

COMP6696001

Research Methodology

in Computer Science

Introduction to Research Methods in Computer Science, Empirical Research
Week 1

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Hello World

// Waw C++ ^_^

```
#include <iostream>
```

```
int main() {
    std::cout << "Hello World! I am Sera (D3697)";
    std::cout << "seraphina@binus.ac.id";
    return 0;
}
```





Materials

- COMP6696001-Research Methodology in Computer Science
- https://binusianorg-my.sharepoint.com/personal/seraphina_binus_ac_id/_layouts/15/guestaccess.aspx?share=EkT-otVfObVJggGxrfC8cCABRB9-IaCNagZYdIGFL_em7Q&e=8pubhG

Materials

- COMP6696001-Research Methodology in Computer Science
- ~~https://binusian.org-my.sharepoint.com/personal/seraphina_binus_ac_id/_layouts/15/guestaccess.aspx?share=EkT-otVfObVJggGxrfC8cCABRB9-laCNagZYdIGFL_em7Q&e=8pubhG~~
- <https://astriani.com/RMCS>

Research Methodology in Computer Science???

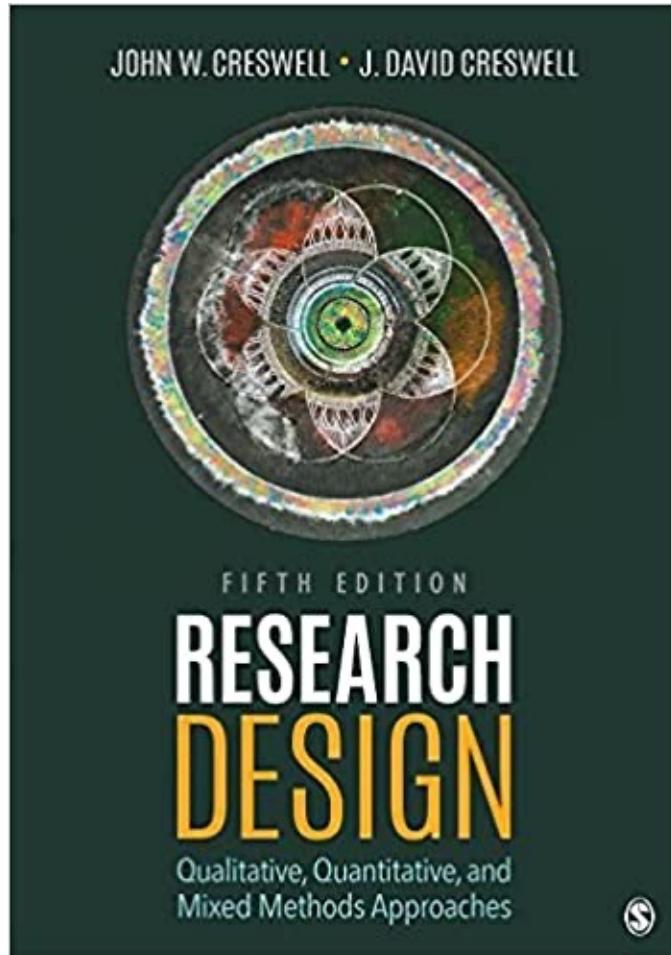
What does it mean?



Learning Outcomes

- LO 1. Explain the research methodology processes in computer science
- LO 2. Design and analyse the research project in computer science
- LO 3. Apply appropriate research methodology techniques

Text and Other Resources



Text

- *Creswell, J. W. & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE Publications, Inc. ISBN: 1506386709, 978-1506386706 [T1]*

Other Resources

- *Tan, W. (2017). Research Methods: A Practical Guide For Students And Researchers. WSPC. ISBN: 978-9813229617, 9813229616 [T2]*
- *Relevant academic papers*

