Marketing Research and Analysis-II (Application Oriented)
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Lecture – 15
Research Design - V

Welcome friends to the course of Marketing Research and Analysis. So in the last lecture, we had started discussing about the kinds of experimental designs basically right. So we started with the pre-experimental referred categories

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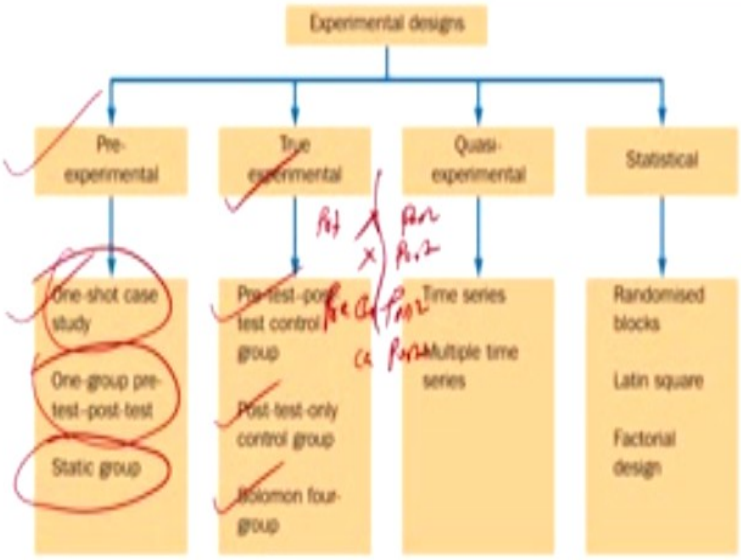

The first category we said is the pre-experimental design and here there were 3 kind of studies; the one-shot case study, the one-group pretest posttest study and the static group study. Second we did with the truly experimental, so why it is called truly experimental. If you remember I had explained, a study can be termed as truly experimental when there is an element of randomisation possible in it. So that means if you can randomly select the test units and place them in the treatment or the control group, then we say it is a real experiment because that is what experiment is all about.

So in an experiment, we do not create any bias, we try to be as fair as possible and unbiased as possible. So there we said the test like pretest posttest control group, so you have a control group and an experimental group basically, posttest only control group, and the Solomon four-group design. So if you remember the Solomon-four group design, we said there are 4

conditions where we said for example you have pretest and posttest with an experiment, then we have an experiment but only a posttest.

Then we said we have pretest posttest but no experiment, this is pre and post but no experiment, so this is a control group basically. Then we said only a post group, this is again a control group, only a post. So these are the 4 stages we said are there. Today, we will talk about another kind of experimental design which is very very vital in the sense in the real-life it so happens that you might not be able to randomly place your test units, you might not be able to do a random testing why because always it is not possible that you can treat human beings the way you can treat machines or materials.

So what you can do with materials, may be a pretest and a posttest, may be you can put in some treatment, some kind of a chemical analysis or something that may not be possible with human beings or organisms. So in such a condition, we go for another kind of test which is a quasi-experimental test.

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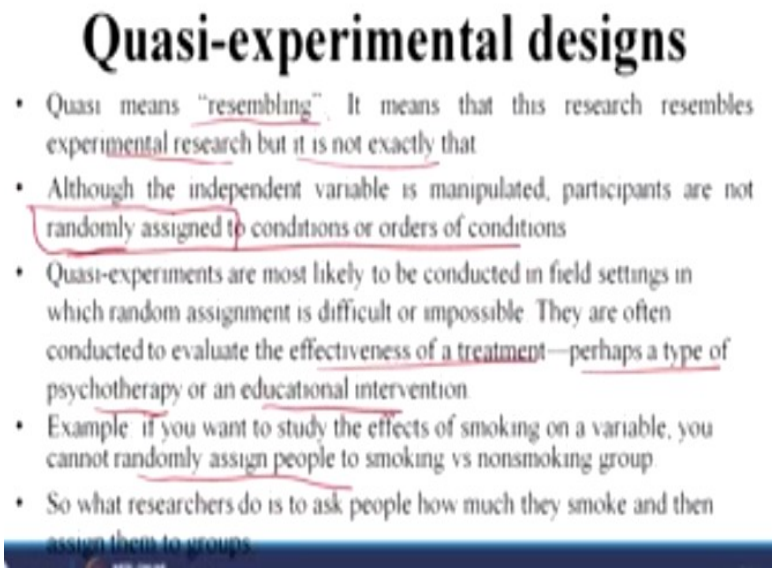

What does this mean? Quasi means to resemble. So it means that this research resembles the experimental research, but it is not exactly that. So as I said there are conditions when you may not get an opportunity to do an exactly proper experimental research, but you need to do some research, so in such a condition so you do something that is very close to the experimental research, so that is why it is called a quasi. Let us see.

