the paradigm, methodology, data types that you have chosen, and to answer the research questions?

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FITNESS FOR PURPOSE, ALIGNMENT, AND FIDELITY

- Are the research questions fit for purpose, aligned to, and faithful to achieving the objectives, purposes, and deliverables?
- Is the methodology (the type of research) fit for purpose, aligned to, and faithful to the ontological and epistemological underpinning of the research, the objectives, purposes, deliverables, answering the research questions, of the research?
- Is the sample fit for purpose, aligned to, and faithful to the objectives, purposes, deliverables, ontology, epistemology, research questions, methodology of the research?
- Is the instrumentation (for data types, data collection, contents, and methods) fit for purpose, aligned to, and faithful to the objectives, purposes, deliverables, research questions, ontology, epistemology, methodology, sample of the research?

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ALIGNMENT/FIDELITY TO THE **DATA TYPES, DATA PROCESSING, & DATA ANALYSIS** OF THE RESEARCH

QUANTITATIVE DATA

i. Numbers/statistics
ii. Voicelessness of researcher
iii. Pre-determined
iv. Measuring, statistical analysis
v. Accuracy, precision
vi. Patterns/regularities
vii. Comparing
viii. Describing
ix. Outsider looking in
x. Structured
xi. Value-neutral

QUALITATIVE DATA

i. Words/pictures/visual data
ii. Participants' voices
iii. Open-ended/responsive
iv. Portraying
v. Uniqueness, complexity
vi. Portraying
vii. Understanding, explaining, interpreting
viii. Subjective perceptions
ix. Insider/outsider looking within
x. Unstructured/semi-structured
xi. Value-laden

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FITNESS FOR PURPOSE IN **QUALITATIVE DATA PROCESSING & ANALYSIS**

Ask how, why, and which qualitative data analysis tools are necessary for answering the research questions, i.e. how they are fit for purpose and appropriate:

- Coding, content analysis, and categorization
- Thematic analysis and thematization
- Narrative analysis
- Discourse analysis
- Constant comparison
- Core variable(s)
- Data saturation

N.B. Qualitative software only *processes* data; **HUMANS** *analyze* and *interpret* the data: what they show and what they mean.

BE FAITHFUL TO THE RESEARCH PURPOSES, DATA, AND PARTICIPANTS

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COMMON ERRORS IN **QUALITATIVE DATA PROCESSING AND ANALYSIS**

1. Failure to understand and interpret meanings, e.g. misinterpretation.
2. Unfair selectivity of data.
3. Projection of researcher's values and interests onto data selection, interpretation, and explanation (researcher bias).
4. Failure to see through the eyes of the participants, e.g. validity, reliability, authenticity.
5. Over-emphasis and under-emphasis of data and findings from them.
6. Superficiality and anecdote.
7. Fragmentation of whole persons by coding and organization by codes rather than by people.
8. Failure to obtain respondent validation.
9. Failure to use sufficient of the key tools of grounded theory, e.g. constant comparison, core variable(s), data saturation.
10. Failure to analyze the data sufficiently systematically.
11. Exclusion or underplay of contradictory and/or exceptional data, cases, and findings.
12. Neglect of the context of the data and the conditions in which they were gathered.

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COMMON ERRORS IN **QUALITATIVE DATA PROCESSING AND ANALYSIS**

13. Neglect of the participants and their characteristics.
14. Failure to do justice to details and nuances.
15. Failure to report appropriately, e.g. to use themes when narratives would do greater justice to the findings and whole persons.
16. Failure to cut a fair and justified path through an overload of data (failure in data reduction).
17. Being descriptive rather than analytical.
18. Failure to separate the signal from the noise (if there is such a signal, i.e. sometimes the noise is the signal).
19. Failure to distinguish the important from the less important: throw everything and include everything.
20. Failure to separate participants' perceptions, attitudes, and opinions from real, factual experiences.
21. A risk of researcher expectancy/Hawthorne effect.
22. Over-reliance on software to the neglect of thinking.

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FITNESS FOR PURPOSE IN **QUANTITATIVE DATA PROCESSING**

Decide which statistics are necessary for answering the research questions, and why, i.e. how descriptive and inferential statistics for parametric and nonparametric data are fit for purpose and appropriate, e.g.:

- Descriptive statistics: frequencies, measures of central tendency, distributions
- Difference testing: statistical significance and effect size
- Correlations and controls
- Predictive statistics and relative weightings, e.g. regression, multiple regression
- Factor analysis, cluster analysis
- Structural equation modelling
- Multilevel analysis

N.B. Statistics and software only *process* data; **HUMANS** *analyze* and interpret the data: what they show and what they mean.

