Research for Marketing Decisions

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Causal Research Design: Experiments and Related Terminologies

Now there is there are two more that I would explain with the help of another example let's say there is an advertisement for a particular brand and the brands want to know whether they'll be change in change in attitude towards the brand after seeing the advertisement right let's say some people are selected let's say the brand is Dove brand and they want to see they have a particular advertisement they want to release it nationally but before that they want to conduct an experiment to see whether there will be change in attitude of people towards the Dove brand after seeing the ad. So what they did, they selected random target random some 30 random people from the target population and got them to a test facility let's say threatre and they told them that we are conducting a study and for that we are calling you. They will be, you know, they are volunteers as well as they have voluntarily participated then they will be paid something. So, when they come to a threatre, they are given a survey to fill for many different

many different soap brands in addition to Dove soap so there are questions that are also about the Dove brand but about other competitor brands as well and unrelated questions a survey is given to fill then they are shown four or five ads and in between that ad there is the Dove brand ad and then after showing all of them the reading, the survey was given again. Now, in this course of experiment, there are further problems. There are some more external factors that could impact the reading. So, the reading, attitude reading was taken before on a 10 point scale.

How do you evaluate reading? Dove brand which was asked amongst the list of other questions how do you evaluate brand on quality ? High quality 10 low quality 1 and that's the same question at the end of this ad but they again the same questions that were given before and after other competitor brands also so the main question is hidden among other

questions. So whether the O2 minus O1 in this case Can we conclude whatever changes are there O2 minus O1 is because of the add? In this case there is possibility of two things, two more, two external factors. One is called main testing effect which means when people are, when people know that they are part of the experiment,

They either try to be consistent with their earlier responses because they might, you know, make some hypothesis, some theory in their mind that we have been asked to do something. We have been asked to participate in this. So they might be looking at and they are compensating us as well. So they might be looking at, you know, something which maybe some ads because they are showing us ads. So let us...

Because they might be looking at our responses. Some may think that let's try to help them and change our responses. Because they are trying to do something, let's help them. So others would try to remain consistent. Let us be what we are.

Let's not... Others might think something else and they might... try to remain consistent with pre and pre whatever their responses were before seeing the ad, the same responses they will give after seeing the ad. And others would intentionally change their responses in order to please the interviewer, in order to please the people who carried out this experiment. So those effects could also come, that is called main testing effect. When people try to remain either consistent or intentionally change their responses.

Because they are told that they are part of the experiment. That called main testing effect. So one has to control that as well. And there is another one called interactive testing effect. When people were given the questionnaire.

They filled one of the question about dove brand or few questions about the dove brand. Now they become sensitized about that brand. And when the ads are running they would be likely to pay more attention to Dove brand ad because they filled up the survey. In the survey, there were questions about Dove brand.

Now Dove is there in some packet of their memory. They know that Dove questions were asked. Now when the ads will be shown, they would be able to something will click that, okay, we just filled a survey about Dove and Dove ad is, we filled one of the questions about Dove, there is a Dove brand. So, the time you will, the attention you will give to the Dove brand ad would be more than what you would have given had you not filled the survey.

So, that kind of attention, that extra attention that you are giving because you filled a question, few questions about Dove brand, that would impact your Y variable? Suppose you would not have paid that much attention that actually you now paid. And because of that your attitude changes. Can we say it is because of the ad?

There is sensitization which means you now paid more attention just because you filled a survey. That is called interactive testing effect. So there are these external variables that one needs to control when we conduct the experiment, only after we control many of them we say that X is a true cause of Y. So what are the variables now controlling when we control all these. So when we control for all these external variables and conduct the experiment in the right way, they become true experiments and true experiments with high external validity.

Sorry, high internal validity. So when we conduct the experiment controlling for all these extraneous variables, we get the variable with high internal validity. So the aim of the experiment is to increase the internal validity. What is internal validity? To confidently say that the change in Y has happened because of the X, not because of anything else.

That is just the name is given is internal validity. So, we conduct the experiments to increase the internal validity, not so much the external validity. The more you try to achieve external validity is how much the results could be generalized to other situations or situations in real. That becomes difficult. The goal of experiment is to increase the internal validity which means to confidently say that X

causes Y not anything else that is the internal validity. Now before we discuss the type of experimental designs now we we know there are problems and we want to increase the internal validity which means we want to confidently say X is a cause of Y and we have to take care of these problems there are ways by which we can take care of these problems and that we will see through these experiments. One way is if we introduce a control group. There are ways. One is introducing a control group in the experiment.

