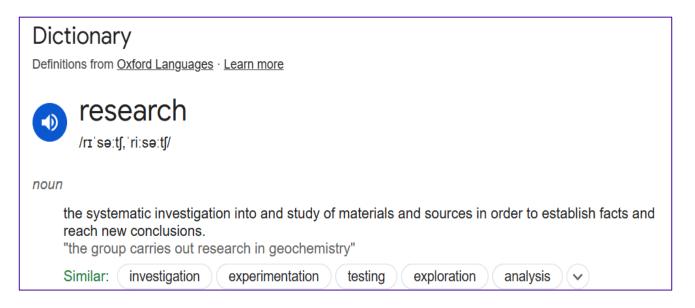
STQP6014: RESEARCH METHODOLOGY AND INDUSTRY SEMINAR

RESEARCH PHILOSOPHIES, PRINCIPLES AND ETHICS

Lecture Outline:

- Saunders Research Onion
- ► Research Philosophy
- Research Ethics
- Research Methodology

What is Research?



Research is a **systematic process** of inquiry aimed at discovering, interpreting, and revising facts. It seeks to answer questions or solve problems using data, evidence, and critical analysis.

Attaining Research Quality

Defining quality research:

Biggest impact achieved ———— Research Output

- In the shortest time,
- with the simplest approach,
- at the lowest cost
- by/with the least resources

Research Process or Input

What is research methodology?

- A way describing or explaining how a researcher intends to carry out their research
- The plan for how to conduct research, including how to collect and analyze data
- A systematic way to solve research problems and ensure valid and reliable results

Steps in Conducting Research

How to plan

How to execute

How to analyze

How to write and publish

How to protect

How to develop

How to comercialize

Steps in Conducting Research

1. How to plan

- LR, Gantt chart, K-chart
- 2. How to execute
 - LR, design, theoretical development, modeling, simulation, survey, experiment, data collection, data management
- 3. How to analyze
 - Descriptive/statistical analysis, Relationship characterization/ cause and effects analysis, Comparative analysis, Optimization analysis
- 4. How to write and publish
 - LR/CR, organizing results for publication, composition, reviewing, quality journals, authorship
- 5. How to protect
 - Copy right, patent, ownership
- 6. How to develop
 - lab. Prototype, Eng. Prototype, testability, manufacturability
- 7. How to commercialize
 - market need analysis, commercial prototyping, mass production, testing, end user vs. manufacturer considerations, ownership, out-right vs royalty, entrepreneurship, funding

Research Onion

- https://gradcoach.com/saunders-research-onion/
- Saunder's Research Onion: Explained Simply
- ▶ Journal article: Melnikovas A. 2018. Towards an Explicit Research Methodology: Adapting Research Onion Model for Futures Studies. Journal of Future Studies December 2018, 23(2):29-44

Research Onion Model – You Tube

https://www.youtube.com/watch?v=Yoq-x4eVn6A&t=16s

Saunders' Research Onion

- At the simplest level, describes different decisions in developing a research methodology
- Presents various choices in conducting research, progressing from highlevel and philosophical to tactical and practical in nature.
- Also mimics the general structure for the methodology chapter.
- Saunders' research onion is certainly not perfect, it's a useful tool for thinking holistically about methodology.
- At the least, it helps understand what decisions to make in terms of your research design and methodology

Layers of Saunders' Onion

The layers of Saunders' research onion

The onion is made up of 6 layers, which you'll need to peel back one at a time as you develop your research methodology:

- 1. Research philosophy
- 2. Research approach
- 3. Research strategy
- 4. Choices
- 5. Time horizon
- 6. Techniques & procedures

Research Philosophy

- Research philosophy is the foundation of any study
- Research philosophy describes the set of beliefs the research is built upon
- Using ontology (what/how of what we know what is the nature of reality... what are we really able to know) and epistemology (how we can obtain knowledge and come to understanding things)
- ➤ 3 main (more common) research philosophies:
 - Positivism
 - Interpretivism
 - Pragmatism

Research Philosophy

Positivism:

- Reality is objective and can be measured.
- Emphasizes hypothesis testing using statistics.

Pragmatism:

 Focuses on practical outcomes, combining methods that best address the research question.

Interpretivism:

- Reality is subjective; knowledge is socially constructed.
- Emphasizes understanding participants' perspectives.

Critical Realism:

 Reality exists independently but is only partially knowable through interpretation and theory.

Research Philosophy

The set of beliefs, assumptions, and principles that guide the way you approach your study and develop your methodology

Positivism

Rooted in the belief that reality is independent of the observer, and consequently, that knowledge can be obtained through objective observations

Positivism

- Knowledge exists outside of what's being studied
- What is being studied can only be done so **objectively**, cannot include opinions or personal viewpoints – researchers do not interpret, they only observe
- ▶ There is only one reality, all meaning is consistent between subjects
- Knowledge cam only be acquired through empirical research based on measurement and observation
- i.e. All knowledge is not reliant on human reasoning but instead is gained from research
- Knowledge can only be true m false, or meaningless

Interpretivism

Reality is subjectively constructed by the observer through their experience of it, rather than being an independent thing.

Interpretivism

- Opposite to Positivism the other side of the spectrum
- Social and Cultural factors have influence on an individual
- This philosophy focuses on people's thoughts and ideas, in light of sociocultural backdrop
- Researcher plays an active role in the study to draw a holistic view of the participants and their actions, thoughts and meanings

Pragmatism

Focuses on the usefulness and applicability of research findings, rather than an all-or-nothing philosophical position

Pragmatism

- ► Highlights the importance of using the best tools possible to investigate phenomenon
- Main aim use practical point of view knowledge is not fixed, but instead is constantly questioned and interpreted
- Consists of element of researcher involvement and subjectivity, specifically when drawing conclusions based on participants' responses and decisions
- Not committed to (or limited by) one specific philosophy

Research Approach

- ▶ Broader Method for research Inductive or Deductive
- ▶ Inductive generating theories from research, rather than starting a project with a theory as a foundation.
- Deductive begins with a theory and aim to build on it (or test it) through research
- whether your research will build on something that exists, or whether you'll be investigating something that cannot necessarily be rooted in previous research

Research Approach: Qual vs Quant

- Qualitative vs Quantitative Research
- qualitative research focuses on textual, visual or audio-based data, while quantitative research focuses on numerical data.
- Inductive approaches are usually used within qualitative research, while quantitative research tends to reflect a deductive approach

Types of Research

Quantitative Research

- Involves numerical data, measurable variables, and statistical analysis.
- Example: Predicting housing prices using regression models.

Qualitative Research:

- Involves textual or visual data to explore perceptions and experiences.
- Example: Interviewing users to understand how they interact with a new app.

Mixed Methods:

- Combines
 quantitative and
 qualitative
 approaches.
- Example: Survey data (quantitative) supported by interviews (qualitative).

Research Strategy

How research can be conducted i.e. Research Design Several strategies, for example:

- Experimental research
- Action research
- Case study research
- Grounded theory
- Ethnography
- Archival research

Experimental Research

Experimental research involves manipulating the independent variable to observe a change in the dependent variable.

Action Research

Action research is conducted in practical settings such as a classroom, a hospital, a workspace, etc. This helps researchers understand problems related to interactions within the real-world.

Case Study

A case study is an detailed study of a single subject to gain an in-depth understanding within the context of the study.

Grounded Theory

Grounded theory is all about "letting the data speak for itself" - i.e. you let the data inform the development of a new theory or model.

Ethography



Archival Research

- draws from materials that already exist, and meaning is then established through a review of this existing data.
- ► This method is particularly well-suited to historical research and can make use of materials such as manuscripts and records.

Choices

- Mono method -
- Mixed method combinatory
- Multi methods more than one method from each quant and qual

