VIET NAM NATIONAL UNIVERSITY HO CHI MINH CITY

BK TP.HCM

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ENGINEERING RESEARCH & DEVELOPMENT METHODOLOGY

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ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH

TRƯỜNG ĐẠI HỌC BÁCH KHOA

CONTENT

Vài nét về SỰ NGHIỆP

- FP7 postdoc Marie Curie fellowship tại Microsystems Design and Characterization Laboratory, Tel Aviv University, Israel: 2013 - 2014
- Phó trưởng khoa, Khoa Cơ khí, Trường Đại học Bách Khoa ĐHQG TPHCM: 01/2024 - nay
- Đại diện Marie Curie Alumni tại Việt Nam (https://www.mariecuriealumni.eu/groups/southeast-asia-chapter): 2015 - nay
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Scientific Research Process


Selecting a Research Topic


Determining Topic Relevance


Reviewing the Literature


Formulation of Research Problem


Research Design & methodology


Data Analysis & Interpretation


Presenting Results

Selecting a Research Topic

- As you progress in your research journey, you'll find that developing a topic for investigation becomes more intuitive and manageable with **experience**;
- Selecting a topic is a concern for many beginning researchers.
- Beginning researchers need to pay particular attention to the available material like journal articles & archive data.
  - Should **not** tackle broad research questions, but should try to isolate a smaller, more practical subtopic for study.
  - Should develop an appropriate method of analysis & then proceed through data analysis & interpretation, to a clear & concise presentation of results.

Determining Topic Relevance

Question 1: Is the topic too broad?

Concentrate on one small area of a field	**Problem**: There is a tendency for researchers to choose topics that, while valuable, are too broad to cover in one study. • – **Solution**: write down the proposed title as a visual starting point & attempt to dissect the topic into small questions.

Determining Topic Relevance

Question 2:
Can the problem really be investigated?

- A topic might prove unsuitable for investigation simply because the question being asked has yet to be answered with the facilities & information available.
- The solution/ things to be considered are to reanalyze the original idea in conformity.
- Review the available literature to determine whether the topic has been investigated.

Question 3: Are the data susceptible to analysis?

- A productive research topic requires collecting data that can be measured reliably & validly.
- Considerations:
  - Having enough data to make the study worthwhile
  - experience with the statistical method selected to analyze & interpret the data

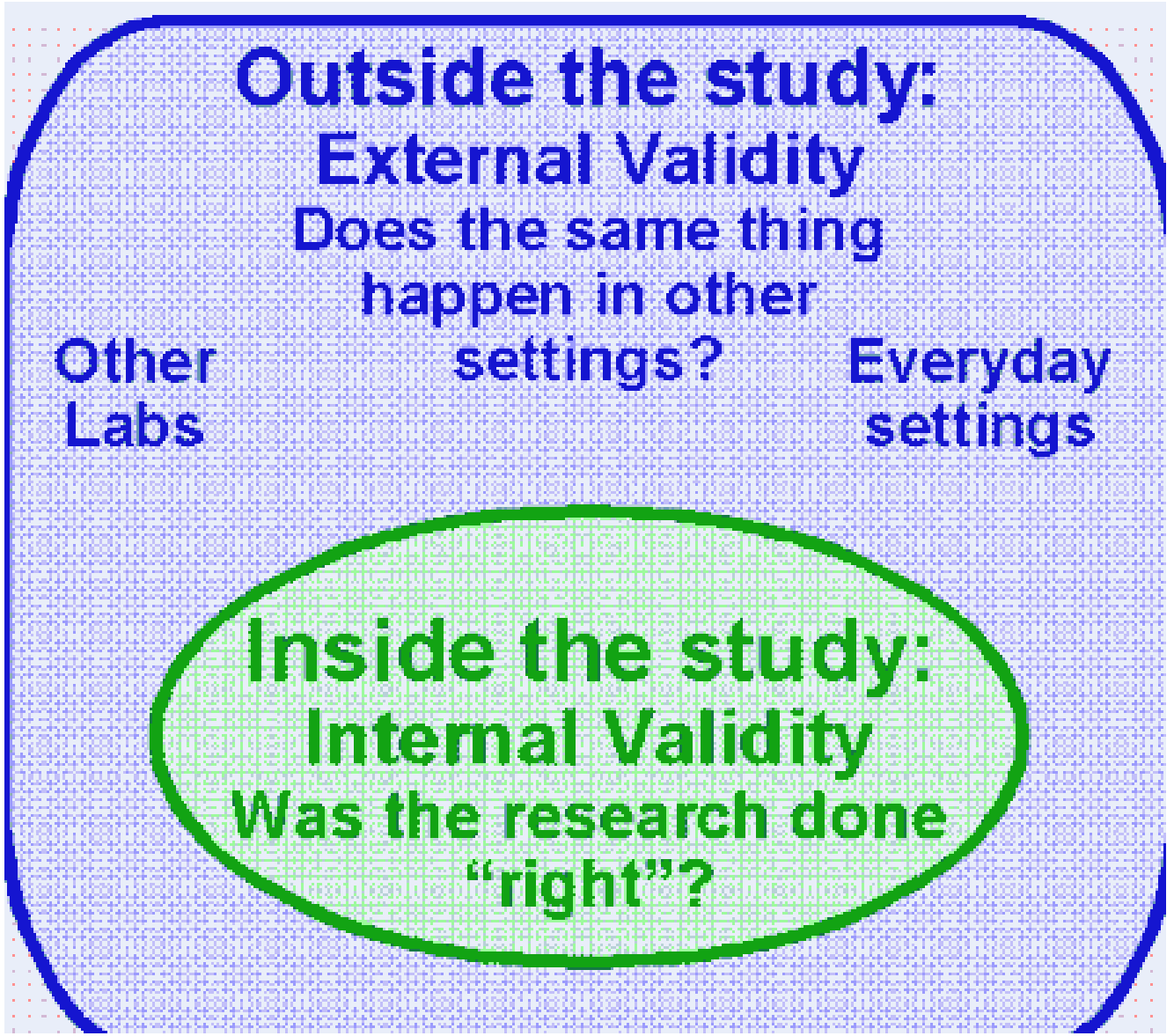
Question 4: Is the problem significant?

- Whether the results will have **practical** or **theoretic** value.
- The goal of all research is to help further the understanding of the problems & questions in the field of study; if a study does not do this, it has little value beyond the experience the researcher acquires from conducting it.

Determining Topic Relevance

Question 5: Can the results of the study be generalized?

- For a research project to have practical value to be significant beyond the immediate analysis it must have ***external validity***;



Determining Topic Relevance

Question 6: What costs & time are involved in the analysis?

- In many cases the cost of a research study is the sole
- determinant of the feasibility of a project.
- Considerations:
- A carefully itemized list of all materials, equipment, & other

Facilities before beginning a research project.

Financial aid that subsidize research projects.

- Research studies must be designed in such a way that they can be completed in the amount of **time** available.

Determining Topic Relevance

Question 7: Is the planned approach appropriate to the project?

- The most marvelous research idea may be hindered by a
- Poorly planned method of approach.
- Considerations:
  - Could the study be planned differently to eliminate some of the expenses?
  - A close look at every study is required to plan the best approach.

Question 8: Is there any potential harm to the subjects?

Carefully analyze whether the project may cause any physical or psychological harm to the subjects under evaluation.

- For example: Will respondents be frightened in any way? Is there any possibility that the exposure to the research conditions will have lasting effects?

Solution:

- Prepare detailed statements explaining the exact procedures involved in the research which can help to ensure that subjects will not be injured in any way.

Literature review

Consulting available literature.

The review provides information about ***what was done****,* ***how it was done****, &* ***what results were generated****.*

It is one of the most important steps in the research process because it not only allows them to learn from previous research data but also saves time, effort, & money.

Failing to conduct a literature review is as detrimental to a project as failing to address any of the other steps in the research process.

