

Usable Security and Privacy (ECE 750)

Study Variables Handout

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1 Overview

The purpose of this activity is to look at a set of example study designs and think through what independent and dependent variables are being collected as well as the impact of the study design on external validity.

We are going to be using statistical language to describe the different information being collected in the described studies.

Today, you will be reading through a set of study design cases and for each case you are going to identify the *independent* and *dependent* variables as well as the *fixed aspects* and their impact on *external validity*.

Independent Variables are variables (data) that you collect during a study that are independent of the study outcome. These can also be thought of as data that existed after the study was planned, but before it was run. An independent variable is also sometimes known as a *predictor* variable because it may impact (predict) the dependent variable. We measure independent variables because they help us explain or understand the outcome of the study.

Dependent Variables are also sometimes known as *outcome* variables because they depend on the study being run and represent its outcome.

Fixed Aspect is a part of the study that the researcher is holding constant, or fixed. Researchers often control parts of the study as a way of reducing possible impacts on the study outcome. Having fixed aspects allows researchers to focus on what they are most interested in, but they can also impact external validity.

External Validity is how much a researcher can generalize the findings of a study to other situations, people, settings and measures. In other words, how much and in what ways can a researcher use their study outcomes to inform their understanding of situations outside the study.

Case 1: Lab Study

Mary has built a phone app that entertains cats. Similar to the app “Fruit Ninja”, her app causes objects to move across the screen and if the cat swats the object the object will vanish and a new one appear. Mary sets up a lab study with a 12 inch tablet and a video camera. The tablet shows her app and the camera captures the interactions the cat has with the app. She performs the test in the cat’s home. She starts by asking the cat’s owner a few questions using a structured survey method, including the gender of the cat, if it normally lives indoors or outdoors, and how energetic the cat normally is on a scale of 1 to 10. She uses a “snowball” sampling methodology to find participants where she asks friends with cats to participate in her study and then asks them to recommend other people with cats she could test with. She was able to recruit 20 cat owners, but 4 had complex schedules, and 3 of them had 2 cats. So she ended up testing on 19 cats.

After completing the data collection, Mary goes through the video and measures how much time the cat was looking at the tablet screen and how many times they swatted at the screen with their paw.

Dependent Variable(s):

Independent Variable(s):

Fixed Aspect(s):

External Validity:

Alternative design:

Mary sets up a lab experiment in a veterinary office. She asks people with cats in the waiting room if they would like to participate in her study. If they agree she has them bring their cat into the exam room a bit early and has the cat play with the app as described above.

External Validity:

Case 2: Retrospective Lab Study

Arie is interested in how people identify fraudulent SMS messages. He knows that people are likely to behave differently in a lab setting than they would normally, so he decides to create a study that involves both a retrospective component and a lab component.

He asks people to come into a lab and starts with a short structured interview. He asks them to tell him about past SMS spam and fraud they have experienced, including what the message looked like and how they determined it was fraud. After the interview he conducts a lab study. He shows them 6 SMS messages half of which are messages from real organizations and the other half are fraudulent. He asks the participant to indicate which messages are real and which ones are fraud. He also asks them to fill in a short form asking demographic information including age, gender, occupation, how long they have owned a mobile phone, and how often they receive fraudulent communications.

After all the studies are done, he uses qualitative data analysis (thematic analysis using open coding) to analyze the retrospective interviews. He determines that people often get fraud claiming to be from delivery companies, phone providers, and internet service providers. He also determines that people use cues like if the message is the first one they have received from that number (no message history), professionalism, weird characters or digits, and if they are expecting the message. For the lab study he looks at how accurate the participant was in identifying fraud.

Dependent Variable(s):

Independent Variable(s):

Fixed Aspect(s):

External Validity:

Case 3: Interview

For his student project, John decided to create a new user interface for the popular SnapChat app that would make it easier for new users to understand when messages will vanish and under what circumstances they might not. After completing the app he posted on a local discussion forum for SnapChat users to find people willing to beta test the app. He was able to find 10 people who installed the app and used it for a month. After the month was over, he setup semi-structured hour-long interviews with each participant.

He started each interview session by asking a set of structured questions including demographics (gender, age, occupation), the frequency they used the app, and how much they enjoyed it compared to the older version. He then asked them to describe what it was like when they first started using his new app. Followed by several more questions about past experiences with using his app.

After he was done with the interviews, he used open-coding and thematic analysis to come up with a set of themes involving participants' experience with the app.

Dependent Variable(s):

Independent Variable(s):

Fixed Aspect(s):

External Validity:
