Exam Revision 1

INFR11158/11230 Usable Security and Privacy

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THE UNIVERSITY of EDINBURGH

Exam Structure

- Three questions: you must do Question 1 and select either Question 2 or Question 3 to answer
- “NOTES PERMITTED, CALCULATORS NOT PERMITTED examination. Candidates may consult up to THREE A4 pages (6 sides) of notes. CALCULATORS MAY NOT BE USED IN THIS EXAMINATION”
- Past exams online: https://exampapers.ed.ac.uk/

Expectation

- Applying concepts and frameworks learned in the lecture
- Thinking and analyzing critically using logic and examples
  - What are the limitations/tradeoffs?
  - What are the experiment tasks and materials?
  - Any similar cases?
  - ...
- No statistics, calculation, and drawing tested in the exam

Topics

- USEC basics
- Study method and analysis
- Authentication
- Online fraud and phishing
- Security and privacy communication (warning, advice, etc.)
- Privacy framework, tools, and policy
- Ethics and consent
- Access control, vulnerability research, AI, IoT, at-risk users....
- Other coursework-related topics (framework application, dark patterns, etc.)

USEC Intro

Defining security – CIA definition

Confidentiality	No improper information gathering
Integrity	Data has not been (maliciously) altered
Availability	Data/services can be accessed as desired
Accountability	Actions are traceable to those responsible
Authentication	User or data origin accurately identifiable

Usability and human factors

- **Learn-ability** – The type for typical users to learn the actions relevant to a set of tasks.
- **Efficiency** – How long it takes users to perform typical tasks.
- **Errors** – The rate of errors users make when performing tasks.
- **Memorability** – How users can retain their knowledge of the system over time.
- **Subjective satisfaction** – How users like the various aspects of the system.

USEC is challenging because

- Interdisciplinary
- Seemingly familiarity
- Interrelations
- User evaluation
- Ecological validity
- Adversary model
- Technology velocity
- Customer

Threat Modelling: Adversaries

- Malicious actors
  - Hacker
  - Users (your family, your friend, your customer, etc.)
- Service providers
  - Company
  - App developers
- “Big brother”
- ... (depending on your position)

Assets

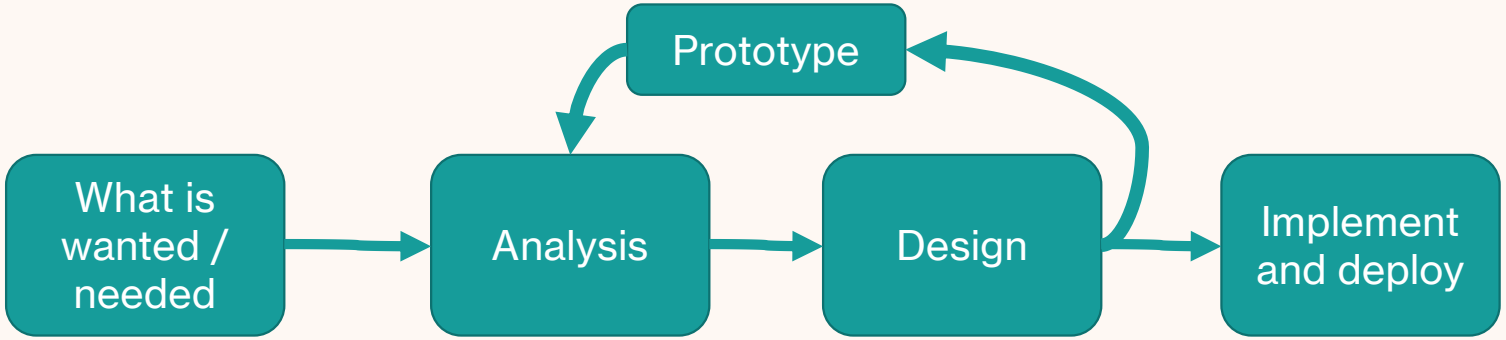
- Computer hardware: phone, laptop, server...
- Computer software: apps, operating systems, database...
- Physical assets: house, car.....
- Information: health record, your profile/identity, business info...
- Emotion, reputation, user experience....