CHOOSE THE CORRECT STATISTIC

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FITNESS FOR PURPOSE IN **DATA PROCESSING** **(USING THE CORRECT STATISTICS)**

PARAMETRIC DATA		**NONPARAMETRIC DATA**
• Frequencies, means, medians, S.D., z-scores	⟷	• Frequencies, modes, crosstabulations
• Pearson correlation	⟷	• Spearman correlation
• t-tests (independent groups/paired groups	⟷	• Mann-Whitney (M-W) (independent) Wilcoxon test paired)
• ANOVA	⟷	• Kruskal-Wallis test
• Tukey HSD/Games-Howell	⟷	• Dunn/Siegel-Tukey test
• Effect size, e.g.: Cohen' *d*, Hedges *g*, eta-squared, Glass's delta, Cohen's pooled standard deviation	⟷	• Effect size (E.S.), e.g.: E.S. = z/√N (z values from M-W; N: Observation number)
• Multiple regression	⟷	• Logistic regression/ordinal regression

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'**SAFETY CHECKS**' OF **ASSUMPTIONS** BEHIND PARAMETRIC STATISTICS.

Ratio data (continuous data, equal intervals, true zero, rank order)

FITNESS FOR PURPOSE

- Normal Gaussian curve of distribution, skewness, kurtosis, outliers?
- Sample size?
- Sub-sample sizes and equality?
- Random sampling?
- Equal variances?
- Linear relationships?
- Multicollinearity/independence of variables?

If the assumptions have not been met, then use distribution-free, nonparametric statistics.

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SAFETY CHECKS FOR LINEAR MULTIPLE REGRESSION

- Data type (ratio data)
- Sample & sub-sample size
- Normal distributions (skewness and kurtosis), e.g. Shapiro-Wilk; Kolmogorov-Smirnov
- Low collinearity (Variance Inflation Factor (VIF) and Tolerance levels of collinearity)
- No outliers (Mahalanobis and Cook's tests of distance and outliers)
- Linearity (straight-line relationship predicted with the scores on the dependent variable)
- Homoscedasticity (same variance of the residuals around the dependent variable scores)
- Normal P-P plot of Regression, Standardized Residual, and Scatterplot tests of normality
- Adjusted R Square change and model fit

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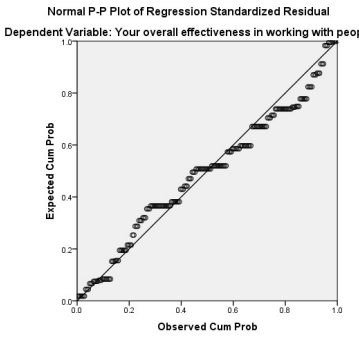
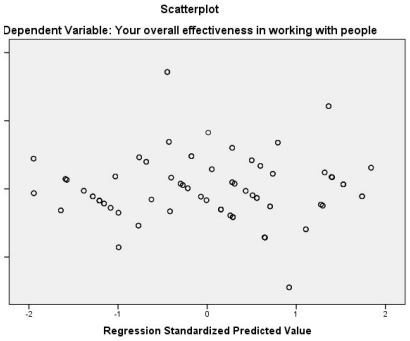
Adjusted R-square: .459

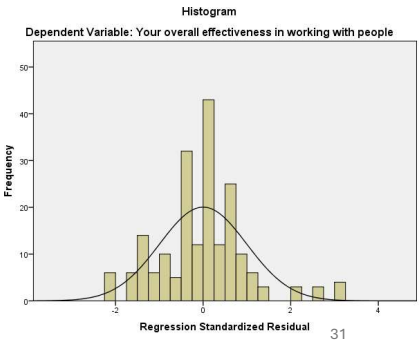
	Standardized Coefficients		Collinearity Statistics	
	Beta	Sig.	Tolerance	VIF
(Constant)		.000		
Your ability to contribute new ideas to the group	.643	.000	.124	8.081
Your ability to take on different roles in a group	.741	.000	.137	6.073

Your overall effectiveness in working with people

MULTIPLE REGRESSION SAFETY CHECKS IN FITNESS FOR PURPOSE







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TEN COMMON ERRORS IN **QUANTITATIVE DATA PROCESSING**

1. Using the wrong statistic(s), e.g. for data types (nominal, ordinal, interval, ratio, parametric, nonparametric), required assumptions, sample sizes, for purposes (e.g. using correlations for difference testing).
2. Insufficient attention is given to statistical power, confidence intervals, error margins, standard error.
3. Raw data rather than standardized data are used, e.g. to compare groups, in interpreting multiple regression.
4. Statistical significance is wrongly used as a measure of magnitude of difference. It is the likelihood of a finding being by chance, not a measure of magnitude of difference (which uses effect size).
5. Statistical significance is used when the null hypothesis has not been demonstrated.
6. There is a failure to isolate and control variables, e.g. in correlations.

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TEN COMMON ERRORS IN **QUANTITATIVE DATA PROCESSING**

7. Failure to look at the sample size in statistics and statistical significance. Statistical significance is affected by sample size: the larger the sample, the greater is the likelihood of statistical significance.
8. Overstatement of claims from effect sizes. Effect size is affected by the research design, sample size, e.g. is often overstated with small samples.
9. What data tell the researcher is **not self-evident**; data do not speak for themselves; they describe. Statistics process and describe data.

   HUMANS analyze, explain, infer, interpret, make meanings, draw conclusions, and make claims for what data and findings mean and show.
10. Researchers make claims for the findings that the data and findings do not show, i.e. they overstate their claims.

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DOING JUSTICE TO THE DATA

Correlations

		Mathematics test score	How easy do you find mathematics?
Mathematics test score	Pearson Correlation	1	.738**
	Sig. (2-tailed)		.000
	N	500	500
How easy do you find mathematics?	Pearson Correlation	.738**	1
	Sig. (2-tailed)	.000	
	N	500	500

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

Control Variables			Mathematics test score	How easy do you find mathematics?
How interested are you in mathematics?	Mathematics test score	Correlation	1.000	.071
		Significance (2-tailed)	.	.112
		df	0	497
	How easy do you find mathematics?	Correlation	.071	1.000
		Significance (2-tailed)	.112	.
		df	497	0

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A WORKED EXAMPLE

Teachers, parents, and students in Macau were asked for their views on areas of the identity and ethos of schools in Macau, giving marks of 0-10 for each of 54 items in the areas of identity and ethos.

- Ratio data with a true zero, therefore the researcher could use use statistics such as means, standard deviations, t-tests, ANOVA, Pearson correlation, multiple regression, Cohen's *d* for effect size, factor analysis, **if, and only if**, the assumptions of parametric statistics had been met.
- All parties consistently gave high marks for the areas of school identity and ethos being studied.
- The teachers gave highest marks, higher than those of parents and students.

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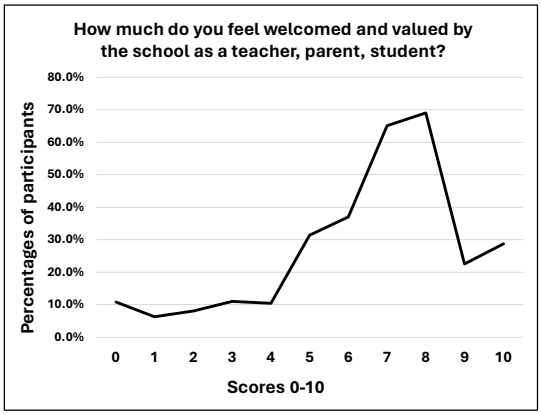
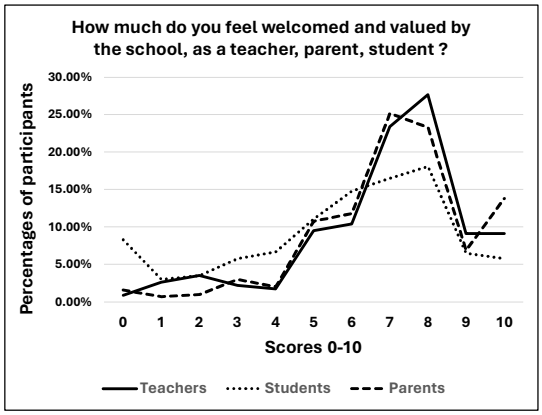


FITNESS FOR PURPOSE



1. At first, the researcher was going to use the **means of aggregated ratio data** (left-hand graph).
2. Then, because of the wide **range of sub-sample scores,** he decided to use sub-sample **distributions**.
3. Then, because of the differences in the **means and distributions** of the disaggregated data (right-hand graph), he decided to use ANOVA and the Tukey HSD statistic.
4. Then, because of differences in **sub-sample sizes**, he decided to use ANOVA and the Games-Howell statistic.
5. Then, because of problems of **skewness and kurtosis**, i.e. non-normal distributions, he decided to use the Kruskal-Wallis statistic and effect size for nonparametric data.

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ALIGNMENT AND FIDELITY TO DATA: **EXPLAINING FINDINGS**

Respondents consistently gave high marks for the areas of identity and ethos being studied, and the teachers gave the highest marks. How can this be explained?

1. The respondents gave very honest, genuine and positive opinions about the positive identity and ethos, and they were happy with the school, and valued it. They wanted to be loyal to themselves and their own values, and the school.
2. Teachers gave higher scores than the other two parties because they were more knowledgeable and understanding of issues.
3. Local culture argued for respect for authority and hierarchy, keeping silent rather than speaking negatively, not wishing to offend unnecessarily, and avoiding speaking badly and doing harm etc.
4. The respondents were scared about getting into trouble, so they gave high marks.
5. Some parents and students had little knowledge about school identity and ethos, so they gave a 'safe' or non-controversial answer, as there was no need not to do this, and/or they saw this as fairer and kinder than giving a low mark, they did not see the need to upset matters and relationships with the school.
6. The parents and students did not really care about, or have a strong opinion on, many of the items in the questionnaire, so they saw no harm in giving high scores.

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ERRORS IN **EXPLAINING FINDINGS**

FIDELITY, FITNESS FOR PURPOSE

- Failure to identify and consider possible alternative explanations of the findings.
- Failure to evaluate/weigh up possible explanations, with evidence and plausibility, singly and in combination (e.g. underdetermination and overdetermination).
- Failure to justify the explanation(s) chosen as the most suitable.

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FITNESS FOR PURPOSE, ALIGNMENT, AND FIDELITY

- Are the data processing and data analysis fit for purpose, aligned to, and faithful to, the objectives, purposes, deliverables, research questions, methodology, sample, instrumentation, data types of the research?
- Are the findings, their explanation and interpretation fit for purpose, aligned to, and faithful to the objectives, purposes, deliverables, research questions, methodology, sample, instrumentation, data types, data analysis of the research?
- How convincing are the explanations and interpretation?

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ERRORS IN **DRAWING CONCLUSIONS & CLAIMS**

ALIGNMENT, FITNESS FOR PURPOSE, AND FIDELITY

1. The conclusions and claims do not follow from, or draw from, the data and the findings.
2. The conclusions do not address the research purposes, objectives, and deliverables.
3. There are no conclusions; the writing simply stops. It is inconclusive.
4. The conclusions are not conclusions at all; they are summaries.
5. The claims are selective, overstated, and misrepresent the data and the findings.
6. The conclusions and claims fail to recognize the boundaries, limitations, and weaknesses of the research.
7. The conclusions and claims are inconsequential and insignificant; the 'so what' factor.
8. The conclusions and claims are unclear on what they offer conceptually, substantively, methodologically, operationally, practically in advancing the field etc.

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ERRORS IN **REPORTING**

ALIGNMENT, FITNESS FOR PURPOSE, AND FIDELITY

The report …

1. omits key areas, e.g. purposes, objective, research questions, deliverables, methods.
2. provides insufficient information to indicate how the research was planned, designed, conducted, and led to the conclusions and claims made.
3. was selective (e.g. conclusions and claims) and did not do justice to key findings (e.g. overlooked contradictions, exceptions, conditions, qualifications).
4. included errors in its conclusions and claims (e.g. overstatement).
5. was thin, too skeletal.
6. did not answer (sufficiently) the research purposes, objectives, and 'deliverables'.
7. was inconclusive.
8. did not address the 'so what' question.
9. was flabby, neglecting key findings and failed to separate the signal from the noise.
10. was inappropriate for the readership (e.g. contents and register).

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FITNESS FOR PURPOSE, ALIGNMENT, AND FIDELITY

- Are the conclusions and claims made from the research fit for purpose, aligned to, and faithful to the objectives, purposes, deliverables, research questions, methodology, sample, instrumentation, data types, data analysis, findings from the research?
- Is the reporting fit for purpose, aligned to, and faithful to objectives, purposes, deliverables, research questions, methodology, sample, instrumentation, data types, data analysis, findings, explanation interpretation, conclusions, and claims of the research?

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KEY TAKEAWAYS FOR INTEGRITY, RIGOUR, AND LOGIC OF THE RESEARCH

Alignment, fitness for purpose, and *fidelity* to a **cumulative** range of areas are essential for valid, reliable, usable, and honest research:

- Objectives and purposes
- Deliverables
- Research questions
- Methodology
- Design
- Sample
- Instrumentation
- Data types
- Data processing and analysis
- Data interpretation and explanation
- Conclusions and claims
- Reporting

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