

Human Computer Interaction

Study Variables Tutorial

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1 Overview

The purpose of this tutorial 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. None of the course works require statistics to do them. But they do use some of the main study-design concepts frequently used in statistics, so it is healthy for you to get used to using statistical terminology.

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 interview 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.

Independent Variables:

Dependent Variables:

Fixed Aspect:

External Validity:

Case 2: 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 interact with it. 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.

Independent Variables:

Dependent Variables:

Fixed Aspect:

External Validity:

Case 3: Cognitive Walkthrough

The employees at Acme Systems are complaining that the new billing software is hard to use. In particular, they dislike the process for entering travel receipts into the system which they claim is hard to do.

To determine what might be causing the system to be difficult to use, Zoe and her team decide to use a cognitive walkthrough. Zoe has a meeting with the billing system developers to find out what what sequence of steps an end-user is expected to use when entering a receipt for train travel. She then creates a document listing all the steps and the four cognitive walkthrough questions for each step.

She then holds a meeting with her team of three HCI experts. Each expert has a laptop with the billing system setup on it and a blank template UAR form. She then shows the team each intended step of the billing entry process on a projector. The team fills out the cognitive walkthrough questions, and for any issues they spot, they fill out a UAR form. The process is done in near silence, the team asks Zoe occasional clarifying questions such as if an icon appears elsewhere in the interface.

After the cognitive walkthrough is complete, Zoe's team combines the UAR reports together so they can all see what issues people identified. They then prioritize the issues through a discussion so they can tell their client what issues need to be fixed the most and which can have a lower priority.

Independent Variables:

Dependent Variables:

Fixed Aspect:

External Validity: