



U s e r I n t e r f a c e s

EECS 346I – Sections A & B
Fall 2021

Resource Pack: Knowledge and Knowledge Practices I
Activities, Methodologies, Methods

© **Melanie Baljko**

Intellectual Property Notice

This presentation is protected by Canadian and international copyright laws. Reproduction and distribution of the presentation without the written permission of the copyright holder is prohibited.

These course materials are designed for use as part of the EECS3461 course at York University and are the intellectual property of the instructor unless otherwise stated. Third party copyrighted materials (such as book chapters, journal articles, music, videos, etc) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law.

Copying this material for distribution (e.g., uploading material to a commercial third-party website) may lead to a charge of misconduct under York's Code of Student Rights and Responsibilities and the Senate Policy on Academic Honesty and/or legal consequences for violation of copyright law if copyright law has been violated.

© Melanie Baljko, 2021

Dependencies

This resource pack assumes that you are already familiar with:

- *no dependencies*

Inquiry

1. What is a *methodology* vs a *method*?
2. What are the four core activities (in most design methodologies)?
3. What is research?

In Sum

[putting the “punchline” upfront]

- a research methodology is different from a design methodology
- the four core activities that are relevant to (most) design methodologies are: research, ideation, prototyping, evaluating
- research, which is concerned with generating knowledge, can depend on one or more of unstructured qualitative data, structured qualitative data, and/or quantitative data
- data can be linked to knowledge through the (speculative) DIKW model
- a *methodology* refers to a system of *methods* used in a particular activity, and the *methods* refer to particular procedures
- part of being a critical learner is being attuned to the rationales and epistemologies that underlie various methodologies

1. What is a methodology vs a method?

Method vs Methodology

- the terms *method* and *methodology* are often used interchangeably, but they are indeed different
- *method*: a particular procedure for accomplishing or approaching something (akin to a tool)
- *methodology*: a system of methods used in a particular activity; has an underlying rationale and implements a particular strategy

This is a reasonable discussion:

Brookshier (2018) Method vs. methodology: understanding the difference, <https://uxdesign.cc/method-vs-methodology-whats-the-difference-9cc755c2e69d>

Methodology

- is a general approach, a general strategy for the activity
- consists of methods, rules, and postulates
- provides the rationale behind the methods that are chosen

Different Methodologies

Of course, there are different activities, and thus there are different methodologies...

- **research methodology:**
 - a system of methods for **research**
 - methodology for knowledge production (for generating knowledge outputs)
- **design methodology:**
 - a system of methods for **design**
 - methodology for generating design outputs
- **evaluation methodology:**
 - a system of methods for **evaluation**
 - methodology for generating evaluation outcomes
- **prototyping methodology**
 - a system of methods for prototyping

Examples:

- Examples of methodologies:
 - research methodology: ethnography, scientific method
 - design methodology: double diamond, waterfall
 - evaluation methodology: outcome-based, process-based
 - prototyping methodology: electronics prototyping, scale modelling, rapid prototyping, functional prototyping
- Examples of methods:
 - research methods: interviews, behavioural observations
 - design method: journey mapping
 - evaluation methods: metrics, case study, sampling
 - prototyping methods: pen-and-paper sketching, cardboard modelling, wireframing

Rationale behind a Methodology

- as we already established, a methodology provides the rationale behind the methods that are chosen
- this is often referred to as the underlying *epistemology*

Epistemology

“An epistemology is a theory of knowledge. It answers questions about who can be a “knower” [...]; what tests beliefs must pass in order to be legitimated as knowledge? [...], what kinds of things can be known (can “subjective truths” count as knowledge?), and so forth.”

[Harding, 1987]

- beliefs are the starting point, beliefs remain beliefs until they pass a test to be *legitimated* as knowledge

Types of Knowledge

It is common in epistemology to distinguish among three kinds of knowledge. There's the kind of knowledge you have when it is truly said of you that you know how to do something—say, ride a bicycle. There's the kind of knowledge you have when it is truly said of you that you know a person—say, your best friend. And there's the kind of knowledge you have when it is truly said of you that you know that some fact is true—say, that the Red Sox won the 2004 World Series. Here we will be concerned with the first and last of these kinds. The first is usually called “knowledge-how” and the last is usually called “knowledge-that” or “propositional knowledge.”