Schedule

Week	Topics	References	Learning Outcomes
1.	<ul style="list-style-type: none"> • Introduction to Research Methods in Computer Science • Empirical Research 	[T1] Ch. 1, 5	LO 1
2.	<ul style="list-style-type: none"> • Writing The Proposal • Research Problems • Literature Review 	[T1] Ch. 2, 3, 4 [T2] Ch. 2, 17	LO 1, LO 2
3.	<ul style="list-style-type: none"> • Research Questions • Hypotheses 	[T1] Ch. 7 [T2] Ch.3	LO 1, LO 2
4.	<ul style="list-style-type: none"> • Quantitative Methods 	[T1] Ch. 8	LO 1, LO 2, LO 3
5.	<ul style="list-style-type: none"> • Qualitative Methods 	[T1] Ch. 9	LO 1, LO 2, LO 3
6.	<ul style="list-style-type: none"> • Survey • Sampling 	[T1] Ch. 8, 9 [T2] Ch. 5	LO 2, LO 3
7.	<ul style="list-style-type: none"> • Project Proposal Presentation 	N/A	LO 1, LO 2
8.	<ul style="list-style-type: none"> • Test 	[T1] Ch. 8, 9	LO 2, LO 3
9.	<ul style="list-style-type: none"> • Mixed Methods Procedures 	[T1] Ch. 10	LO 1, LO 2, LO 3
10.	<ul style="list-style-type: none"> • Project Milestone Presentation 	N/A	LO 2
11.	<ul style="list-style-type: none"> • Writing Research Paper • Ethical Considerations 	[T1] Ch. 4 [T2] Ch. 17	LO 2, LO 3
12.	<ul style="list-style-type: none"> • Summary/Quiz 	N/A	LO 1, LO 2, LO3
13.	<ul style="list-style-type: none"> • Project Presentation 	N/A	LO 3

Assessment

No.	Components	Percentage	Course Intended Learning Outcomes
1.	Assignments	20 %	LO 1, LO 2, LO 3
2.	Quiz	20 %	LO 1, LO 2, LO 3
3.	Final project	30 %	LO 1, LO 2, LO 3
4.	Final examination	30 %	LO 1, LO 2, LO 3
Total		100 %	

Project



Project presentation + demo + documentation

Programming language? It's up to you 😊

- Write a proper and good **proposal & report**

Group

- Max. 3 students





Q & A

Session Learning Outcomes

Upon successful completion of this course, students are expected to be able to:

- LO 1. Explain the research methodology processes in computer science

Topics

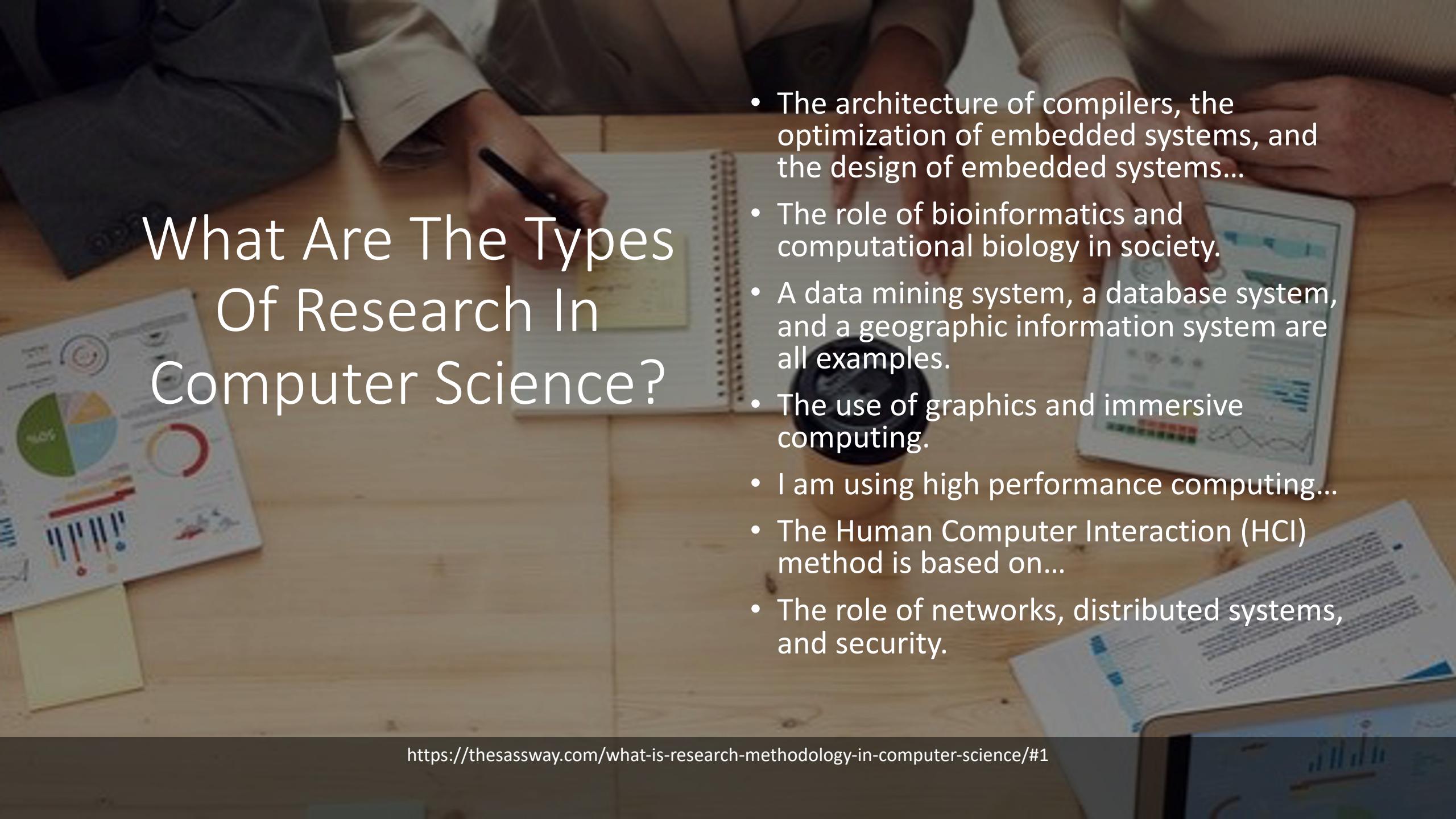
- Introduction to Research Methods in Computer Science
- Empirical Research

