Experiments work best when they build on existing knowledge to address a clearly defined problem. A **research proposal** is an organized "battle plan" in three parts:

**The problem**

This is where you *define* the question or problem, *justify* why the problem should be studied, and *review* what we already know about the problem. For example:

*How to decrease employee churn? Churn creates inefficiency as new people have to be trained in and knowledge from experienced workers is lost. In exit interviews, employees name "out-of-date technology" and "poor communication" as major motivations to leave.*

**The potential solution**

Here you *propose a hypothesis* (potential explanation) to be tested. For example:

*Adding Slack to employee computers will decrease churn by increasing communication.*

**The method of testing the solution**

Describe the *design* of the experiment, the *analysis plan*, and *set benchmarks*:

*Install Slack on half of the employees' computers and monitor churn for the next two months. The variable of interest is churn in Slack and non-Slack groups. This is an A/B manipulation where Slack is installed or not installed.*

*We will compute the churn rate for two months before the study and compare it to the churn rate in Slack and non-Slack groups for two months during the study.*

*If churn in the next two months decreases by 10% among Slack users (using churn estimates from the past year), conclude that Slack is effective and install on all computers. If churn in the next two months decreases among Slack users, but by less than one standard deviation, observe for two more months before deciding. If churn does not decrease in two months, uninstall Slack.*

Even if no one reads the research proposal but you, it is important to clearly lay out exactly what you plan to do and why. A research proposal helps to avoid many common experimentation pitfalls, such as:

* Mis-match between question and study design.
  + E.g., a study that claims to address churn but actually focuses on employee communication and doesn't measure churn.
* A design that does not generate usable data.
  + E.g. We want to compare employee satisfaction in two groups, but the groups use different satisfaction measures and there's no way to compare them.
* False positives
  + E.g. Changing the endpoints mid-way through a study by moving benchmarks or stopping data collection early when things start to look promising increases the risk of getting results that look good but reflect random chance rather than real trends.
* The research proposal also presents and maintains a standard. It should outline the way things should be and hold you to it. In the real world there will be pressure to run things faster, reduce costs, or cut corners here or there. The proposal provides the standard for how the experiment *should* be run. It also provides an easy response to questions like: "Why is this taking so long?"

A good research proposal starts with a big question ("How to reduce employee churn?") but rapidly narrows in scope ("Adding Slack to employee computers will decrease churn by increasing communication"). It is a practical reference document that helps to maintain a straight line between goals and actions.

**DRILL: Make a quick research proposal**

Look back to the potential experiments in the previous assignment. For one of those experiments, write up the essential points of a research proposal for an improved version of that experiment.

Submit it and review with your mentor.

1. A company with work sites in five different countries has sent you data on employee satisfaction rates for workers in Human Resources and workers in Information Technology. Most HR workers are concentrated in three of the countries, while IT workers are equally distributed across worksites. The company requests a report on satisfaction for each job type. You calculate average job satisfaction for HR and for IT and present the report.

Flaws: The sample is not random enough. HR workers are specific to 3 countries where IT is equally distributed.

Correction: Randomize the sample, take another sample and perform the A/A test method.

**The problem**

*How to increase job satisfaction? Poor job satisfaction decreases employee morale and job effectiveness. Low job satisfaction can create inefficiency work habits of employees and poor work quality. In exit interviews, employees name "job satisfaction" and "lack of opportunity" as major motivations to leave.*

**The potential solution**

*Adding an internal career webpage to showcase new opportunities decrease job satisfaction and increase opportunities.*

**The method of testing the solution**

*Create a new career webpage and monitor the number of internal employees that visit the webpage. The variable of interest is the number of employees that visit the career webpage and the number of employee’s that don’t visit the career webpage. This is an A/B test where the number of employees that visit the site is compared to the number of employees that don’t visit the career webpage.*

*We will compute the number of visitor’s for two months during the study and compare if this number is greater than the number of non-visiting employee by 20%. Then we can conclude the webpage is effective at decreasing job satisfaction and increasing opportunity. If the employee visit to the webpage is less than 20% then we remove the webpage.*