Literature review

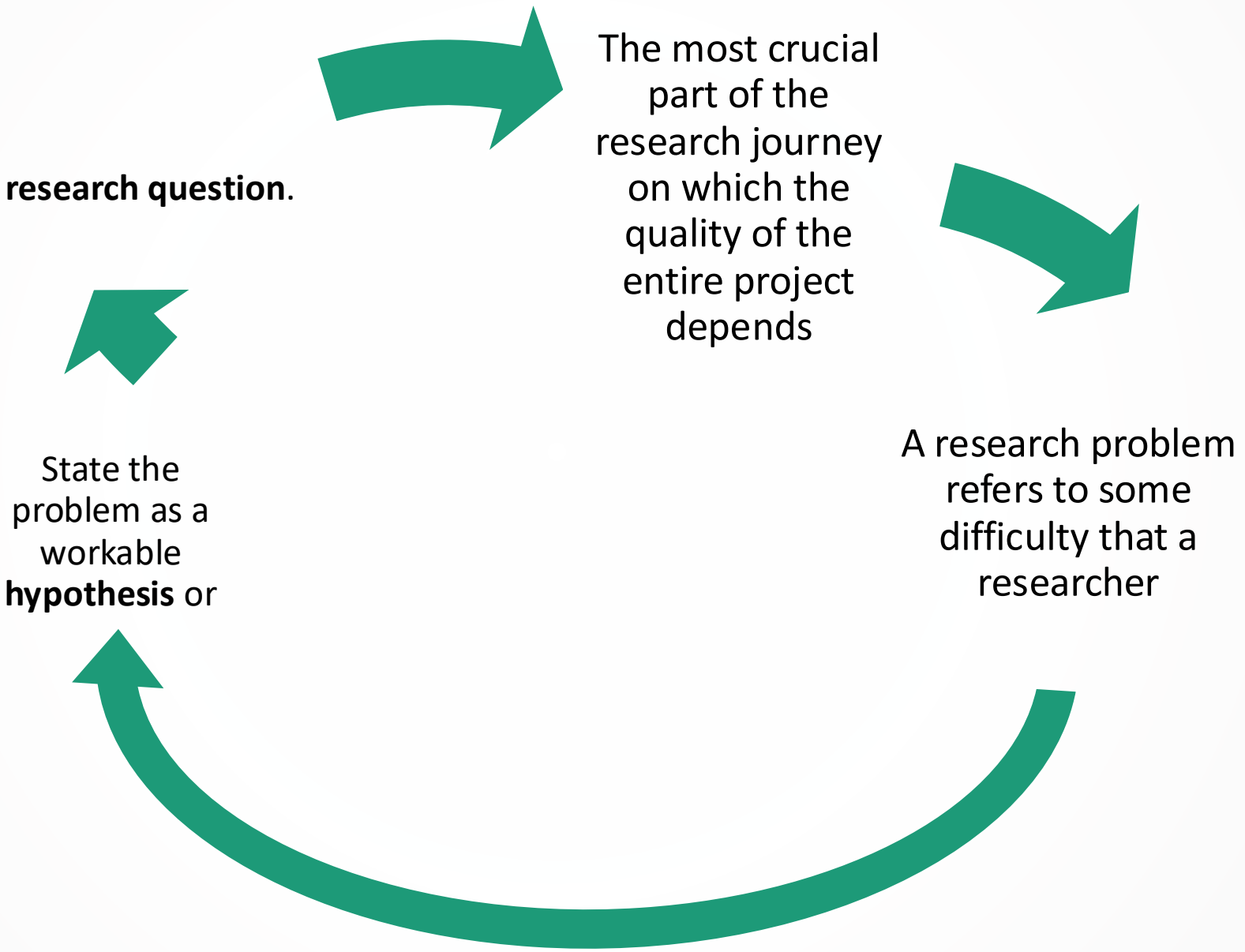
Literature review will help to ask the following questions:

- *What type of research has been done in the area?*
- *What has been found in previous studies?*
- *What suggestions do other researchers make for further study?*
- *What has not been investigated?*
- *How can the proposed study add to our knowledge of the area?*
- *What research methods were used in previous* studies?

Answers to these questions will usually help define a specific hypothesis or research question.