Introduction to Research Methods in Computer Science

Introduction

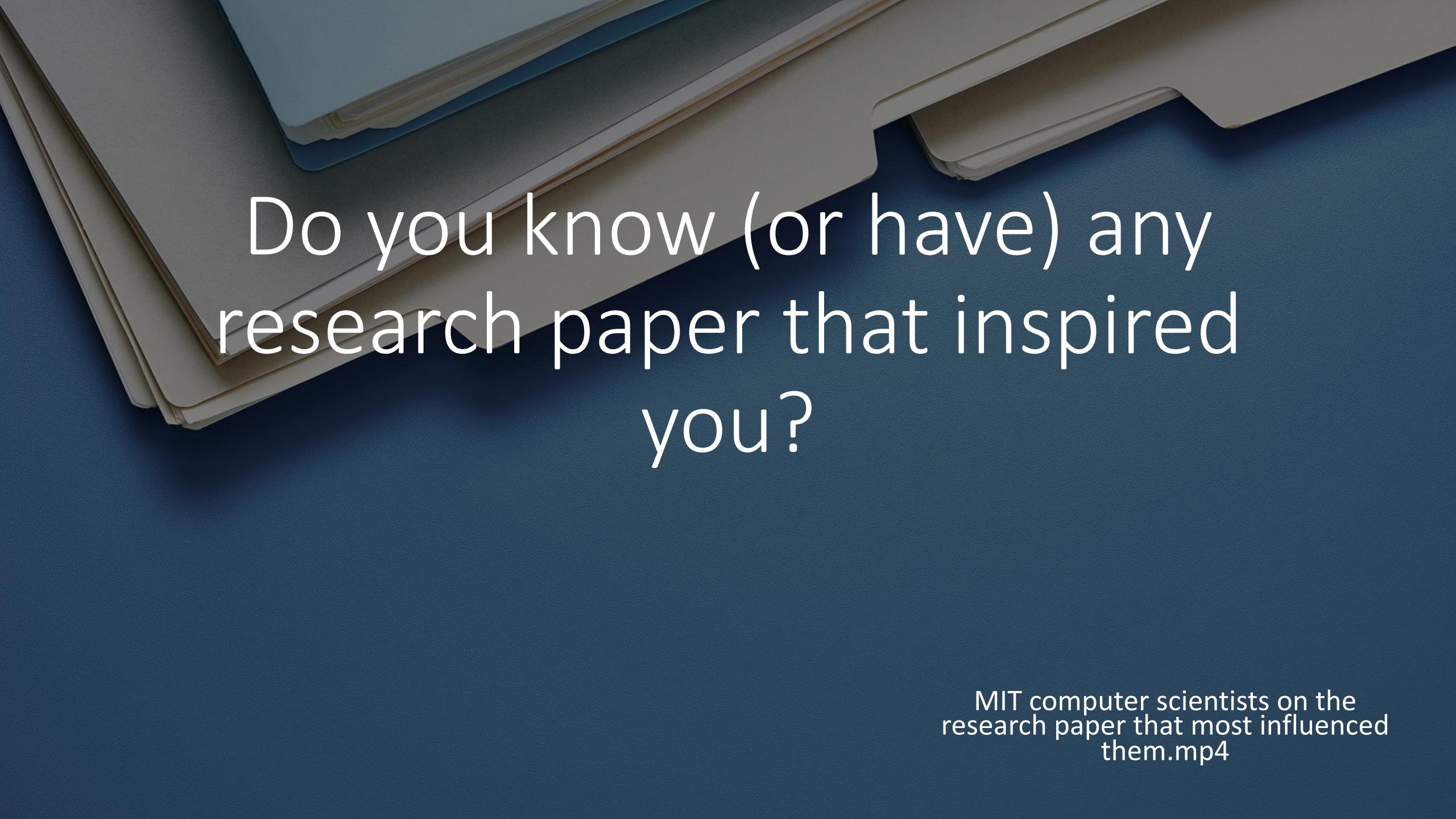


- Computing Science uses a **process methodology** to understand **how tasks are accomplished**
- Research methodology aims to develop the skills needed to conduct research and write about computer science and engineering
- The need for multidisciplinary approaches in software development has led to many of the concepts being borrowed from **social science, psychology, statistics, and other disciplines**.



What Are The Types Of Research In Computer Science?

- The architecture of compilers, the optimization of embedded systems, and the design of embedded systems...
- The role of bioinformatics and computational biology in society.
