Use minimum detectable effect (MDE) when designing an experiment

Skip Ahead

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THIS ARTICLE WILL HELP YOU:

- Estimate how long an experiment will take
- Decide how "sensitive" an experiment should be
- Decide how many variations to run

Once you decide on a hypothesis, you’ll design an experiment. How many variations should you create? What kind of experiment should you run: A/B, multivariate, or multi-page?

Experiment design is important, because it's a key part of the cost calculation of experimentation. The design and scope of your experiment determine how long it will take to reach statistical significance.

Use this information to consider:

- Are the results of this experiment likely valuable enough to justify the amount of traffic or time? Are other, potentially more impactful ideas that you could be experimenting on?

- Should you reduce the number of variations to speed up my experiment? If so, how would you re-design this experiment?

- Should you increase the drama - or degree of difference - between the variation and the original to reach statistical significance sooner and speed up the experiment?

- How can you design variations that focus on maximizing lift for your primary goal?

A statistical calculation called the minimum detectable effect (MDE) can help you connect cost to your experiment design. Use it to make informed decisions about your experiment parameters.
You can also use MDE to prioritize experiments and as part of your experimentation roadmap.

### Using MDE

Minimum detectable effect (MDE) is a calculation that estimates the smallest improvement you’re willing to be able to detect. It determines how "sensitive" an experiment is.

Use MDE to estimate how long an experiment will take given the following:

- Baseline conversion rate
- Statistical significance
- Traffic allocation

You can use Optimizely’s Sample Size Calculator to make this calculation.

For example, imagine these parameters:

- Your baseline conversion rate is 15%
- You’d like to measure statistical significance to 95%
- You’d like to detect a 10% lift at minimum (this is your MDE)

According to the Sample Size Calculator, you’d need ~8,000 visitors per variation to reach statistical significance.

In reality, you don’t know the actual lift in advance. If you did, you wouldn't be running the experiment, right? By estimating the minimum lift you'd like to detect, with a given level of certainty, you establish boundaries for how much traffic or time you'll invest in this experiment. You can plan and scope your experiment more accurately.

Let’s follow the example above one step further.

You design the experiment above with four variations. Your site averages 10,000 unique visitors per week. If you show this experiment to 100% of visitors, it will probably take 3.2 weeks to reach significance.

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\text{8,000 visitors per variation} \times 4 \text{ variations} = 32,000 \text{ visitors}
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32,000 \text{ visitors} / 10,000 \text{ visitors per week} = 3.2 \text{ weeks}
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At this stage, consider whether the traffic and time is worth it, and how you might design a faster experiment.

### Best practices

Here are a few best practices for designing an experiment with MDE in mind.
Use potential business impact to decide on the sensitivity of your experiment.

Many programs trade speed for a less sensitive experiment. But your appetite for a lower MDE may increase if a conversion event is directly connected to revenue. This low-MDE experiment requires a larger amount of traffic, but even small amounts of lift in revenue-generating goals can make a big impact.

Use MDE as a guide rather than an exact prediction.

The whole concept of experimentation is based on the fact that you don’t know what effect a given change will generate. Instead of trying to pinpoint the MDE, use the calculation as a guide: to set boundaries on the time you’re willing to invest and the value you expect to generate.

Design impactful variations.

If traffic is a concern (and it almost always is), consider limiting your variation scope to changes that directly influence the primary conversion event.