Risk, threat and vulnerability

- Vulnerability: the weakness of X (system/human) that can be exploited
  - The program is overprivileged to access things
  - The user reuses their password across applications
- Threat is an action performed by the adversary to damage the asset by exploiting a vulnerability
- Risk = asset X threat X vulnerability

Study and Analysis Methods

Project lifecycle



Ethics guidelines

School of Informatics Intranet
INFWEB

InfWeb home

Research

Ethics and integrity

- Introduction to research ethics and the Informatics ethics process
- Ethics and COVID-19
- Ethics and integrity guiding principles
- Ethics and the UK GDPR
- Ethics procedure
- Ethics levels
- Ethics approval duration
- Ethics resources
- Using secondary and social media data
- Ethics FAQs

Home > InfWeb > Research > Ethics and integrity > Ethics procedure

Contact us

Ethics procedure

An overview of the School's ethics procedure, including when and how to complete an ethics application for review.

Consideration of the ethical aspects of our research is both a moral and a legal obligation, as well as part of the academic culture in which we should be training researchers. The following procedures should help us fulfil those requirements. The goal of the system is full legal accountability with minimal effort. The first goal is served by keeping the full record. The second goal is served by keeping form filling to a minimum, by holding information locally, and by assuring that decision-making is as close to the pertinent research expertise as possible.

The procedures proposed here aim to ensure that ethical consideration are taken into account in any research done in the School. The proposed framework borrows heavily from current practice in PPLS Psychology and Linguistics, as well as procedures in GeoSciences.

The system outlined on these pages apply to UG final year projects, MSc projects, PhD projects, Post-doc fellowships, funded research requiring a proposal, research performed by a visitor, and personal research for which there is no proposal.

Ethics application via online form

This is the online form, which has replaced the old Word forms. Please use it for all staff and student projects. Your data is stored on a server in the EU, following UK GDPR rules. The Principal Investigator will receive a copy of the form.

If you are submitting more than one ethics application, please wait to receive the automated confirmation of receipt for your first application before submitting the next.

Once submitted, the panel will aim to reply within 10 working days.

Update for December 2023 / January 2024:

Ethics guidelines

THE UNIVERSITY of EDINBURGH SharePoint 在此网站中搜索

Research Services 主页 文档 页面 网站内容

沉浸式阅读器 共享

Level 1

Reviewed by one assigned member of the Informatics ethics committee

Applications are considered at level 1 if the proposed research involves human participants or personal data, but it does **not** involve any of the points outlined under level 2.

Level 2

Reviewed by two assigned members of the Informatics ethics committee

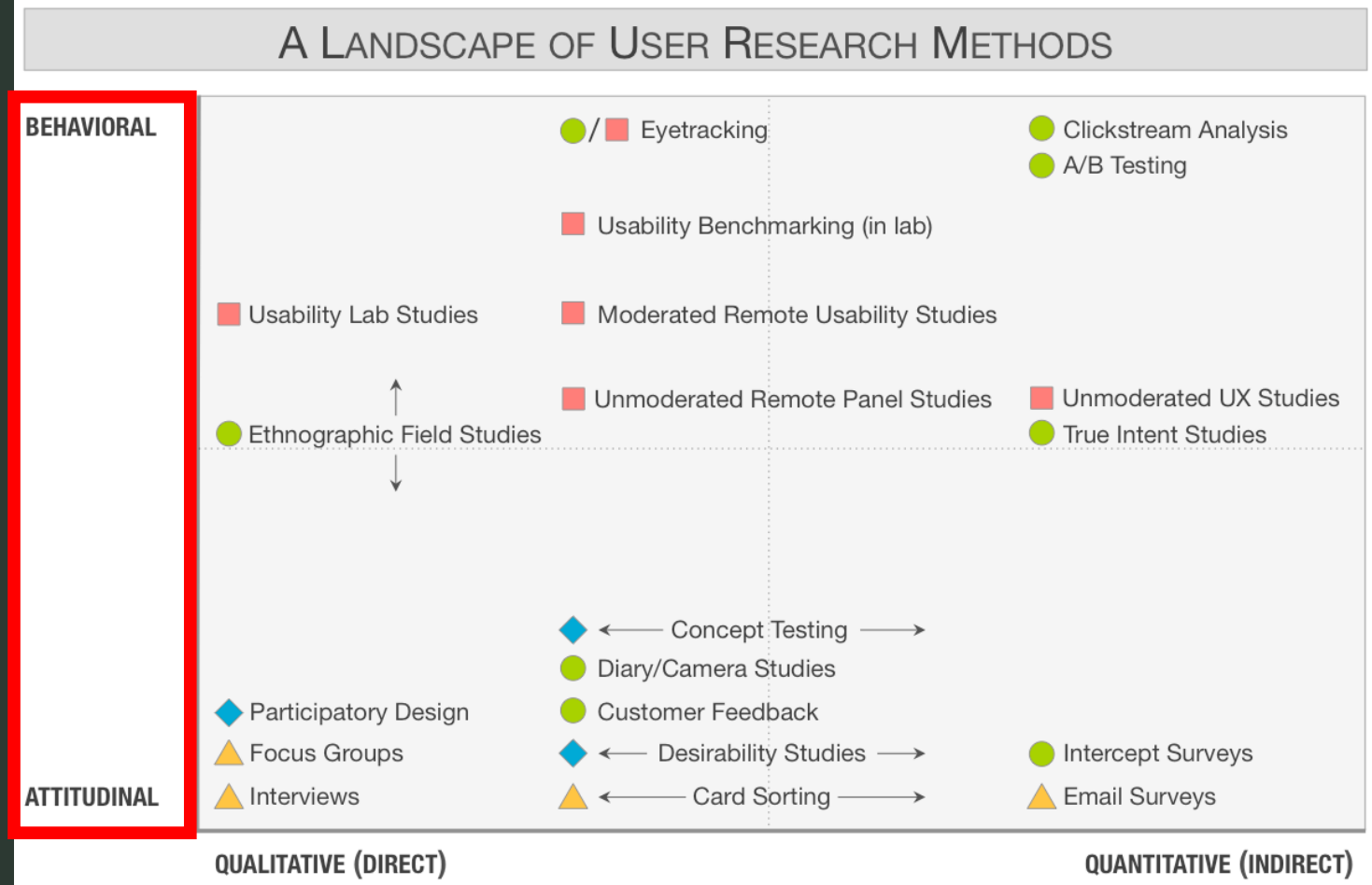
Applications are considered at level 2 if the research involves any of the below:

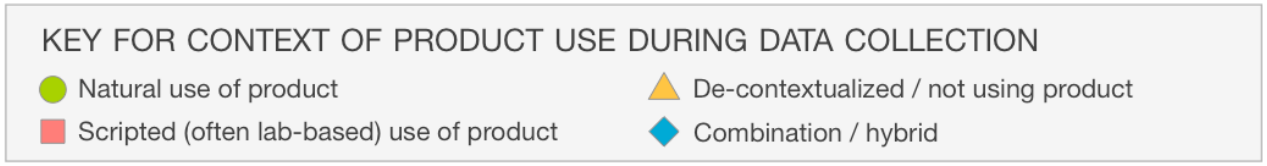
- Issues with regards to the safeguards quoted as good practice in the University's Data Protection policy (including the minimization principle, anonymization of personal data, and secure storage of data. See the University's data protection policy and accompanying handbook for further information (sections 12 and 13 relevant for research and student projects respectively).
  - Data Protection Policy
  - Data Protection Handbook
- Issues with regards to data protection and consent, including but not limited to:
  - The use of services which are not UK GDPR compliant (e.g. Dropbox) to store data that are sensitive and/or could be used to identify participants.
  - The collection of participant data without explicit participant consent (e.g. where participants cannot meaningfully provide consent [see also Vulnerable participants], or where administrative consent is sought in lieu of participant consent [e.g. for aggregated information on participants])
- Significant potential for physical or psychological harm, discomfort or stress, including but not limited to:
  - Projects where the true purpose of the research is concealed from participants
  - Potential harm to the researcher(s)
- Vulnerable participants, including but not limited to individuals who are:
  - under the age of 15
  - disabled
  - in any other dependent relationship with the researchers(s), e.g. student-teacher
  - known to have special education needs
  - physically or mentally ill, or with diminished cognitive capacity
  - in the care of a Local Authority

https://uoe.sharepoint.com/sites/inf-researchservices/SitePages/Ethics-levels.aspx

Behavioral – measures how people actually behave, what they do.