Although the independent variable is manipulated, the participants are not randomly assigned, now this is important, to conditions or order of conditions that means the test units are not randomly assigned that is the most important term when you talk about the quasi experimental design. Quasi experiments are most likely to be conducted in field settings in which random assignment is difficult or impossible. Let us see an example, they are often conducted to evaluate the effectiveness of a treatment perhaps a type of psychotherapy or an educational intervention.

Example, let us say if you want to study the effect of smoking on let us say on a variable like smoking on the health effect, the effect of smoking on health. You cannot randomly assign people to smoking versus nonsmoking group because that is unethical, so you cannot ask people to go for smoking because that is not ethical and it is wrong. Similarly there are several other things for which we need an answer but then we cannot test it because they are harmful to the human beings.

For example in impact of the driving in an alcoholic condition or in an intoxicated condition, so would you ask people to get drunk and then drive, no you cannot do it, so then the pure experiment is not possible in that condition but then what we can do is maybe we can check in with those people who were drunk and then what happened to the driving that we can check and what happened to people who were not drunk and they were driving. So this difference we can see and this difference is the closest thing that you can do to an experimental research.

So that is why these kind of tests are called the quasi-experimental test. So what researchers do is to ask people how much they smoke and then assign them to groups. So somebody is already smoking, then you can ask them well how much do you smoke, maybe I smoke 1 packet per day or half a packet. So we will put them into different groups and then test it because they are already consuming.

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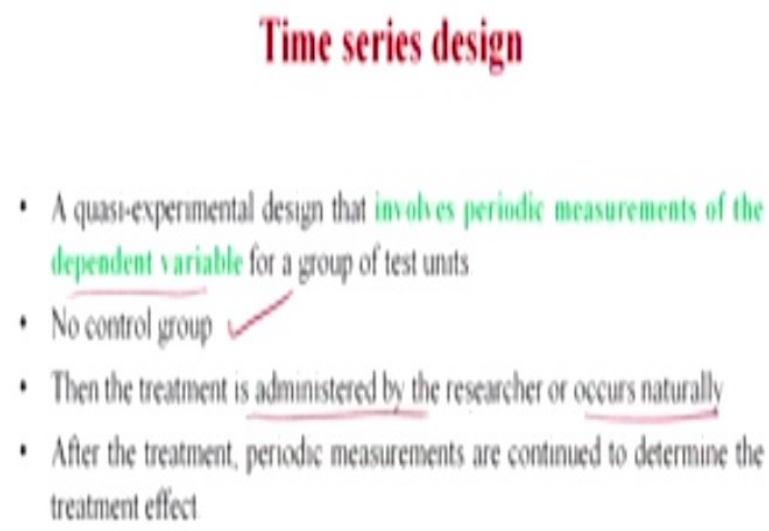

So under experimental design, there are two basic conditions that we will talk about. How do you deal with a quasi-experimental design. So in a quasi-experimental design, it involves the periodic measurements of the dependent variable. So for example when you talked about the smoker, so you take a group of smokers and nonsmokers and you try to see on a periodic basis what is the effect of smoking on the health of the smokers. So I will check his heart condition may be in a week's time, then may be after another week's time or one month, second month, third month, fourth month, fifth month, sixth month, so I go and continuously do it.

So when I do this, I can see the effect of a building effect, a cascading or a cumulative effect of smoking over the smokers. Here you remember as a person or as researcher, I have not advised them to smoke, you have not advised them to smoke, they are smokers, they are smoking, so you have not encouraged them to do it, so that is why there is no problem, but in an experimental condition had it been, you might have taken test units and put them in a condition which they are not ready to do.

For example, they are not ready to smoke and you would have requested them to do that, that is not possible ethically. So there is no control group. One important thing in the kind of a quasi-experimental design is there is no control group, you only have the experimental group here. The treatment is administered by the researcher or occurs naturally, so either the treatment is administered or it naturally occurs. So if it is a possible condition that you can give a treatment.

For example I can give a treatment of asking somebody to let us say eat sweets and see whether sweets induce sleep, they say that if you take sweets you will feel sleepy. So to test that, we can ask somebody because it is not harmful, it is not dangerous, but the same test cannot be done with alcohol, you cannot do that. So the treatment is administered by the researcher or it occurs naturally like for example somebody having some habit which is natural to him or her, no that is a part of that test unit's condition.

After the treatment, periodic measurements are continued to determine the treatment effect. So regularly we will check and see the effects. Let us see this.

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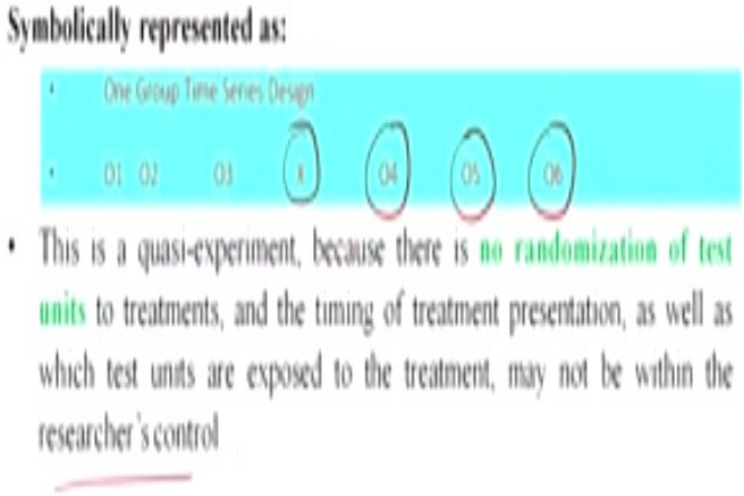

There is a one group time series design. What is happening here. This is a quasi-experiment in which O1, O2, O3 at three time periods, let us say three observations have been taken and this is the treatment. The treatment has been given and again O4, O5, and O6 are the observed, that means observation values. So when you do this kind of a test, it is a number of times you are repeating, you can see the experiment and then you infer some kind of a solution. So this is a quasi-experiment because there is no randomisation of the test units to treatments.

There is no randomisation, you cannot randomly put them because randomisation will become wrong here. You know this fellow let us say is a smoker or a nonsmoker from the very beginning you know it and the timing of the treatment presentation as well as which test units are exposed to the treatment may not be within the researcher's control. So the

researcher cannot control few things like for example let us say I am asking you to be a part of an experiment and you are in a far off place.

So I am thinking I am running the experiment, but then are you really participating honestly or that time you are taking some rest or you are doing something in your home, I do not know, so there I do not have a control. So these are the problem you have in a time series or a quasi-experimental design. Now look at this condition.

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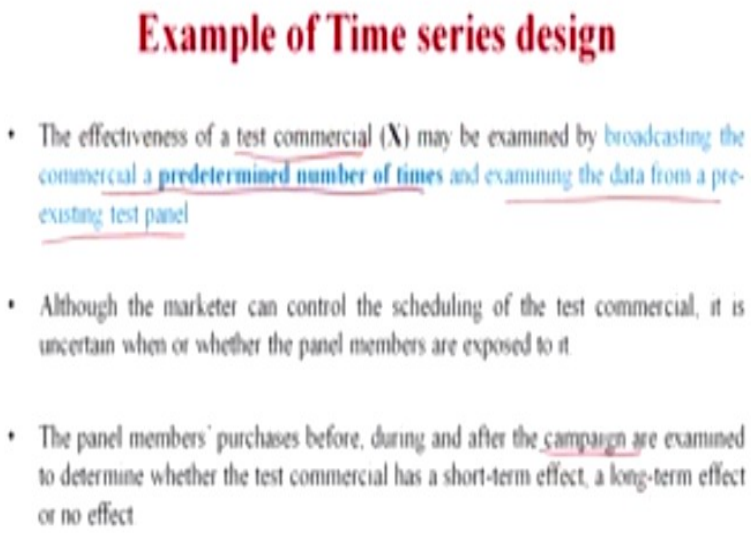

The effectiveness of a test commercial. So a company wants to know the effectiveness of an advertisement. It may be examined by broadcasting the commercial a predetermined number of times, so let us say 5 times a day or 6 times a day and examining the data from a preexisting test panel. So you have taken a test panel, you have shown the advertisement let us say 5-6 times a day and tried to see whether there is an effect on the purchase or the sales or the buying of the particular that advertisement whatever product was by these respondents.

Although the marketer can control the scheduling of the test commercial, you can that means for example once I will show the ad at 10 o' clock in the morning, then 12 o' clock, then 2 o' clock, then let us say 4 o' clock, 6 o' clock, so 2-2 hours or 3-3 hours gap I will give and I will show the test commercial. It is uncertain when or whether the panel members I was just telling this are exposed to it.

You are showing it, but how do you ensure that your test unit who is a part of the experimental design is he actually checking or looking at your advertisement or may be that

particular time he has gone somewhere outside because he was doing some other work. So in such condition, we do not have a control, but then we have to live with it, that is a reality. The panel members purchases before, during, and after the campaign, that is campaign is the advertisement, shown are examined to determine whether the test commercial has a short term effect, a long term effect, or no effect.

That means by showing the ad number of times as we showed in the time series, we can say whether this advertisement will have a short term effect, a long term effect, or a medium term effect.

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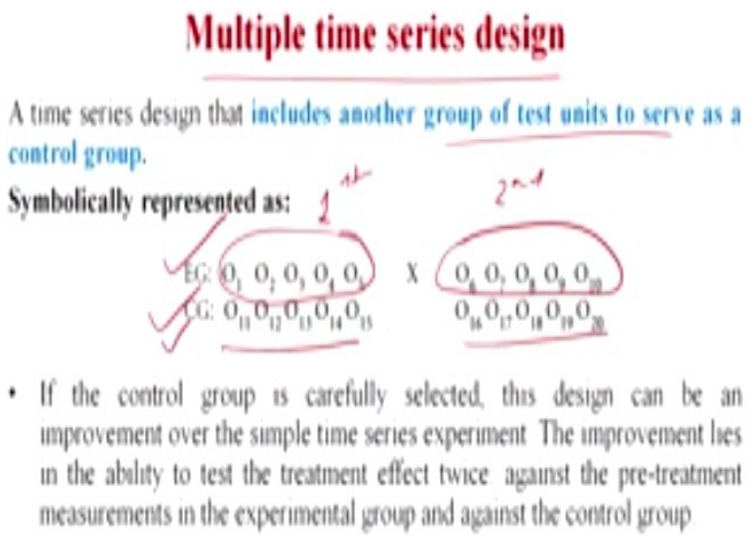

Another kind of a test in the same condition is the multiple time series design. What differenced is it from the simple time series design, we will see this. In a time series design that includes another group of test units, so now, earlier you had only the experimental group you have now brought in the control group also, to serve as a control group. If the control group is carefully selected this design can be an improvement obviously because then it is easier for you to compare between the treatment effect between the experimental group and the control group over the simple time series experiment.

The improvement lies in the ability to test the treatment effect twice against the pretreatment measurements in the experimental group and against the control group. So it is like a very natural. For example now this group the experimental group has O1, 2, 3, 4, 5; 5 experiments observations before and then after the treatment 5 observations have been taken again, and in

the control group 5 observations was taken, no treatment was given, and then again 5 observations were taken, in fact you can set an observations were taken directly.

Now we can check the difference, well that may be, let us say this is the first month, this is the second month okay. So first month 5 observations, second month 5 observations here, but here there was a treatment effect; here first month 5 observations second month 5 observation, but no treatment effect is given. So there we can find out the exact difference. So this is what happens in a quasi-experimental design.

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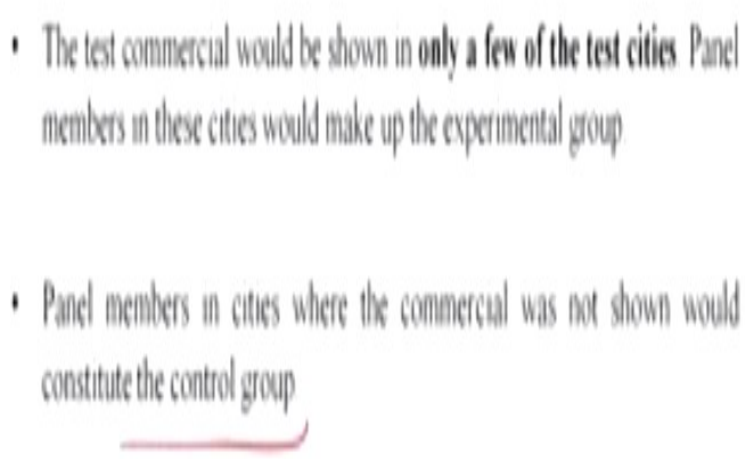

So the test commercial would be shows in only a few of the test cities, panel members in these cities would make up the experimental group. Panel members in the cities where the commercial was not shown would become the control group. So did you understand? That means where the members become a part of the advertisement or they are shown the advertisement, they become a part of the experimental group, and the cities where the ad was not shown, the commercial was not shown, they are the part of the control group.

