

Research questions

Learning outcomes

By the end of this Session, you will be able to:

- Identify and evaluate appropriate topics and questions for research.
- Identify and characterise the type of research question you are proposing to investigate.

Questions, Hypotheses and Variables

- Every good research project starts - not from a topic - but from a precise and relevant **question**. What is the question your research is intended to answer?
- Given a precise question, the next step is to formulate hypotheses (predictions / statements of expectation) about what answers may be possible.
- Hypotheses (including the null hypothesis) normally assert a correlation between two or more variables - independent (IV) and dependent variables (DV).

[Short video about Hypothesis testing from JB Statistics]

<https://www.youtube.com/watch?v=tTeMYuS87oU>

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Research Questions

To develop a strong research question from your ideas, ask yourself the following questions –

- Do I know the field and the literature well?
- What are the important research questions in my field?
- What areas need further exploration?
- Could my study fill a gap? Lead to greater understanding?
- Has this study been done before? If so, is there room for improvement?
- Is the timing right for this question to be answered? Is it up-to-date, or is it becoming obsolete?
- Most importantly, will my research have a significant impact on the field of interest?

Research Questions

Strong research question should pass the 'so what' test.

- What is the potential impact of the research you are proposing?
- What is the benefit of answering your research question?
- Who will it help? What is the benefit? What more shall we know?

Research Questions

Starting with a research question. Ask yourself –

- What are the key texts and authors that have been published which have attempted to answer this question?
- What concepts and theories have been used in order to address the question?
- What is the history of investigation into possible answers?
- What kinds of argument are there about the possible answers?

Go on to ask yourself –

- Has anyone else recently attempted to answer this question?
- If so, when? And how?
- What research question did they ask?
- Did they use any hypotheses?
- Did they propose any particular model or theory?
- What methodology and data collection tools did they use?
- How did they analyse their data? How were their findings presented?

Research Questions

So good research questions are –

- Well grounded in current theoretical and empirical knowledge (i.e. You must know the relevant literature well).
- Amenable to the formulation of clear hypotheses (if appropriate to the type of research) and operational definitions.
- Important in terms of both theory and application to business / organisational contexts.

Research Questions

Types of research questions:

- Existence
- Description and classification
- Composition
- Relationship
- Descriptive – Comparative
- Causality
- Causality – Comparative
- Causality – Comparative Interaction

Existence Questions

- Does X exist?
- Examples
 - Can children commit crimes?
 - Do older adults buy cosmetics?
 - Are there consumer-holics?
 - Is there a market for recycled food waste?
- Designed to systematically rule out rival explanations or yield a positive / negative answer.

Description/Classification Questions

- What is X like? Is it variable or invariant? What are its characteristics?
- Examples:
 - What are the characteristics of customer loyalty?
 - Is loyalty uni-dimensional or multidimensional?
 - Is loyalty variable or constant?
 - What are the attributes of leadership?
- Can we classify X as a type? Is it an exception? Are there different sub-types of X?

Composition Questions

- What are the components that make up X?
- Examples
 - What are the various forms of profit maximisation?
 - What are the factors that make up 'leadership'?
 - What are the principal components of a brand?
 - What are the attributes of good service quality?
- Answers call for analysis or breakdown of a whole into its component parts, together with investigation into how the parts relate to each other.

Relationship Questions

- Is there an association / correlation between X and Y?
- Examples
 - Is attention span related to IQ?
 - Is job satisfaction related to job grade?
 - Is IS efficiency related to network bandwidth?
 - Is profitability more strongly correlated with cost minimisation than with competitive advantage?
- At least one other variable (Y) is introduced.
- More complex questions of relationships among several variables can be asked (multi-variate analysis)

Descriptive – Comparative Questions

- Is Group X different from Group Y?
- Examples:
 - Are women more cost conscious than men?
 - Do young people make purchase decisions based on price more often than older adults?
 - Are warning labels with pictographs more effective than labels with words only?
- Assumed that the investigator will ensure that comparison groups are similar in all respects other than the issue in question.

Causality Questions

- Does change in X cause, lead to, or prevent changes in Y?
- Example:
 - Does end-user training reduce the cost of IT support?
 - Does diversifying job roles degrade performance?
 - Do property prices increase proportionally to property size?
- Questions can be left open-ended
- Usually not exploratory research
- Often the hardest questions to answer!

Causality Comparative Questions

- Does X cause more change in Y than does Z?
- Example:
 - Are training courses better than 'work-based learning' at accelerating the performance of new employees?
 - Does TV advertising attract more new customers than E-mail advertising (without advertising on TV?).

Causality-Comparative Interaction Questions

- Does X cause more change in Y than does Z under certain conditions, but not under other conditions?
- Example:
 - Does product location affect male adults more than female adults in making purchasing decisions?
 - Can predict complex interactions in data
 - Multiple independent variables allow complex interaction questions, but require more complex analysis!

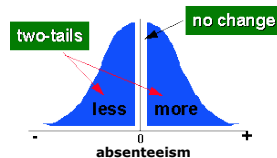
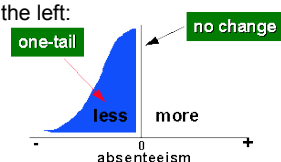
Framing hypotheses

- Formulating initial hypotheses requires careful research design and advance consideration of ontology, epistemology and sampling relevant to your research question(s).

Ontology		Epistemology	
Data types	Data Sources [Sampling]	Data-gathering methods	Techniques
What are the Variables? (Dependent and Independent)	Who / what are the data sources?	How will I obtain the data? How will I test the data?	How will I apply the data-gathering methods?
Are data values (mainly) qualitative or quantitative?	What are the units of measurement?	What forms of analysis will I apply to the data? Are the samples of data valid and sound?	Is my sample normal? What is its 'profile'?

Defining research questions / hypotheses

- A research question or hypothesis is a specific statement of prediction or expectation. It describes in concrete (rather than theoretical) terms what you expect to find in your research. Not all studies have hypotheses. Sometimes a study is designed to be exploratory. A single study may have one or many hypotheses.
- Normally, in research projects, we start with **two** hypotheses -- one states a relationship exists between variables ('**dependent**' versus '**independent**' variables); the second asserts the 'null' hypothesis (that no such relationship exists). E.g. *imagine that you are investigating the effects of a new employee training program and that you believe one of the outcomes will be that there will be less employee absenteeism. Your two hypotheses might be stated something like this:*
 - H_0 (the null hypothesis): **As a result of the XYZ company employee training program, there will either be no significant difference in employee absenteeism or there will be a significant increase.**
 - H_a (the alternative (your) + hypothesis): **As a result of the XYZ company employee training program, there will be a significant decrease in employee absenteeism.**
- In this case, the researcher is (said to be) conducting a "one-tailed" test - as depicted on the left:



In other cases, a researcher may define 3 hypotheses-- positive, negative and null -- thereby conducting a "two-tailed" test - as depicted on the right.

One- and Two-tailed tests

- A one-sided test is a statistical test in which the values for which we can reject the null hypothesis, H_0 , are located entirely in **one tail** of the probability distribution.

In other words, the critical region for a one-sided test is the set of values less than the critical value of the test, or the set of values greater than the critical value of the test.

A one-sided test is also referred to as a *one-tailed test of significance*.

Example: Suppose we wanted to test a match manufacturer's claim that there are, on average, 50 matches in a box. We could set up the following hypotheses:

- $H_0: \mu = 50$, against $H_1: \mu < 50$ or $H_1: \mu > 50$ (μ = arithmetic mean)

Either of these two alternative hypotheses would lead to a one-sided test.

Presumably, we would want to test the null hypothesis against the first alternative hypothesis since it would be useful to know if there is likely to be less than 50 matches, on average, in a box (no one would complain if they get the correct number of matches in a box or more).

Yet another alternative hypothesis could be tested against the same null, leading this time to a **two-sided test**:

$H_0: \mu = 50$, against $H_1: \mu$ not equal to 50

Here, nothing specific can be said about the average number of matches in a box; only that, if we reject the null hypothesis in our test, we would know that the average number of matches in a box is likely to be less than or greater than 50.

Research Questions

Evaluating your research question

- Does the question deal with a topic or issue that interests me enough to spark my own thoughts and opinions?
- Is the question feasibly and fully researchable?
- What types of information do I need to answer the research question?
- Is the scope of this information reasonable?
 - Given the types and scope of the information that I need, is my question too broad, too narrow, or about right?
 - What sources will have the type of information that I need to answer the research question?
 - Can I access these sources?

Research Questions

Risks –

- Choosing a question in a hurry (with insufficient reading).
- Selecting the methods / sources before the question.
- Procrastinating for months over different theories / readings, without developing your own ideas.
- Generalising too much about your findings.
- Ignoring the basic criteria for successful research.
- Relying on an unrepresentative sample (too small, not fairly selected).
- Not being able to demonstrate the application of your results to real world problems.

Self-check of learning outcomes

By now, you should be able to:

- Identify and evaluate appropriate topics and questions for research.
- Frame hypotheses which are:
 - Well-focussed
 - Measurable / testable
 - Amenable to analysis by recognised methods.
- Design a programme of research which meets your research objectives.