We know what is a control group. Everybody knows what is a control group. So control group is that group that is not given any treatment, or that is not manipulated for X, but the readings are still taken pre and the same times at which the readings for the experimental groups are taken. So which means let us say there are two let us say simple experiment there are 30 people who have the same demographics and the same kind of illness is there.

And doctor wants to see the impact of a new medicine for that particular illness. To 15 of them, doctor gives that medicine. And to other 15, doctor gives a dummy, salt, nothing, salt, says that this is medicine. Because we have to make sure every other variable is controlled. Right?

What we are controlling that other 15 that are not given the medicine, they are also going to the doctor. They are also getting the same feeling that we are being treated by a doctor. We are given a medicine, but the medicine which is given to them is a dummy medicine. It is salt, nothing else. But to the other 15, the true medicine is given.

So to the control group for which same things but treatment is not given. We want to see the impact of that medicine on the fever, on the illness. To the control group nothing was given but all things are kept same. They also went to the doctor. Doctor also saw them.

Doctor gave them a medicine but the medicine is dummy. All things are kept constant and then they are then after giving that medicine it was noted their illness, how they are recovering. If it is seen that both are recovering the same way. And both are recovering well in the same way. Which means what?

Which means just going to the doctor and doctor giving anything. We feeling that we are getting cured is enough. We don't require any medicine. If that is the result. Right?

That is the control group. Where you make all the things same but just don't give the treatment. and take the reading pre and post that is one of the ways to conduct to control many of these variables. Other way is so one is control group. Other way is randomization. You randomly select people for the experiment and randomly allocate them to experiment experiment groups experimental group control group you select random people and randomly allocate them to treatment to experiment group or control group, or even you randomly shuffle the experiment and control group as well, so randomization is one is randomly allocating the people to different groups and randomization of the groups as well. That is one way whereby which selection bias and many other similar sort of biases would go away through randomization.

Control group will take care of maturity because control group is also going through the same events. If any event happens in between, the control group would also undergo that event, right? Experiment group, let us say when 15 sales people were given training, another group, they were not given training. There is a control group, let us say, that was run. But they were not given training at that point of time.

But everything else was kept safe. So any event that would happen would also happen for the control group. In the case of doctor's experiment, we are also, you know, control group is there because any event in the, in that particular city would also happen for others as well. Let's say the, the, the smoke, the, the,

the pollution level has gone up in the city quite substantially after the doctor gave them prescription the winters went up and pollution went up now it will be for control group as well as treatment group, so when we are using control group we are able to take care of maturity and likewise some other extraneous variables as well, so control group is one way, randomization is another way randomization directly selection bias is taken. Third is called matching. Matching is generally done when we want to conduct an experiment for a large unit. Let's say a store. Let's say we have Apollo Pharmacy stores.

30 stores are there. And we want to see whether the radio advertisement for certain products have an impact on their sales. Let us say there are not 30, they will be close to 50 plus. From those 50, for this experiment, you selected randomly or not. In this case, randomization will not be done.

But what would be done? Matching. Which means you selected 15 stores for experiment group. And then you identified 15 other stores that match with these 15 stores in terms of neighborhood, demographic of people who live around, the location, the kind of locality that it is, the average business that it gets in a month. So you matching is you select the similar kind of unit for experiment and control and then

You conduct the experiment. So when you do matching, you are taking care of all the personal variables. Again, the bias would go away. So matching is done when you have to conduct some experiments at the store level or the geographic level. Is it different from technical control group?

Sorry? Is it different from technical control group? We are taking control group but in this case, what we are doing is in the control group we are so you selected a store the another store which is a part of the control group it matches with the that particular, so likewise all 15 you would have match pair and to one of the 15 to to the one of the group you will not run the radio advertisement for another you will run and then you will see whether there is a change in sales of those particular products for which advertisement was run. Let's say it is found that whenever the radio advertisements were run for those particular products the sales went twice as much as they were earlier.

So which means in all the Apollo pharmacies then you will have that radio advertisement running throughout the entire day for those products. Which means if you get into marketing or sales role and you would have to conduct something, you would have to conduct experiment related to a particular promotion, whether this will work or that will work. If you get into sales and distribution related to let's say FMCG, you might have to conduct some experiment this way. To match the units for control and experimental group and then see whether it works, present to your management and then you will facilitate it in those stores and it would rightfully apply to any retail store as well. Ambika let's say Ambika has these many retail stores so you want to conduct an experiment related to one particular let's say again you run some TV advertisements or jingles for particular products you match these stores and see whether the experimental or control group so you will have to do this

and then there are so one we identified randomization, control group, matching. There are another other ways one is called statistical control and design control. We will look at design control also through certain design statistical control we will not be able to cover but whatever we discuss if these we will understand we would be able to do some justice to small experiment that we could independently conduct. Now there are four kind of experimental designs, pre-experimental, true experimental, quasi-experiment and statistical designs. So there are four kind of experimental design, pre-experiment, true experiment, quasi and statistical experiments. Statistical experiments are more of design control,

Where we try to control through particular kind of tweaking the design in a certain way. So let's start with pre-experimental are the ones very similar to the example we took for the sales people. There was no control group. And if there is no randomization that will become pre-experiment. These are three examples.

pre-experimental designs, one short study, one group pre-test, post-test and static group comparison. Now before I show you this, let me show you the symbols that we use in experiments. Before we discuss the experiments, little symbols are there. So X is a symbol. So X is a symbol that we use for treatment, which means for the independent variable is

people are exposed to units, test units are exposed to, sample is exposed to independent variable or treatment. X is also called treatment or independent variable. When it is

exposed to the sample unit, test units, it is called treatment. O is observation. EG is for experimental group.

CG is for control group. I will upload these notes. And when all these symbols are written in row wise, all symbols in any one row refer to a specific treatment group. Which means if one row is given, which means this we are talking about either experimental group or control group, one treatment group only. And movement from left to right indicates passage of time.

X for treatment, O for observation, EG for experimental group, CG for control group. Row, when the symbols are written in row, it means we are talking about one particular group. Either experiment group or control group. When we move from horizontal, horizontally, it means time is changing. T1, T2, T3.

Movement from left to right indicates passage of time. So X1 O1 is given, X2 O2 is given if you see here. X1 O1, X2 O2. So X1 O1 this means treatment is given at time T1 and post the treatment at another time O1 observation is taken for the same group. Let's come down here.

Symbols that are directly above or below one another refer to activities or events that occur simultaneously, which means here we have written X1 O1 at time T1 to one of the group X1 was given and at the same time to another group X2 was given. So when the symbols are vertically aligned, it means they are happening at the same time. At time T1, X1 was given to this particular group. Let us say it is experimental group 1. And at the same time T1, treatment was given to this particular group horizontally, this one.

At the same time, this was, treatment was given X2 to second experimental group. So when the symbols are vertically aligned, it means at the same time these activities are happening. And same horizontal line represents up one particular group. Do you understand? X you know what is X?

X means what? Variable right? But what variable? Is it dependent, independent? Independent variable when we write X in experiment we say treatment is given.

Which means units are exposed to the independent variable. O means observation is taken. CG means control group the one which will be not given any treatment but everything else will be kept same. EG means experimental group the group to which the treatment will be given. Now, when we write, lets say, X1 O1, it means when I write X1 O1, I am talking about one particular group. Lets say it is experimental group.

Same horizontal line represents one particular group either experimental group or control same same group, so when I write horizontally I say X1 is taken X1 is given at time T1, and the movement across the horizontal says passage of time which means at time T2 I take the observation. What is this EG? Experimental group Y right so X1 and one what what in the same horizontal line? What do they mean? Now tell me experimental group at time T1 treatment was given and at time T2 observation was taken right so if I parallelly write control group let's say I write control group there is no treatment given. But observation is taken. So same horizontal line represents the same group.

Whether it is experimental control. The above one was experimental. This is control. Now at this time T1 control group is given nothing. Parallel experiment is happening for both experimental group and control group.

At time T1 to experimental group. Treatment is given. To control group, nothing is given. Which means, let us say experimental group, 15 people, they went to doctor. Doctor gave them medicine.

Other 15 people, they also with the same illness, same demographic, went to doctor. Doctor gave them salt or candy. Salt. So, that is control group. Then, at time T2, let us say after a week, observation was taken of their,

some tests, blood tests were carried out for both. That's at time T2. So understand the terminologies now. Vertically, when the things are vertically aligned, which means the activities are happening at the same point of time. Let's say if I put R here, it means randomization has happened from the....

Randomization means, let us say I selected 30 people; they are randomly allocated 15, 15 here as well as these EG and CG are also randomly decided. So when I put RR which means two randomization have happened. Randomization has happened which means I have allocated randomly from 30 15 random people were sent to experimental group and 15 were sent to control group. And even the control group and experimental group were also randomly assigned to them.

So which means you have 30 people. You have randomly divided them into two groups. And control group and experimental group also you have randomly allocated to them. So two kind of randomization have happened. So this is the terminology.