- A data mining system, a database system, and a geographic information system are all examples.
- The use of graphics and immersive computing.
- I am using high performance computing...
- The Human Computer Interaction (HCI) method is based on...
- The role of networks, distributed systems, and security.

The background of the slide features a dark blue textured surface. On the left side, there is a stack of several books and papers. The books have dark grey or black covers, and the papers are white with some showing the edges of other documents underneath. The lighting creates a soft glow around the edges of the books.

Do you know (or have) any
research paper that inspired
you?

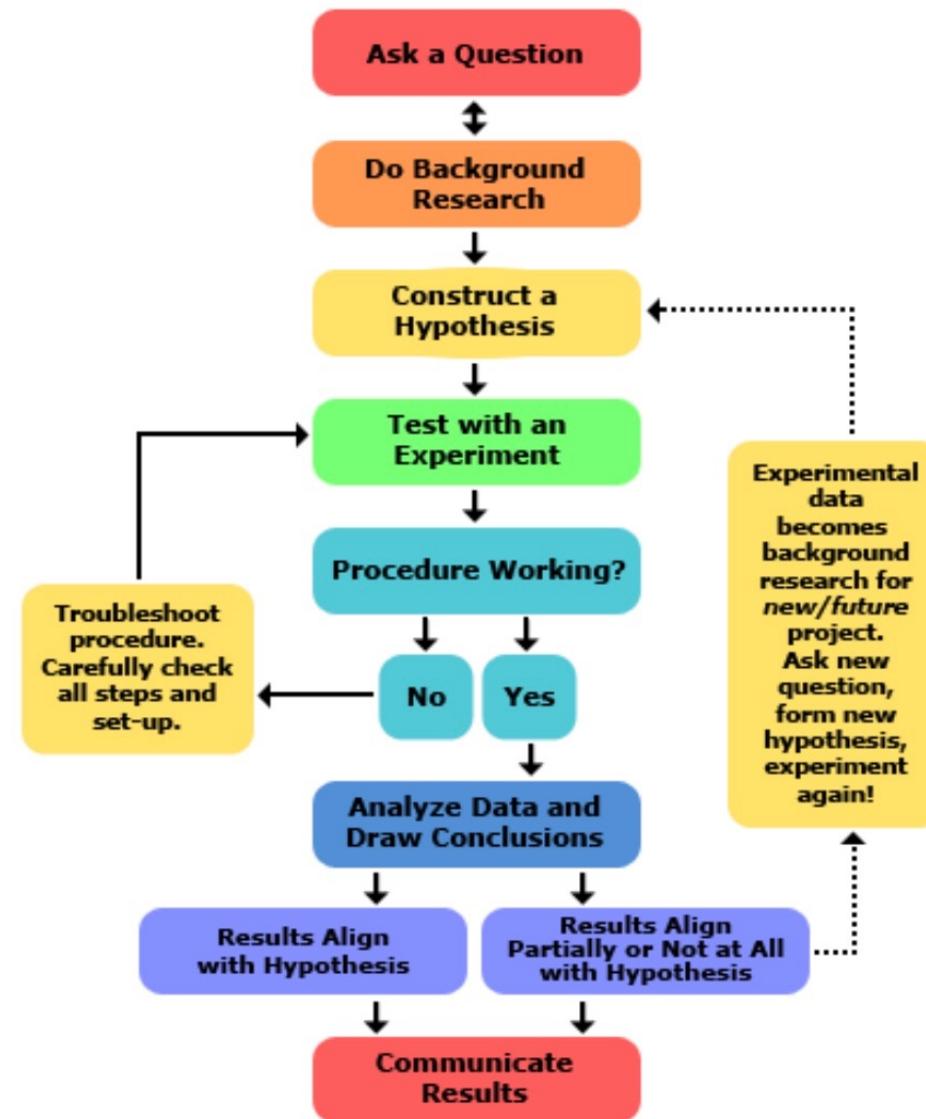
MIT computer scientists on the
research paper that most influenced
them.mp4