Though we can measure the difference of the effect of the commercial by looking at the difference in the purchase of the people from these two cities, where the experimental group is there and where the control group is there.

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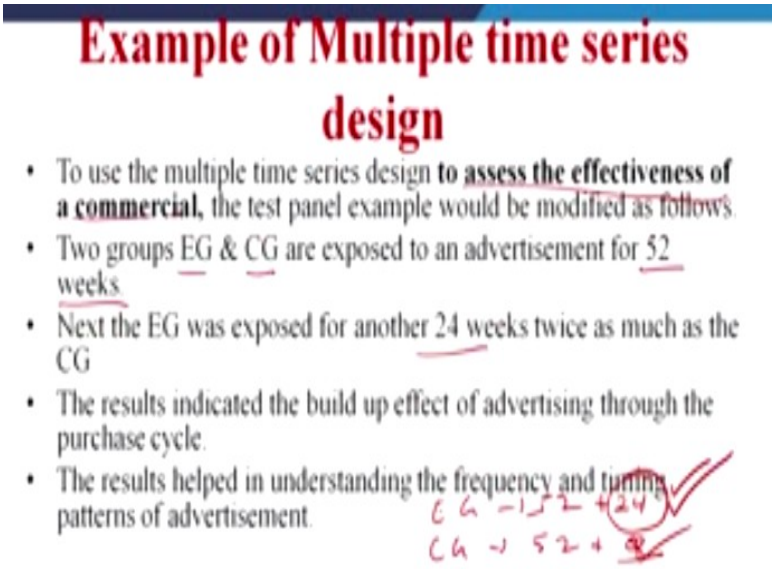

Example. Now look at this, the same condition to assess the effectiveness of a commercial. Two groups, experimental and control group, are exposed to an advertisement for 52 weeks, both, so the advertisement is shown for 52 weeks to the experimental group. So experimental group is 52 weeks and control group is also 52 weeks right, the same advertisement was shows, but what happened next. The experimental group was again exposed for 24 weeks and here nothing, 0 right, 24 weeks twice as much as the control groups.

So that means, so let us say the control group was shown for let us say 2 times a day the experimental group was shown 4 times a day, twice right, the same advertisement. So these 24 weeks are double. So here it is a normal process going on and here it is double whatever it is shown once here then two times here that way. The results indicated that the buildup effect, the buildup effect is because of the extra advertisement, of advertising through the purchase cycle, the purchasing trends, how much purchase they are making because of the extra.

This result helped in understanding the frequency and timing patterns of advertisement. So by doing this, a company can know whether if you increase the frequency, is it going to add to your benefit that means will the purchase increase or not? Similarly what timing is the best timing to show the advertisement that also can be checked through such an example. So this is the example of the time series design simple and multiple which is a part of the quasi-experimental design.

So I hope you have understood quasi-experimental design, that means quasi-experimental designs are very largely applied in areas of like medical science where people cannot exactly

create an experimental design, suppose you want to test the effectiveness of a medicine you cannot ask new medicine to be given to a patient until and unless it is tested, so there we try to create a quasi-experimental study. Then we have statistical designs.

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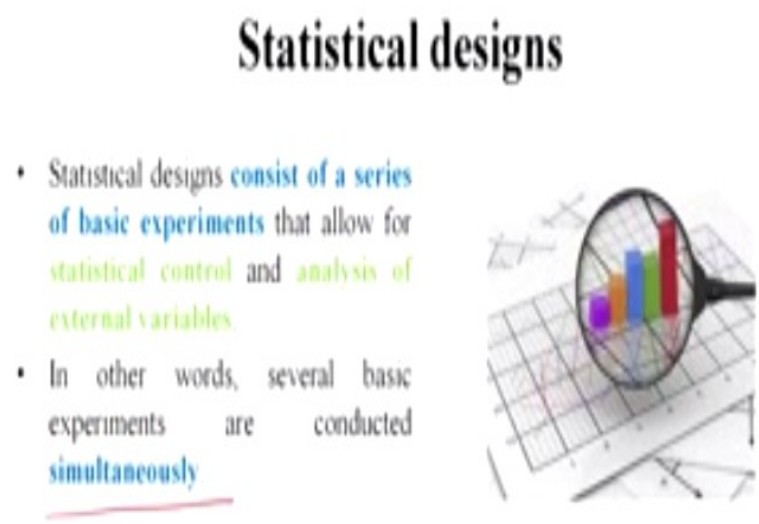

Statistical designs, what happens is, it consists of a series of basic experiments that allow for statistical control and analysis of the external variables. In other words, several basic experiments are conducted simultaneously. So as the name suggests statistical designs help you to manipulate and make some statistical inferences during the study.

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What are the advantages? The first advantage is the effect of more than one independent variable can be measured. So earlier whenever you were talking about any experimental design the quasi or wherever, you were talking about only one independent variable and tried

to manipulate that particular independent variable. So if you would bring in more than one independent variable, then you would not be sure which independent variable is causing an effect on the dependent variable, but here in the statistical design, this offers you that advantage.

Specific extraneous variables can be statistically controlled, so extraneous variables are those variables which are not taken as part of the study but they do have an effect. Economical designs can be formulated when each test unit is measured more once. So let us see.

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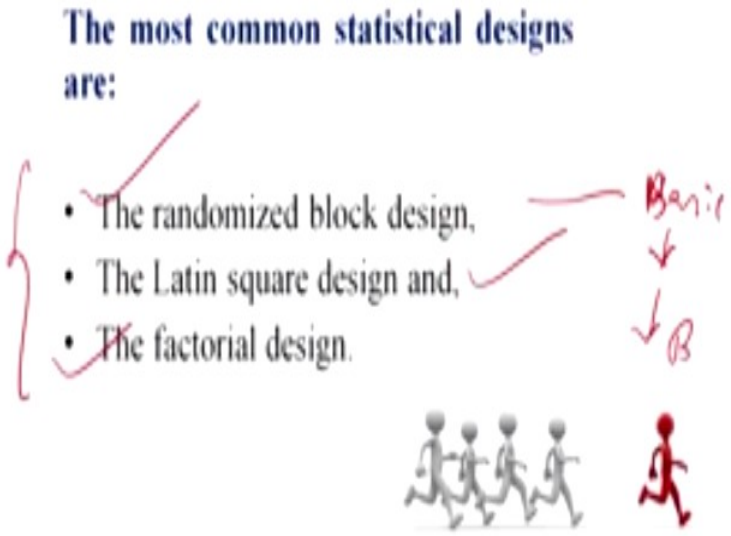

So what are the types of statistical designs? Basically they are three types. The first is the randomized block design, the second is the Latin square design, and the third is the factorial design. So you can understand that this is the most basic, then this one is slightly better this Latin square design, and this is even better, the factorial design is the best.

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Randomized block design

A statistical design in which the test units are blocked on the basis of an external variable to ensure that the various experimental and control groups are matched closely on that variable

So let us understand what is randomized block design? A statistical design in which the test units are blocked on the basis of an external variable to ensure that various experimental and control groups are matched closely on that particular variable of interest. Now look at this, what is it saying. All treatments are allocated to the same experimental units, so the experimental units are treated, all treatments are allocated to the same units right.

Treatments are allocated at random, so the most important word is the randomisation again. So how many treatments are there? There are let us say 4 treatments in this case A, B, C, and D right. so A, B, C, D are the 4 treatments which may be studied. Let us see an example.

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EXAMPLE

In the context of measuring the effectiveness of a test advertisement for the Renault Laguna, we intend to measure the impact of humor on the effectiveness of advertising

Three test advertisements, A, B and C, have respectively no humor, some humor and high levels of humor

Which of these would be the most effective?

Management feel that the respondents' evaluation of the advertisements **will be influenced by the extent to which they have driven Renault cars in the past (work vehicle, owning, hire/rental).** So, **Renault driving experience is identified as the blocking variable**, and the randomly selected respondents are classified into four blocks (heavy, medium, light or never driven a Renault car). Respondents from each block are randomly assigned to the treatment groups (test commercials A, B and C)

In the context of measuring the effectiveness of a test advertisement, we intend to measure the impact of humor how is humor going to impact the effectiveness of the advertisement

right. So three advertisements were made one with let us say A is no humor, B has some humor, and C has high level of humor. Which of these is the most effective commercial, so we want to check it. So to do this, we will do a randomized block design.

So management feels that the respondents evaluation of the advertisements will be influenced by the extent to which they have driven the Renault cars in the past so Renault driving experience is identified as the blocking variable, so what is the blocking variable, your driving experience, otherwise you do not block this experience, experience is not blocked then it may happen that the effectiveness might be influenced by the experience of that person if he has already used it, already driven that particular car.

Randomly selected respondents are classified into four blocks; heavy, medium, light, or never driven. So the blocking variable is basically the one where that means you have created four groups and these four that is what you want to test. So how do these people the users in the block is of the users of the car, how do they respond to the test commercials A, B, C which is no humor, slight humor, and largest amount of humor. Let us understand it again, let me clarify. so what it is happening.

There is one thing that you want to check whether the test commercials do have an effect on the driver or on the experience of the driver let us say. So how does let us say we are measuring the effectiveness of the ad. So how effective the ad is if we taking three level of humor; no humor, some humor, and total large amount of humor, but then on what basis are you dividing the test units.

Now the test units are divided on basis of the level of experience of the drivers, the level of experience could be a heavy driver that means he is always driving this particular car, medium driver somebody who is being driving for may be last few years only or not much, a light or somebody was never driven and now he is also being exposed to this commercial, three type of commercial; some humor, no humor, and heavy humor. So now how would it react, so what reaction would it show, let us see.

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Example of a randomized block design

Block number	Renault usage	Treatment groups		
		Advertisement A	Advertisement B	Advertisement C
1	High	A	B	C
2	Medium	A	B	C
3	Light	A	B	C
4	None	A	B	C

So the example is the block number is 1, 2, 3, 4. So the usage on which do you build the block is high, medium, light, and none, this is the experience. So advertisement A, B, and C are randomized block, this is a randomized way the blocks, they are put into the blocks. Let us say now usage is high advertisement A, so this is the first condition; high B that means this is no humor, some humor, and all humor. So high, no humor, high experience, some humor; high experience, all humor; medium.

So how would they react, how would this each condition each in each cell, what would be reaction pattern right. So we have to measure and by measuring, this we can say which kind of advertisement is affecting whom in what way.

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The **main limitation** of **randomized block design** is that the researcher **can control for only one external variable**

When **more than one variable must be controlled**, the researcher must use Latin square or factorial designs

The main limitation of the randomized block design is the researcher can control for only 1 external variable, only 1 right. When more than 1 variable must be controlled, the researcher must use the other 2 designs, the Latin square and the factorial design. So we have understood the randomized block design.

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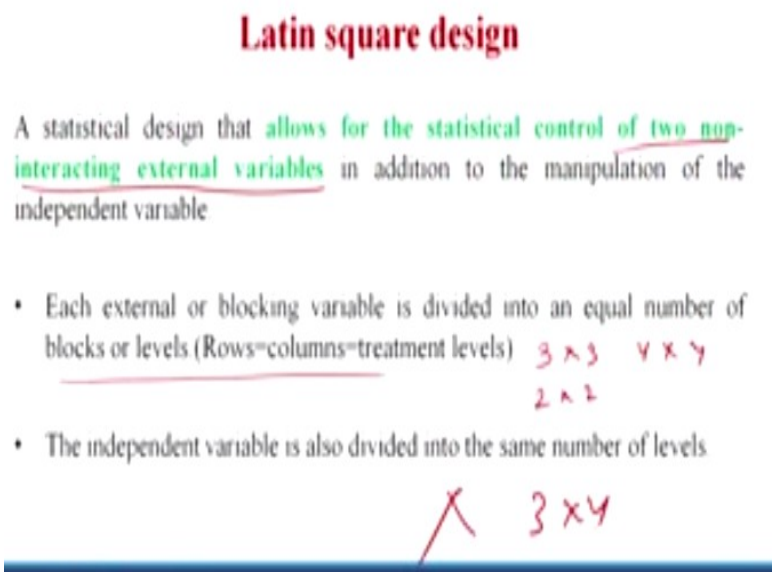

Now we will go to the next one which is the Latin square design, which is an improvement over the randomized block design okay. In this what happens, the statistical control for two non-interacting external variables is taken. S earlier, we were talking about only 1 variable, now you have a scope for 2 variables, but the condition is they should be non-interactive in nature. That means A and B, the result of A and B should not get effected by the presence of each other.

Each external or blocking variable is divided into an equal number of blocks or levels that means this is another problem sometimes of a Latin square design. The number of rows that means it should a 3 x 3 matrix or 2 x 2 matrix or 4 x 4 matrix but not a 3 x 4 matrix, you cannot take it, unequal is not possible, and the number of treatment is also has to be the same. That means for example the treatment in the last case was humor, so some humor, all humor, and no humor.