Time Horizon

- ► How many points in time for data collection
- Cross sectional
- Longitudinal

Techniques and Procedures

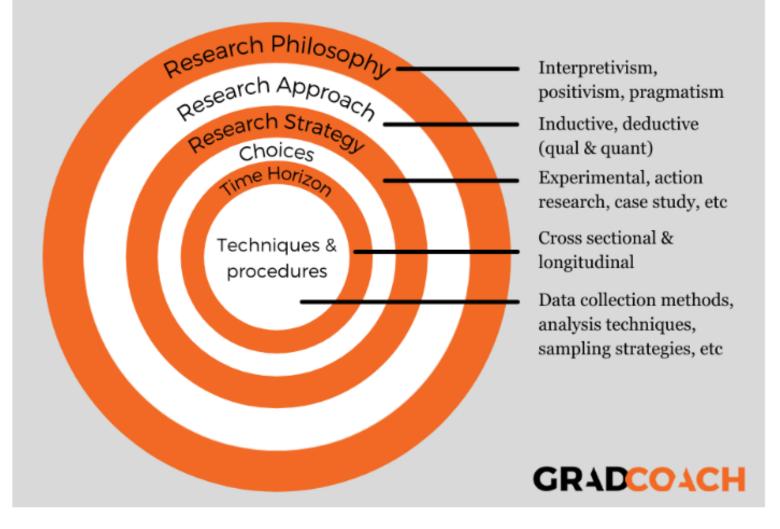
- What data to collect, how to define sample, how to collect, and gow to analyse
- Research methodoloy

Let's Recap: Research Onion 101

The research onion details the **many interrelated choices** you'll need to make when you're crafting your research methodology. These include:

- Research philosophy the set of beliefs your research is based on (positivism, interpretivism, pragmatism)
- Research approaches the broader method you'll use (inductive, deductive, qualitative and quantitative)
- Research strategies how you'll conduct the research (e.g., experimental, action, case study, etc.)
- Choices how many methods you'll use (mono method, mixed-method or multi-method)
- Time horizons the number of points in time at which you'll collect your data (cross-sectional or longitudinal)
- Techniques and procedures (data collection methods, data analysis techniques, sampling strategies, etc.)

Saunders' (2007) Research Onion



RESEARCH ETHICS

What is Research Ethics?

▶ **Research ethics** provides guidelines for the responsible conduct of research. In addition, it educates and monitors scientists conducting research to ensure a high ethical standard.

- What is Ethics in Research & Why is it Important? U.S. National Institute of Environmental Health Sciences
- https://libguides.library.cityu.edu.hk/researchmethods/ethics

Some Ethical Principles

► Honesty:

Honestly report data, results, methods and procedures, and publication status. Do not fabricate, falsify, or misrepresent data.

Objectivity:

Strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, grant writing, expert testimony, and other aspects of research.

Integrity:

Keep your promises and agreements; act with sincerity; strive for consistency of thought and action.

Carefulness:

Avoid careless errors and negligence; carefully and critically examine your own work and the work of your peers. Keep good records of research activities.

Openness:

- Share data, results, ideas, tools, resources. Be open to criticism and new ideas.
- Respect for Intellectual Property:
- Honor patents, copyrights, and other forms of intellectual property. Do not use unpublished data, methods, or results without permission. Give credit where credit is due. Never plagiarize.
- Confidentiality:
- Protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.

Responsible Publication:

- Publish in order to advance research and scholarship, not to advance just your own career. Avoid wasteful and duplicative publication.
- Responsible Mentoring:
- Help to educate, mentor, and advise students. Promote their welfare and allow them to make their own decisions.
- Respect for Colleagues:
- Respect your colleagues and treat them fairly.

Social Responsibility:

Strive to promote social good and prevent or mitigate social harms through research, public education, and advocacy.

Non-Discrimination:

Avoid discrimination against colleagues or students on the basis of sex, race, ethnicity, or other factors that are not related to their scientific competence and integrity.

▶ Competence:

Maintain and improve your own professional competence and expertise through lifelong education and learning; take steps to promote competence in science as a whole.

► Legality:

Know and obey relevant laws and institutional and governmental policies.

Animal Care:

Show proper respect and care for animals when using them in research. Do not conduct unnecessary or poorly designed animal experiments.

Human Subjects Protection:

When conducting research on human subjects, minimize harms and risks and maximize benefits; respect human dignity, privacy, and autonomy.

Research Misconducts

- ▶ (a) **Fabrication** making up data or results and recording or reporting them.
- ▶ (b) **Falsification** manipulating research materials, or changing or omitting data or results such that the research is not accurately represented in the research record.
- (c) Plagiarism the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.
- ▶ (d) Research misconduct does not include honest error or differences of opinion.
- Source: <u>Definition of Research Misconduct</u>
 The Office of Research Integrity, U.S. Department of Health & Human Services