Attitudinal – measures what people say they think or how they say they behave.

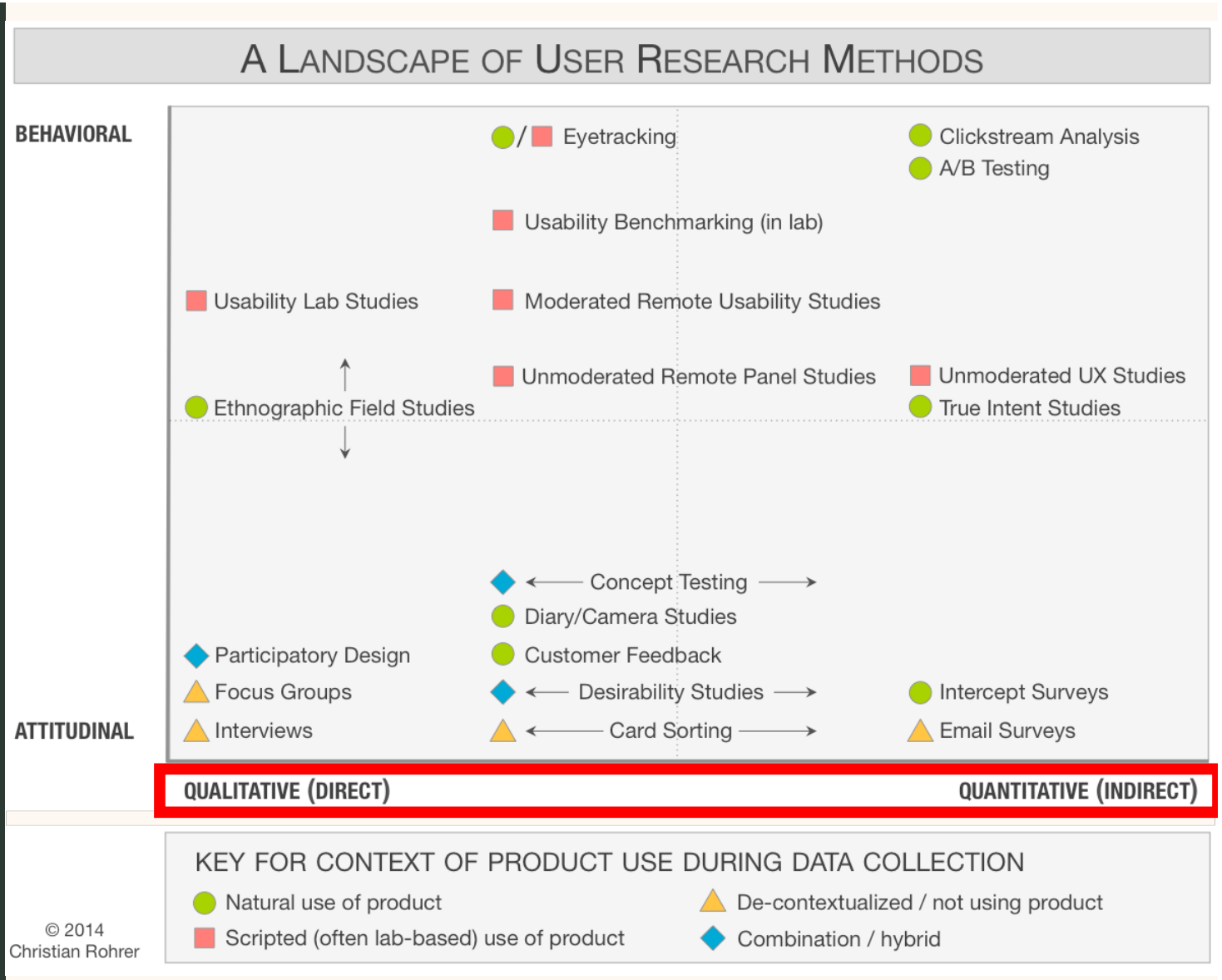




https://www.nngroup.com/articles/which-ux-research-methods/

Qualitative – unstructured data such as natural language.

Quantitative – numerical data. Anything that can be counted or measured with numbers.



https://www.nngroup.com/articles/which-ux-research-methods/

Lab Study

- Basic idea: Have a participant come to a physical place (lab) and interact with the interface there
- You setup the lab so it mimics the situation you want to test
- Pros
  - Full control over the environment so limited confounds
  - Detailed data from each subject
  - Ability to ask them why they did something
- Cons
  - Small sample sizes
  - Being in the lab changes user behavior. They feel safer and their normal distractions are gone. That can be bad for deception studies.

Think aloud

- Basic idea: Have a participant use the interface and speak aloud while they do so
- Think aloud is a very versatile, can be long or short, detailed or minimal, planned or ad-hoc
- Pros
  - Learn what the user is trying to do and why they click on some things
  - Very detailed information
  - Testing with about 5 users will find the majority of major (usability) issues
- Cons
  - Biasing user behavior, making the situation unatural
  - (Concurrent) Talking aloud changes how long a user spends on tasks so this method cannot be combined with timing

https://www.nngroup.com/articles/thinking-aloud-the-1-usability-tool/

Planning a survey

- Surveys normally answer **multiple research questions**. With each research question tied to one or more survey questions.
- **Descriptive** – learn something about the whole population.
  - How many people have heard of the term “phishing”?
  - What words do people use to describe cookie tracking?
- **Testing for correlation or causation** – show that two things are related or one thing causes the other thing.
  - If someone has been trained on phishing in the past, are they better at differentiating phishing emails?
  - We have three training options, each user goes through one training, which training causes people to identify phishing emails the best?

Survey scales

- Basic idea: A set of questions that have been previously shown to measure a property.
- Pros
  - Easy to copy-and-paste into a survey.
  - Allows you to measure hard-to-measure concepts like risk seeking behavior or attitude towards privacy.
- Cons
  - Making a new scale is very challenging.
  - Can contain an annoyingly large number of questions.

Testing: Correlation vs. Causation

- Correlation
  - Two things tend to behave in a way that seems inter-related, where if one thing changes the other thing will also change in a related way.
  - For example, if the price of rice goes up at the same time as the price for beans.
- Causation
  - When one thing changes it causes the other thing to change.
  - For example, when the weather gets cold more people wear coats. Cold weather causes more people to wear coats.

Testing: What are you going to measure?

- In statistics there are classically two types of measurements (variables): dependent and independent
- Dependent
  - Also known as the **outcome variable**
  - “Dependent” on the study
  - Measures the usability **goal**
- Independent
  - Anything **you are directly manipulating**
  - An element of the study which is under your control
  - A pre-existing feature of your participant

Testing: Between vs. Within subjects

- Between subjects
  - Your study only shows one interface to one person
  - You are measuring how well the people randomly assigned to the A interface did compared to the people randomly assigned to the B interface
  - **Lots of variability with this method**
- Within subjects
  - Your study shows all interfaces to all people
  - You are measuring the difference in how they do on the two interfaces
  - **Less variability (same person) but more learning effects and priming**