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- A Latin square is conceptualized as a table, with the rows and columns representing the blocks in the two external variables.
- The levels of the independent variable are then assigned to the cells in the table.
- **The assignment rule is that** each level of the independent variable should appear only once in each row and each column.

A Latin square is conceptualized as a table with rows and columns between the blocks in the 2 external variables. So we explain the levels of the independent variable are then assigned to the cells okay. The assignment rule is that each level of the independent variable should appear only once, only once in each row and each column, you cannot repeat it okay.

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An example of a Latin square design

	Interest in watching Formula One races		
Renault usage	High	Medium	Low
High	B	A	C
Medium	C	B	A
Light and none	A	C	B

Note: A, B and C denote the three test commercials, which have respectively no humor, some humor and high humour

Now look at this, the same condition. The usage now what we have done is we have clubbed these together to make it a 3 because there were 3 things here so high, medium, low. So what is happening interest in watching Formula One races, so people have been taken and these are the commercials A, B, C. So 2 variables have been taken, the experience, high experience, medium experience, and light or no experience. Now how much interest the people have for watching the Formula One races where this Renault car is being used let us see. So that has also been taken so and this is high, medium, and low; so high interest, medium interest, and

low interest. So you have 2 variables now, interest and usage. Now the test commercials are randomly again placed inside and you have to ensure that in each row it has to be only once. So B, let us say A and C. So this C, B, A. Now you can see there is no repetition anywhere, neither vertically nor in the horizontal side, and each has been given only one opportunity.

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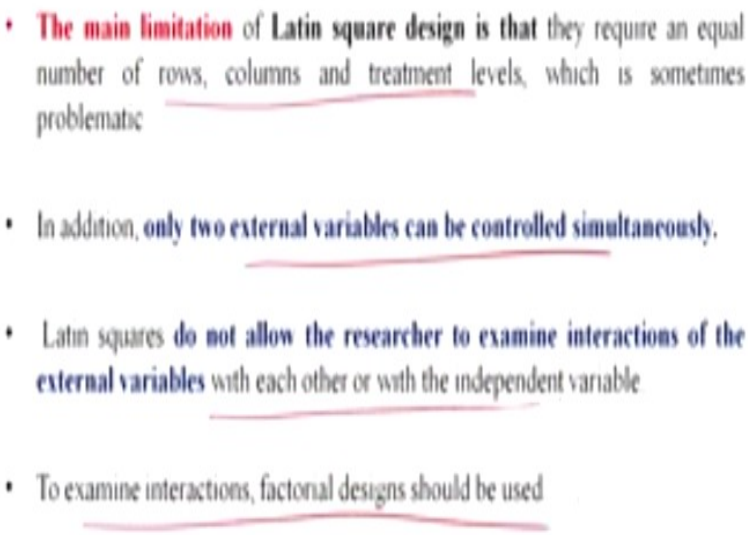

So now after doing this, we would again run this design, but the limitation of the Latin square design is that they require an equal number of rows and columns and treatment levels which is sometimes problematic. In addition, only 2 external variables can be controlled and not more than that. Third interaction effects are not allowed okay. So this is a big issue because in real life interaction does happen because of the presence of one or other variable, there is an interaction, so that you cannot assume it will not happen.

So to examine the interactions, now we have come to an improvement and a new kind of a study which is the factorial design, but today I will wind up here. Let me just summarize what we have done, so in the next lecture we will talk about the factorial design and we will close this chapter. So basically, we talked about the quasi-experimental and then we came to the statistical designs.

In the quasi-experimental, we talked about the time series and the multi time series right and we said quasi-experimental is done when randomization is not possible and a true experiment is not possible. So the researcher tends to make it look like resemble something to a true experimental, but not an exact experimental study. Then we said a statistical design is an

improvement over the others. Now what is happening here, you can take more than one variable, independent variable and test it.

So here, we saw the first is randomized block designed in which we took 1 independent variable and tried to see the effect of some kind of a treatment. Then we came to the Latin square design which is better than the first one, but then it has some limitations like interaction effects are not possible, only maximum 2 independent variables you can take, so these are something that we found was also an advantage but also a limitation.

So we will go to the third design in the next lecture, we will talk about the factorial design which is highly utilized in all kind of experimental studies in social science and other places and even basic science. So thank you for today. We will meet you in the next lecture.