Research Characteristics

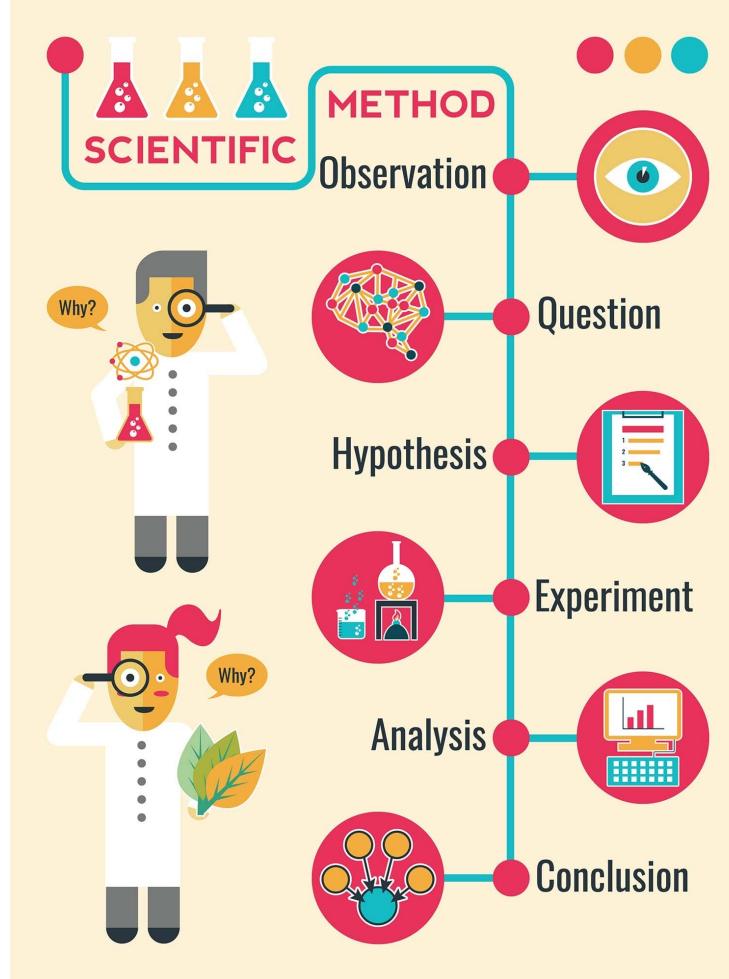


- Originates with a question or problem.
- Requires clear articulation of a goal.
- Follows a specific plan or procedure.
- Often divides main problem into subproblems.
- Guided by specific problem, question, or hypothesis.
- Accepts certain critical assumptions.
- Requires collection and interpretation of data.

Scientific Method



Scientific Method – What We Need To Do



- Hypothesis
- Sequence of experiments
 - Randomization
 - Repetition
- Change one parameter/experiment
- Prove/Disprove Hypothesis
- Document for others to reproduce results

The Selection of a Research Approach

- **Research approaches** are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation.
- This plan involves several decisions, and they need not be taken in the order in which they make sense to us and the order of their presentation here.



Decision and Approach

- The overall decision involves which approach should be used to study a topic.
- Informing this decision should be the philosophical assumptions the researcher brings to the study; procedures of inquiry (called **research designs**); and specific **research methods** of data collection, analysis, and interpretation.
- The selection of a research approach is also based on the nature of the **research problem** or issue being addressed, the researchers' personal experiences, and the audiences for the study

Quantitative VS Qualitative

menti.com

Methodology

Quantitative

- Explanation, prediction
- Test theories
- Known variables
- Large sample
- Standardized instruments
- Deductive

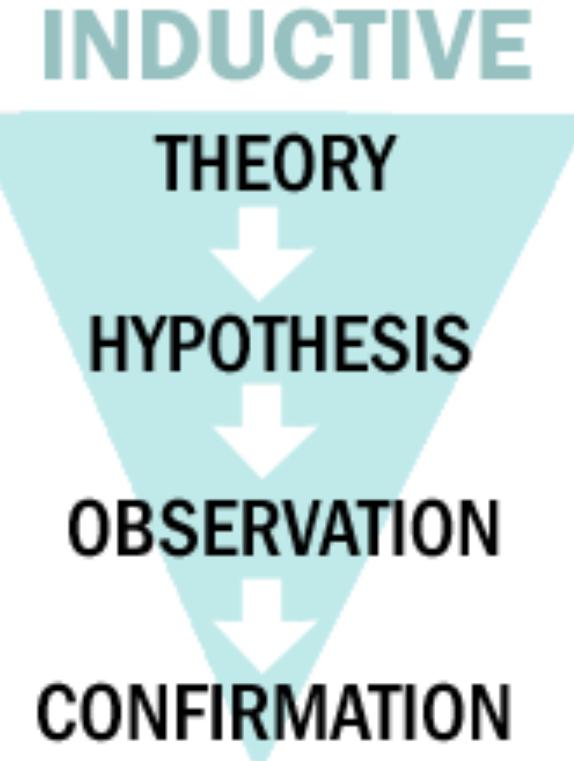
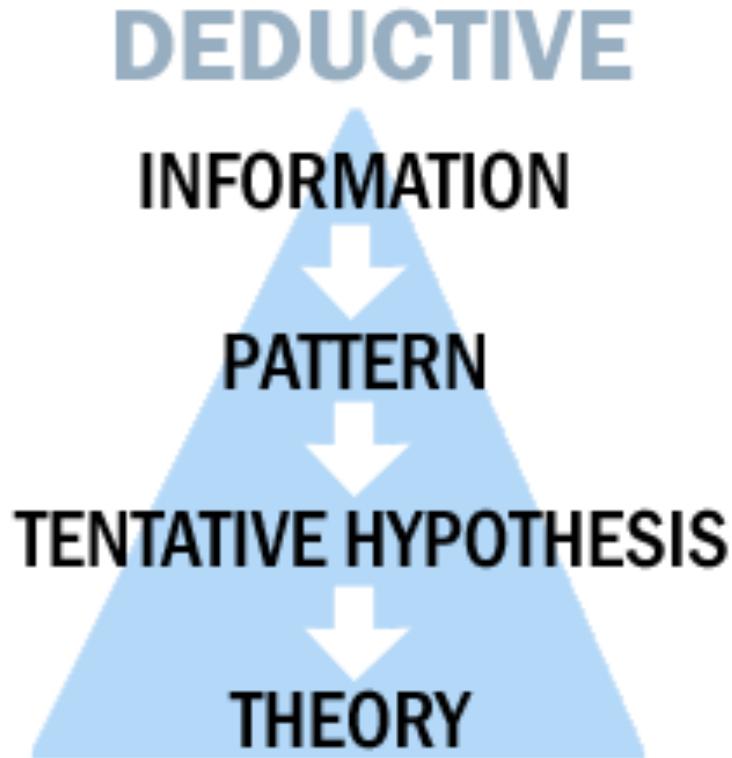


Qualitative

- Explanation, description
- Build theories
- Unknown variables
- Small sample
- Observations, interviews
- Inductive