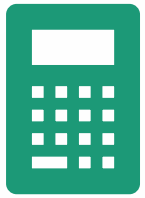
4. Formulation of Research Problem

Formulation of Research Problem



Research Design

Research design are essentially blueprints, or sets of plans, for collecting information.



The ideal design collects a maximum amount of information with a minimal expenditure of time & resources.

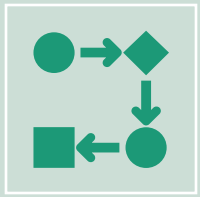
The approach selected by the researcher depends on the purpose of the study & how much money is available to conduct the analysis.

Even projects that sound very simple may require a highly sophisticated & complex research approach.

Research Design

(i) What is the study about?
(ii) Why is the study being made?
(iii) Where will the study be carried out?
(iv) What type of data is required?
(v) Where can the required data be found?
(vi) What periods of time will the study include?
(vii) What will be the sample design?
(viii) What techniques of data collection will be used?
(ix) How will the data be analysed?

Data Analysis & Interpretation



Every analysis should be carefully planned & performed accordingly

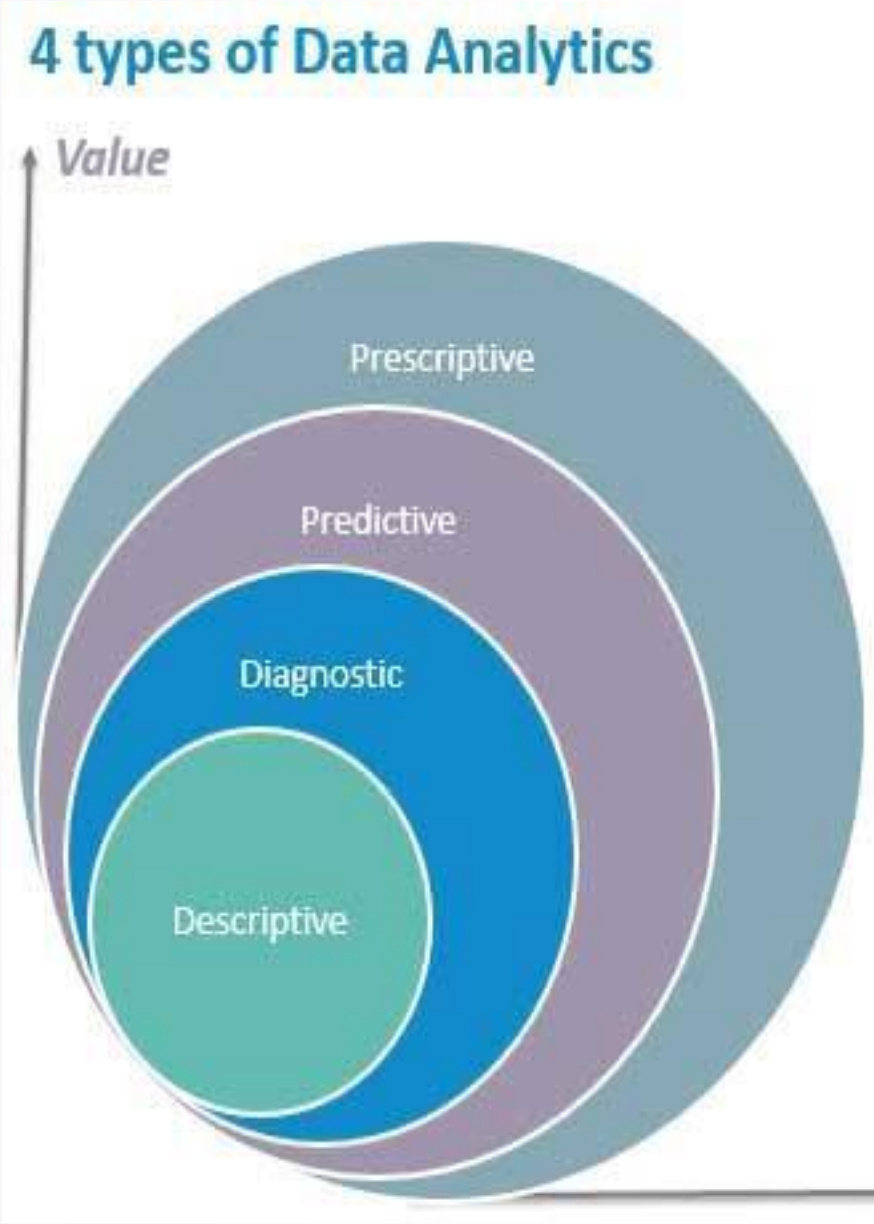
The results must be analyzed with reference to their external validity & the likelihood of their accuracy.