Testing: Types of data

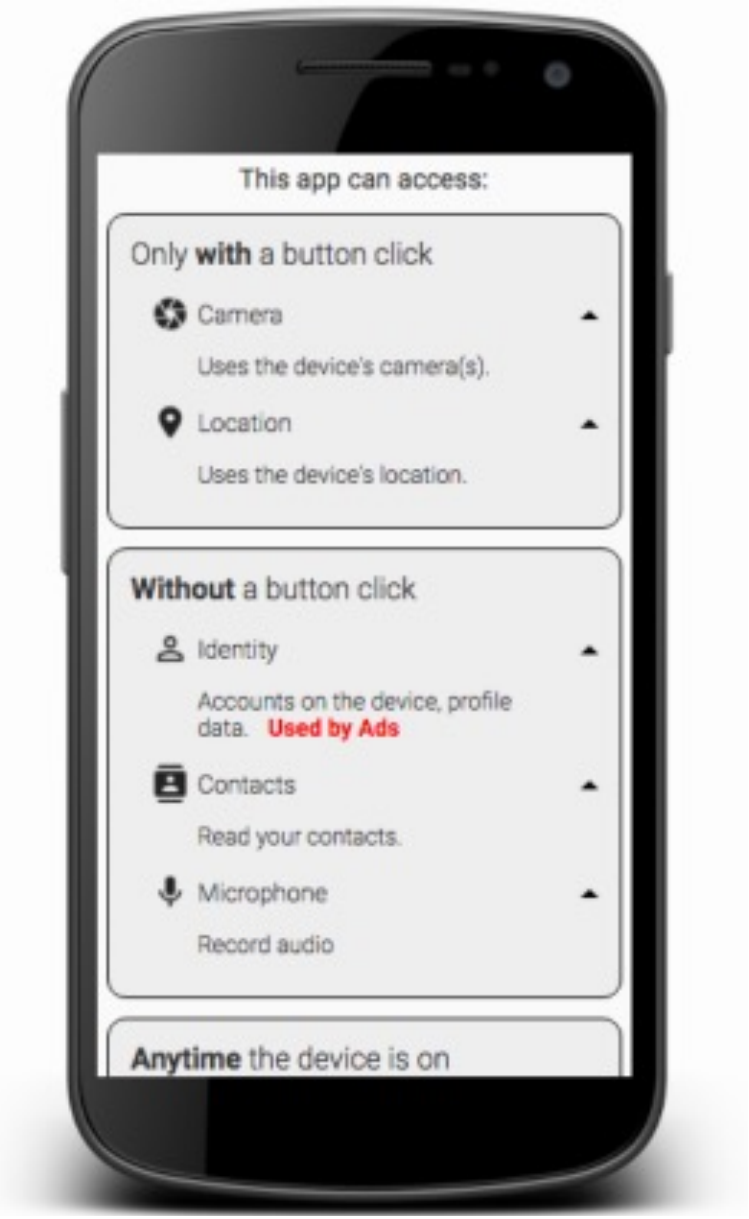
- Numeric
  - **Continuous** – Any value on the range is possible including decimal (1-5)
  - **Discrete** – Only certain values on the range are possible (1,2,3,4,5)
  - **Interval** – Only certain values on the rage are possible and each has equal distance from its neighboring values (strongly agree, agree, neutral, disagree, strongly disagree)
- Categorical
  - **Binary** – Only two possibilities (true, false)
  - **Ordinal** – The values have an ordering (slow, medium, fast)
  - **Nominal** – The values have no ordering (apple, pear, kiwi, banana)

Some research questions:

- Can people differentiate between a subdomain and a domain when reading a URL?
- Does [my new system] help people differentiate between malicious URLs and safe ones?
- Can users use [my new password manager] faster and with less errors than [the old password manager]?
- Does knowing how an app will use its permissions impact app installation decisions?
- What factors impact end-users' willingness to update software?
- Using [website], can users successfully opt-out of cookie tracking without forming inaccurate mental models?

Study design

- RQ: Does [my new interface] enable people to accurately determine what permissions an app will use?
- A/B test between the existing and new interface
- Between subjects
- 10 Tasks shown in the same order to all participants
- Dependent variables
  - Accuracy on task
- Independent variables
  - Which interface (A or B)

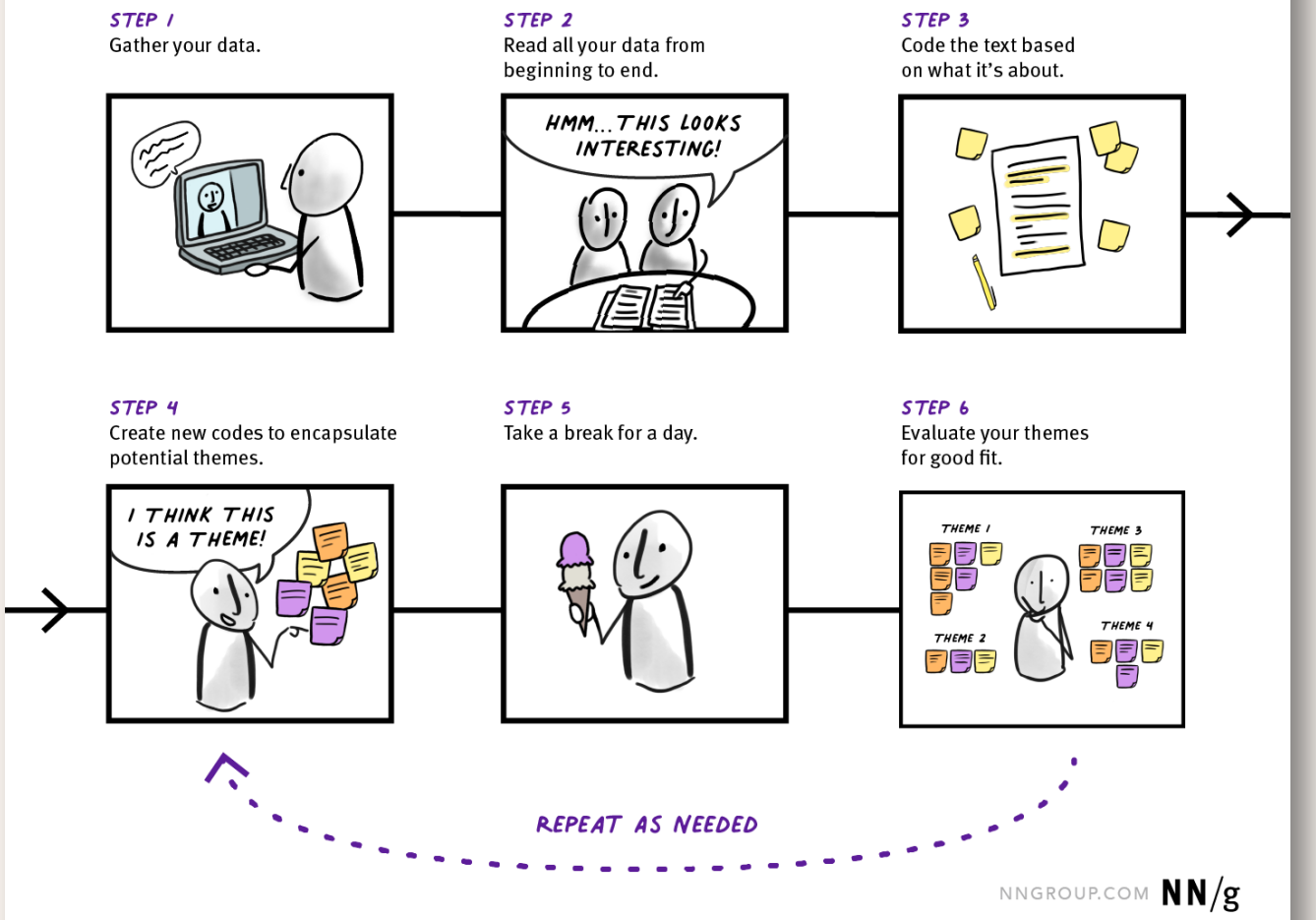


Inductive coding vs deductive coding

- **Inductive (bottom-up):** look for any ideas that interest you from different aspects
    - Snapshot of an app on a phone
    - Child playing with dog
    - Edited picture
    - Motion detection enabled
    ....

- **Deductive (top-down):** start with some hypothesis
    - Children being monitored by app (privacy concern)
    - Camera placed in the living room (place of the scene)

6 Steps to Doing a Thematic Analysis



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Framework and Topics (next lecture)