“Knowledge How”, Stanford Encyclopedia of Philosophy,
<https://plato.stanford.edu/entries/knowledge-how/>

Positivism (in a nutshell)

- *positivism* refers to a philosophical position, an epistemological stance
- holds that the world consists of regularities and these regularities are detectable
 - society and the world operates according to general laws
 - thus, the researcher can infer knowledge about the real world by observing it
 - the researcher should be more concerned with general rules than with explaining the particular
- the only true or genuine knowledge is that which can be verified by sense experience
 - facts are 'out there' in the objective world, facts are not mediated by the social world

Other epistemological stances

- what if you do not believe that the social realm can be studied solely using a scientific approach?
- for instance:
 - you might feel that not all facts are 'out there' in the objective world, instead what we consider to be fact may instead be socially constructed
 - you feel that some types of knowledge are subjective, cannot be verified by science, and yet still are true and genuine knowledge
 - ... and so on (there are many objections to positivism)...
- and so we will need to consider other epistemological stances (forward pointer to module on Third Paradigm HCI)

Why are we talking about this?

- Interactive system design makes use of several different knowledges (only one of which is scientific knowledge)
- at this point in your degree program, you are likely to have a certain developed stance with respect to what counts as knowledge
 - this stance is likely to depend on your program of study
 - this stance may be based on assumptions that you have made (even without realizing)
- sometimes there is a default assumption that the only knowledge is knowledge that is produced by the scientific method
 - if so, this assumption can be problematic the discipline of interactive system design

Being a critical learner

- a component of being a critical learner is asking questions about what is being taught and about what assumptions are being made

In Sum

- a *methodology* refers to a system of *methods* used in a particular activity, and the *methods* refer to the particular procedures
- a research methodology is different from a design methodology
- methodologies have underlying epistemologies, which have underlying rationales
- part of being a critical learner is being attuned to these underlying rationales

2. What are the four core activities?

HCD: Four Core Activities

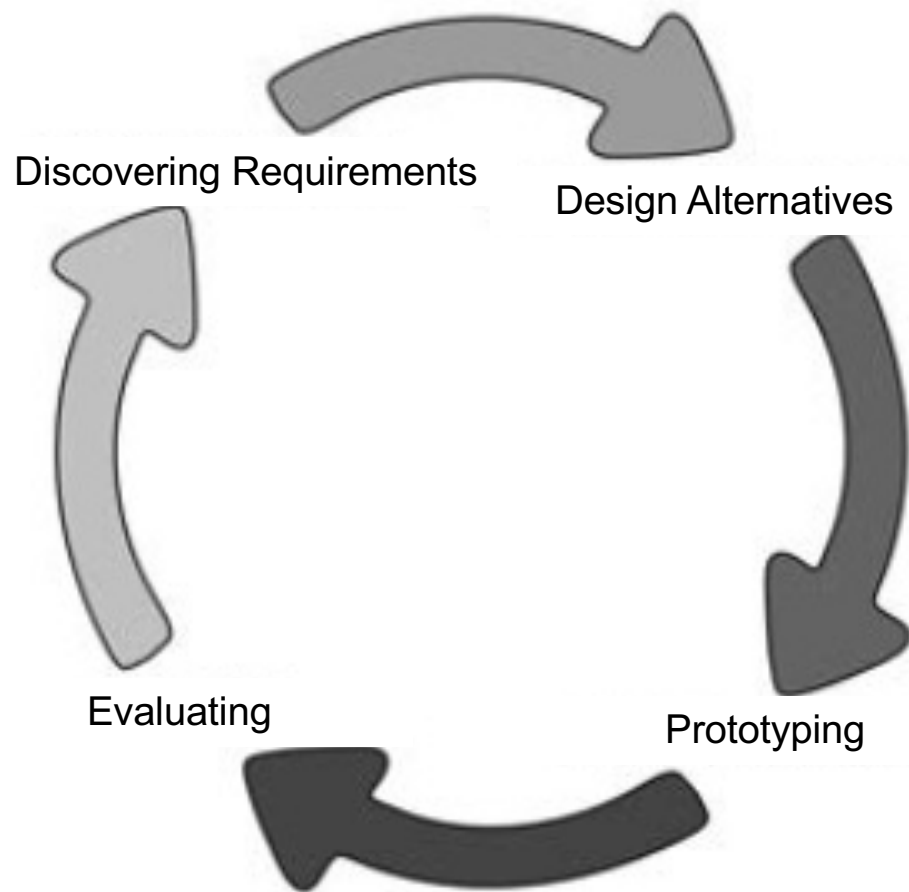
- In most design methodologies, especially human-centered methodologies, there is some arrangement of four core activities
- Although the activities may be called by different names, they align with common underlying methodologies

Sharp et al (2019):

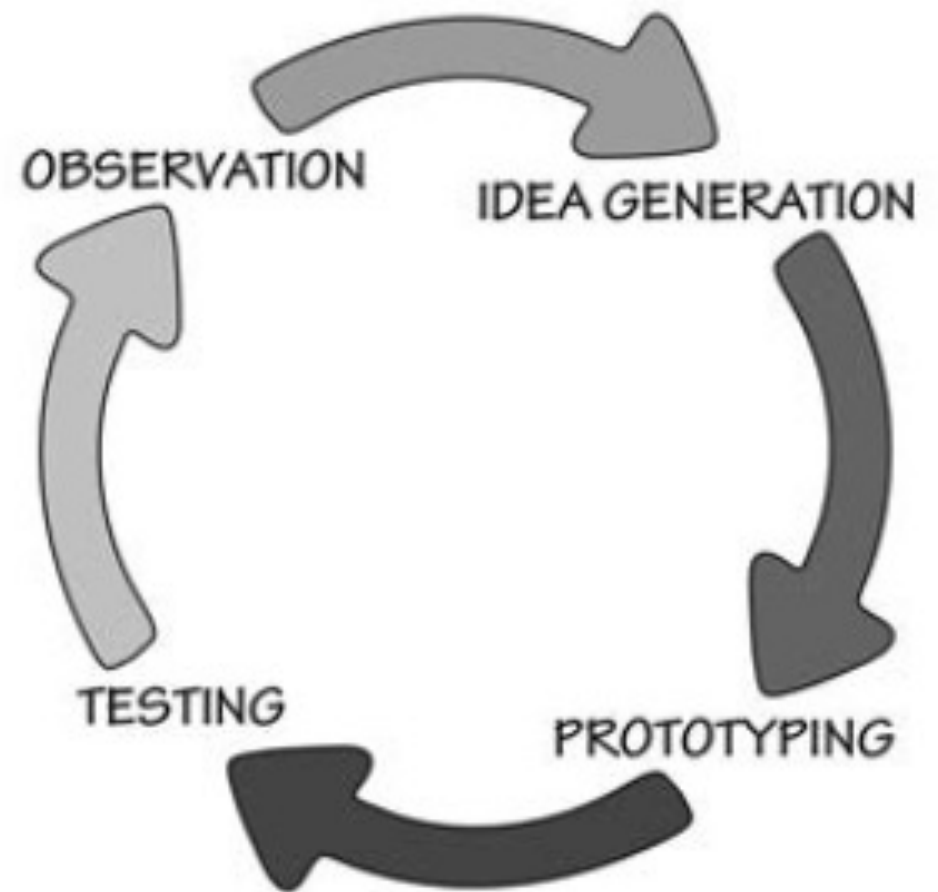
1. Discover requirements
2. Designing alternatives
3. Prototyping
4. Evaluating

Norman, Design of Everyday Things (2013)

1. Observing (research)
2. Generating Ideas
3. Prototyping
4. Testing



Sharp et al, (2019), 2.2.5 Four Basic Activities of Interaction Design, pp.50



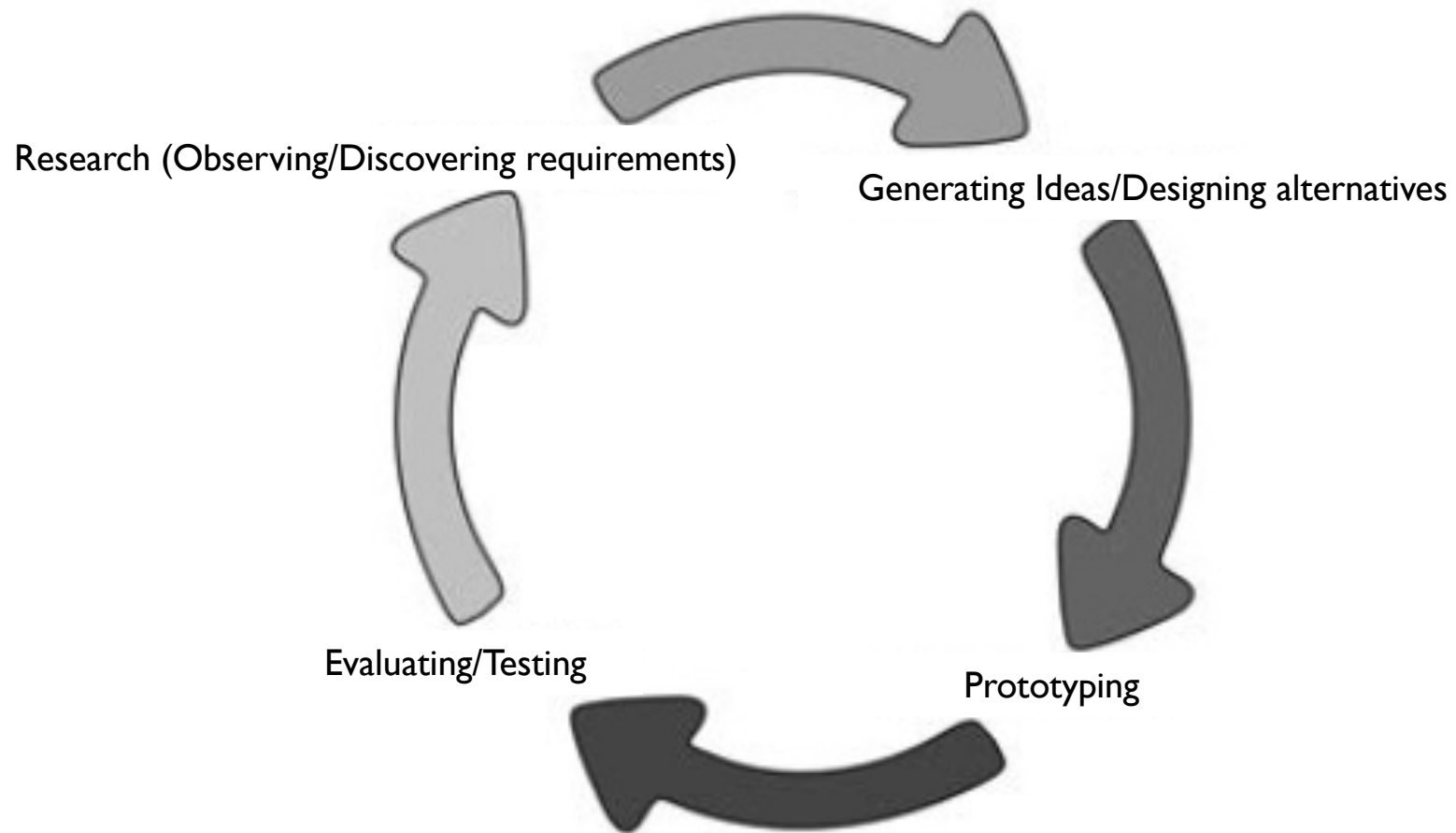
Donald A. Norman, The Design of Everyday Things, New York : Basic Books, 2013.

Four Core Activities

1. Research (Observing/Discovering requirements)
2. Generating Ideas/Designing alternatives
3. Prototyping
4. Evaluating/Testing

Four Core Activities

the output of one activity generally feeds into the next activity



In Sum

- the four core activities that are relevant to most design methodologies are:
 - Research (Observing/Discovering requirements)
 - Generating Ideas/Designing alternatives
 - Prototyping
 - Evaluating/Testing

3. What is research?

Why ask the question “What is research?”

- We want to ask and answer the question “What is design?” (subsequent module)
- To get there, we’ll start with a different but related question “What is research?”

What is research?

Research is “the systematic investigation into and study of materials and sources in order to establish **facts** and reach **new conclusions**” [OED]

Research is "creative and systematic work undertaken to increase the stock of **knowledge**" [OECD, 2015]

Scientific research is investigation or experimentation aimed at the discovery and interpretation of **facts** and **revision** of accepted **theories or laws** in light of new facts [MacKenzie, 2013, Ch 4, pp.129]

Research entails a methodology

“A methodology is a theory and analysis of how research does or should proceed.”

[Harding, 1987]

Research-Creation

- An approach to research that combines creative and academic research practices, and supports the development of knowledge and innovation through artistic expression, scholarly investigation, and experimentation.
- The creation process is situated within the research activity and produces critically informed work in a variety of media (art forms).
- Research-creation cannot be limited to the interpretation or analysis of a creator's work, conventional works of technological development, or work that focuses on the creation of curricula.
- Fields that may involve research-creation may include, but are not limited to: architecture, design, creative writing, visual arts (e.g., painting, drawing, sculpture, ceramics, textiles), performing arts (e.g., dance, music, theatre), film, video, performance art, interdisciplinary arts, media and electronic arts, and new artistic practices.

What is the outcome of research?

- there are different ways to characterize the outputs of research
- the most general characterization is increasing **knowledge** or to generate **knowledge outputs**
- knowledge outputs:
 - knowledge-that
 - knowledge-how

Empirical Knowledge, Empirical Research

- knowledge that is gained by means of the senses, particularly by observation and experimentation
- While many research methodologies are empirical, not all are... e.g., philosophy, literary criticism, cultural studies, ...

Data, Phenomena

- observations or facts that capture something about phenomena and/or the state of the world
- a phenomenon refers a situation that is observed to exist or to happen, especially one whose cause or explanation is in question
- these observations has no inherent meaning without context and interpretation

Data: Singular or Plural

Is *data* singular or plural?

- For instance, in the field of medicine, one will often hear “these data demonstrate that longevity is not correlated to ...” – that is, *data* is a plural
- In computer science, the term *data* is used to describe a mass of information to be accessed, stored, or processed: “this data was collected to demonstrate that Star Trek TNG is the best show ever”
- Usage has evolved from the word's origin as the Latin plural of *datum*, singular verbs now are often used; there is plenty of debate
- I use the word *data* in the singular form

Data

observations or facts can be captured via:

- *unstructured* approaches (data used in qualitative research)
 - call this “Unstructured Qualitative Data”
- *structured but non-numerical* approaches (qualitative data)
 - call this “Structured Qualitative Data”
- *structured and numerical* approaches (quantitative data)
 - call this “(Structured) Quantitative Data” or just “Quantitative Data”

Unstructured Qualitative Data

- observations or facts that capture something about phenomena and/or the state of the world *using unstructured approaches*
- examples:
 - field notes (taken by a researcher during the course of observation)
 - audio or video recordings (made by a researcher of participants in natural settings)
 - interview and focus groups transcripts
 - reddit posts or other contributions on social media
- unstructured qualitative data is analyzed using specialized techniques
 - e.g., coding, thematic analysis
 - to be discussed later in the course

Structured Qualitative Data

- observations or facts that capture something about phenomena and/or the state of the world *using structured approaches*
- examples:
 - true/false, agree/disagree questions
 - questions that ask for rating (“on a scale from 1 to 5” ...)
 - questionnaires asking about qualities, characteristics, preferences
- this data gets represented using variables, and these variables have scales
 - the data gets structured by virtue of the scale of measurement
- only some mathematical operations can be performed on this type of data
 - e.g., calculation of the mode (the most frequent item)

(Structured) Quantitative Data

- observations or facts that capture something about phenomena and/or the state of the world *using structured and numerical values*
- examples:
 - number of input errors
 - typing speed
 - proportion of a GUI's menu hierarchy that gets traversed
 - user's ranked preference for interface options
 - force exerted on input device to activate input action
- the data gets structured via the measurement scale associated with its representation (e.g., counting and numerical measurement)
- many types of mathematical operations can be performed on this data (from basic to advanced)
 - basic: compute the mode or median
 - advanced: compute the coefficient of variation

Structured Data: Notice!

- mathematical operations can be performed on both quantitative data and structured qualitative data
- the ability to perform mathematical operations is **not the sole defining characteristic** of quantitative data

Data

- data refers to observations or facts that capture something about phenomena and/or the state of the world
- these observations has no inherent meaning without context and interpretation
- the scale of measurement employed to represent and structure data provides some of the context, but data still needs to be analyzed and interpreted

DIKW Pyramid

- the DIKW pyramid is a speculative model of the relationships between **d**ata, **i**nformation, **k**nowledge, and **w**isdom



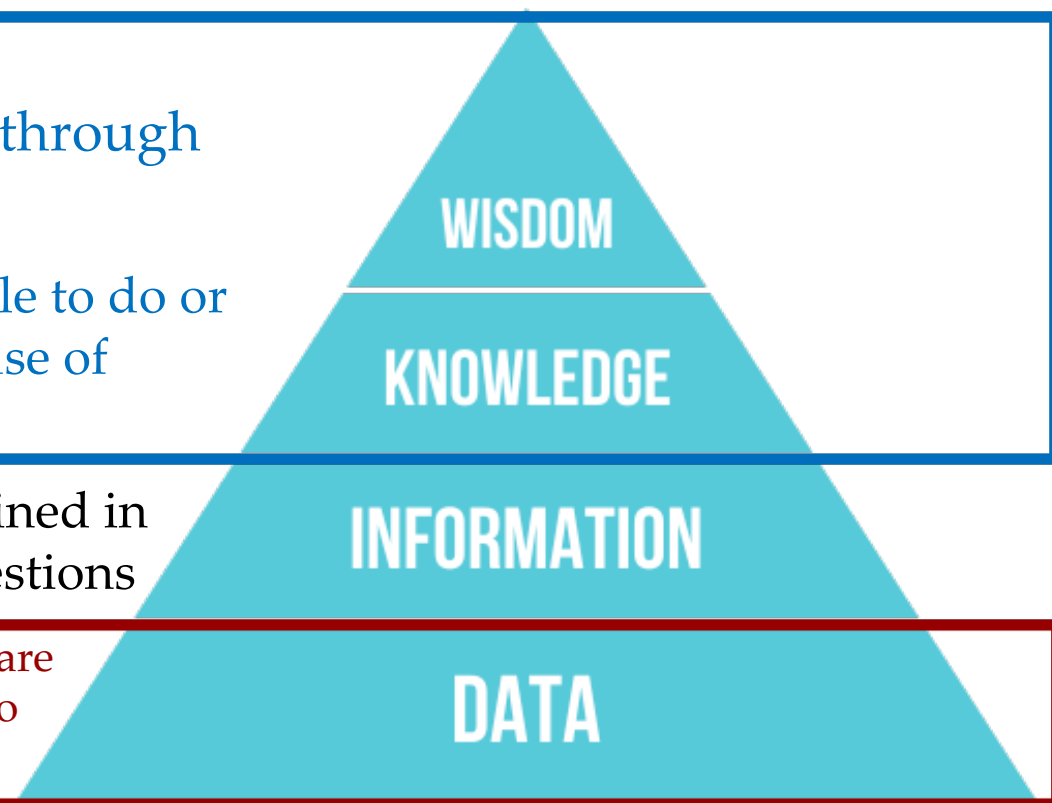
DIKW Pyramid

wisdom is increasing effectiveness through judgement and knowledge

knowledge is know-how (e.g, being able to do or to accomplish something through the use of information)

information: gets inferred from, or defined in terms of, data; provides answers to questions

data: merely raw "facts" or "observations" that are products of a collection procedure that are of no use until they processed into a useable form



In Sum

- answering the question “what is research?” helps us toward answering the question “what is design?”
- research is concerned with generating knowledge
- knowledge generation (often) depends on data: unstructured qualitative data, structured qualitative data, and quantitative data
- data can be linked to knowledge through the (speculative) DIKW model

In Sum

- a research methodology is different from a design methodology
- the four core activities that are relevant to (most) design methodologies are: research, ideation, prototyping, evaluating
- research, which is concerned with generating knowledge, can depend on one or more of unstructured qualitative data, structured qualitative data, and/or quantitative data
- data can be linked to knowledge through the (speculative) DIKW model
- a *methodology* refers to a system of *methods* used in a particular activity, and the *methods* refer to particular procedures
- part of being a critical learner is being attuned to the rationales and epistemologies that underlie various methodologies