Deductive VS Inductive

Deductive = using a general premise to form a specific conclusion



Inductive = using specific observations to form a general conclusion

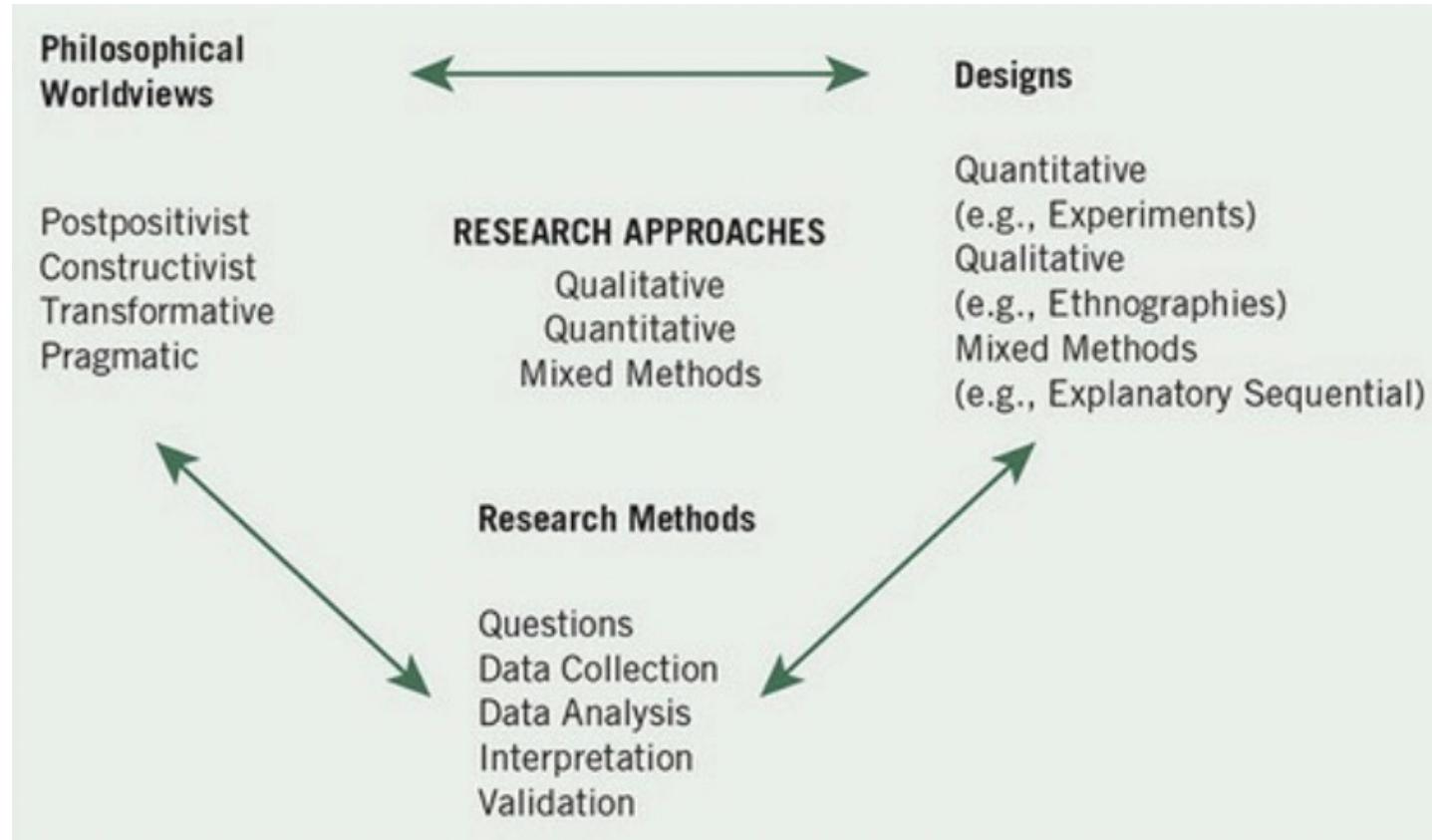
A photograph showing a group of people in a meeting room, focused on a wooden table. On the table are several large, colorful 3D icons representing different concepts: a power button, a cloud, a Wi-Fi signal, an upward arrow, a share symbol, a circular arrow, and a rocket ship. The people are dressed in professional attire, and one person's hands are visible reaching for the icons.

The Three Approaches to Research

- Qualitative
 - Quantitative
 - Mixed method
-
- Experiment? Survey?
Interview? Observation?
 - Primary data?
Secondary?

Three Components Involved in an Approach

- A Framework for Research—The Interconnection of Worldviews, Design, and Research Methods



Two important components in each definition are that the approach to research involves philosophical assumptions as well as distinct methods or procedures. The broad research approach is the plan or proposal to conduct research, involves the intersection of philosophy, research designs, and specific methods.

Empirical Research

Empirical Research

QuestionPro



- Empirical research is research that is based on observation and measurement of phenomena, as directly experienced by the researcher.
- The data thus gathered may be compared against a theory or hypothesis, but the results are still based on real life experience.
- The data gathered is all primary data, although secondary data from a literature review may form the theoretical background.

Empirical Research

- Typically, empirical research embodies the following elements:
 - A research question, which will determine research objectives.
 - A particular and planned design for the research, which will depend on the question and which will find ways of answering it with appropriate use of resources.
 - The gathering of primary data, which is then analysed.
 - A particular methodology for collecting and analysing the data, such as an experiment or survey.