Researchers must determine through analysis whether their work is valid internally & externally.

An **externally valid** study is one whose results can be generalized to the population.

To assess **internal validity**, one asks: Does the study really investigate the proposed research question?

Data Analysis & Interpretation



What is the data telling you?

Descriptive: *What's happening in my business?*

- Comprehensive, accurate and live data
- Effective visualisation

Diagnostic: *Why is it happening?*

- Ability to drill down to the root-cause
- Ability to isolate all confounding information

Predictive: *What's likely to happen?*

- Business strategies have remained fairly consistent over time
- Historical patterns being used to predict specific outcomes using algorithms
- Decisions are automated using algorithms and technology

Prescriptive: *What do I need to do?*

- Recommended actions and strategies based on champion / challenger testing strategy outcomes
- Applying advanced analytical techniques to make specific recommendations

Presenting the results

The format used in presenting results depends on the purpose of the study.

- However, all presentations of results need to be written in a clear & concise manner appropriate to both the research question & the individuals who will read the report.

Too often, researchers conduct one study & report the results as if they are providing the basis for a theory or law.

- However the results of any single study are only
- *indications of* what might exist.

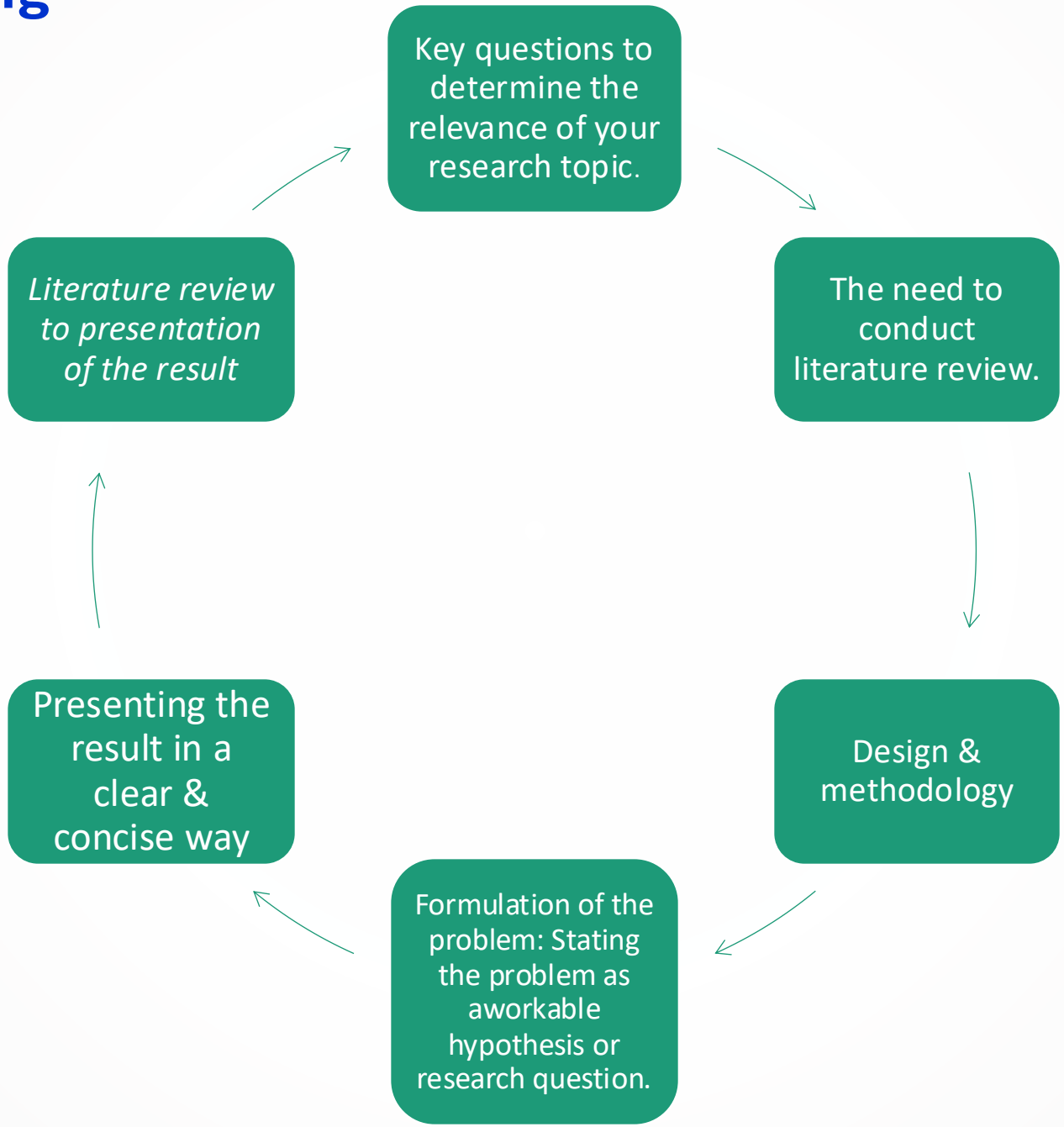
Presenting the results

A study provides information that says, in effect,

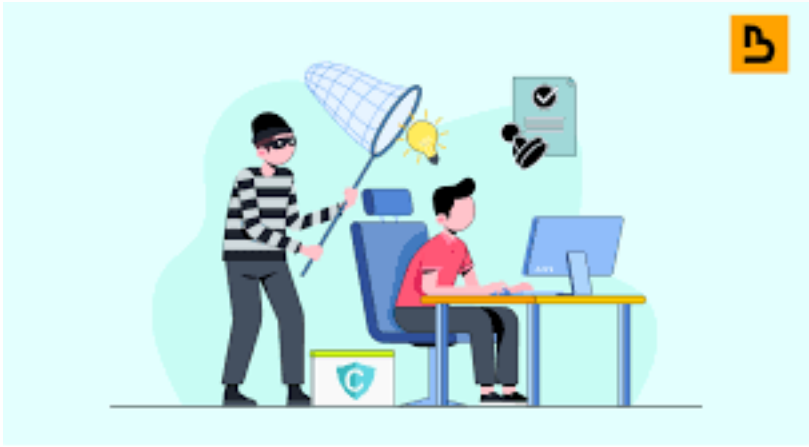
"This is what may be the case."

- To be relatively sure of the results of any study, the research must be **replicated**.
- A research question or hypothesis requires investigation from many different perspectives before any significance can be attributed to the results of any one study.
- Researchers overwhelmingly advocate the use of replication to establish scientific facts.

Reflective Thinking



Plagiarism



What is plagiarism?

It is the act of taking another person's writing, conversation, song, or even an idea and passing it off as your own.

In our words

Plagiarism is copying ideas from others without giving them credit and claiming them to be yours.

But why is it wrong?

People will start to believe it was YOUR idea, when you actually took it from someone else.

How can we avoid it?

Internal citation

This is used to give credit to the original author by citing their words/ideas in your paper.

Works cited page

Also known as a bibliography or reference list, comes at the end of your paper listing all the works you've quoted.

Common knowledge

This does not need internal citation in the paper, common knowledge is something considered a well-established fact.

Unique phrase

A phrase used by an author and commonly used by others in a specific genre.

Conclusion

By avoiding plagiarism, we are not saying we should stop getting information from the Internet or any other sources. We should give credit to those who came up with those ideas first by using the tips already mentioned. We should not take without permission what is not ours.

THANK YOU FOR LISTENING