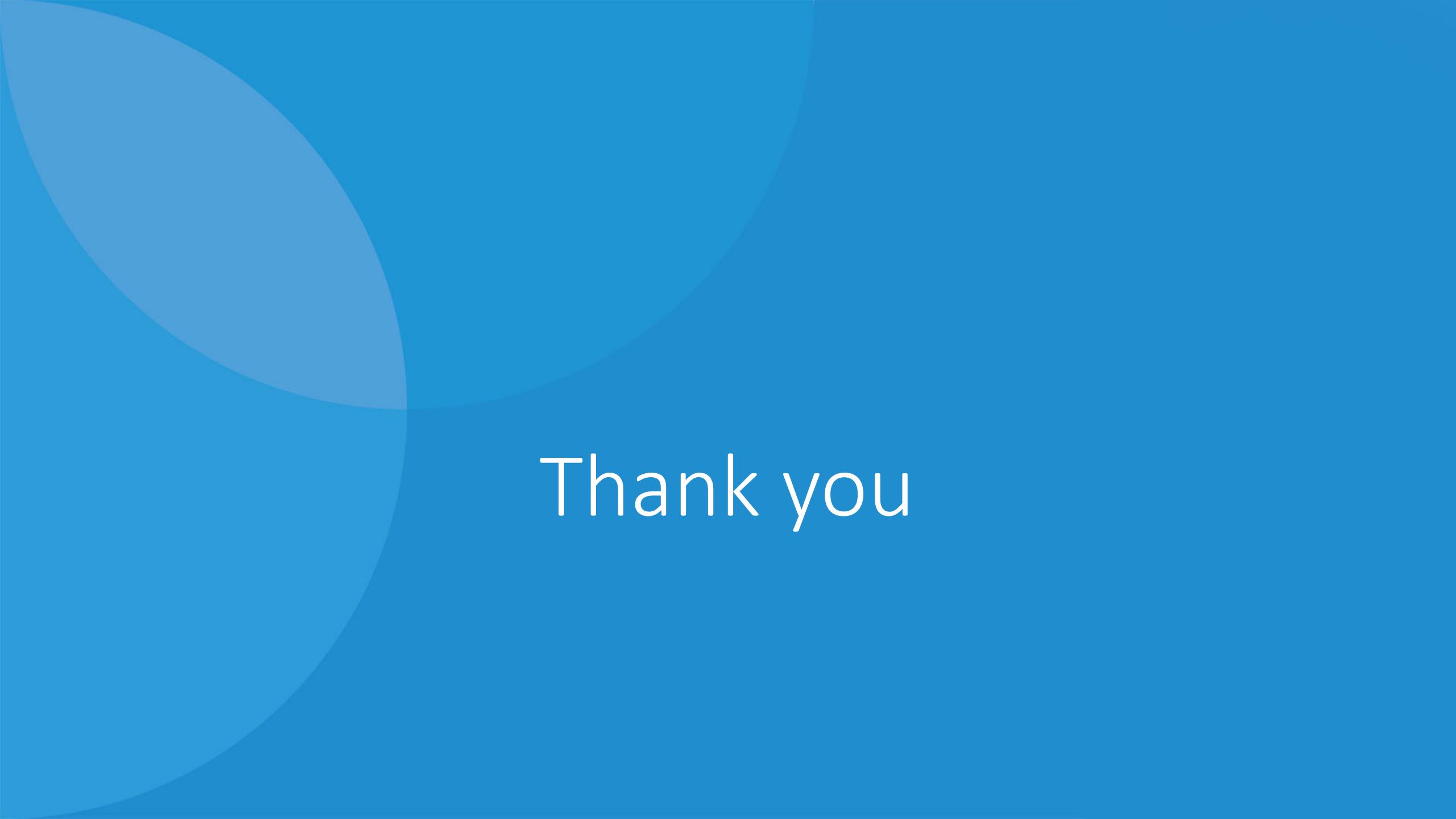
Empirical Research (continue)

- Typically, empirical research embodies the following elements:
 - The limitation of the data to a particular group, area or time scale, known as a sample: for example, a specific number of employees of a particular company type, or all users of a library over a given time scale. The sample should be somehow representative of a wider population.
 - The ability to recreate the study and test the results. This is known as reliability.
 - The ability to generalise from the findings to a larger sample and to other situations.



References

- Creswell, J. W. & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE Publications, Inc. ISBN: 1506386709, 978-1506386706
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Thank you