INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

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Marketing Research

Lec-14
Experimental Design and Sampling
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Welcome friends again to the session of marketing research analysis we were in the last session we were discussing about the experimentation or the causal effect basically in which we talked about causal research has two basic parts one is the field experiment.

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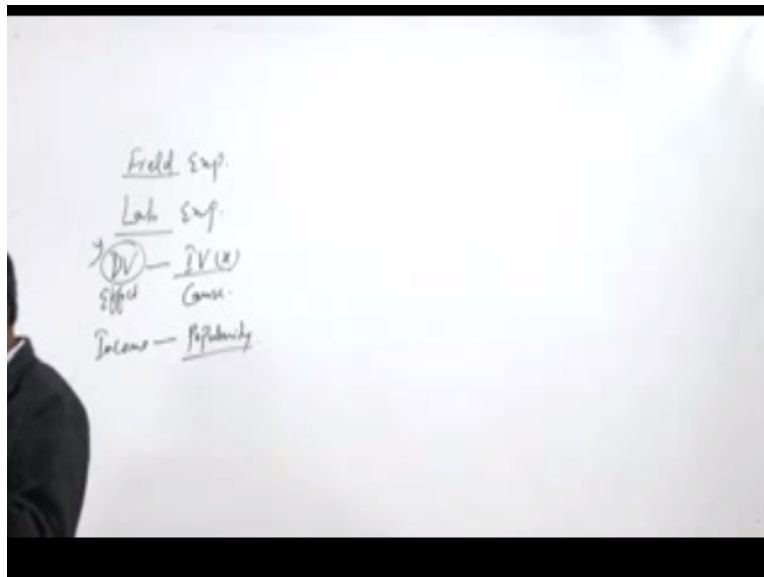
Right and the other being the lab experiment right so where research is being done either in the lab or on a set like the field right on let us play on people at large in the public domain so you can experiment to see how a variable effects right and the variables being the we spoke about was the dependent variable and the independent variable right so the dependent variable is basically the Y which we say is the is a effect right and the dependent independent variable being the X which we say is the cause right.

So this is the cause which effects which and that is the effect right so what is the effect let's say of let us say the film's income let us say income is how income is affected by the popularity of actor popularity of the actors right so this we are trying to measure and we see if we suppose change the actor is there a change in the revenue right or the if suppose you must have seen in sitcoms and all this proves the program's basically where the change in actor in between the series right after some time.

So what happens is basically why does it do it they try to see whether they feel they have hypothesis that if we change this actor maybe our program will do better right they will pull in more you k consumers more eyeballs to the program and people's interest for the program will increase and that is why they try to change and sometimes it also helps them in breaking the boredom right. So we did with the started with the experimental design right so the pre -experimental and the true experimental.

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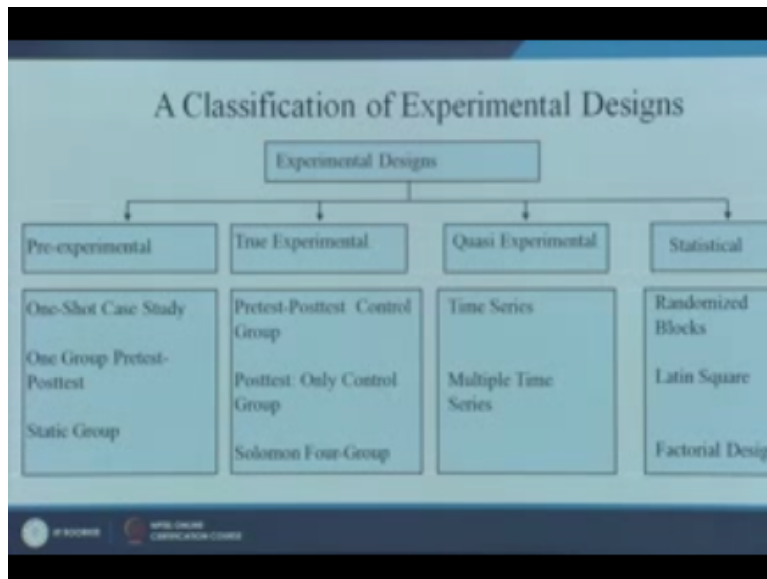
We said in which we had there was pre-experimental this is the one short case study not and this is a true experimental where we had pretest and posttest both this has got an advantage but the third is basically what we are discussing is the quasi experimental so what is the quasi experimental and why it is different from the others right for example the pre experimental and the prop the expert true experimental the basic difference between Quasi and the others is that it was the experiment.
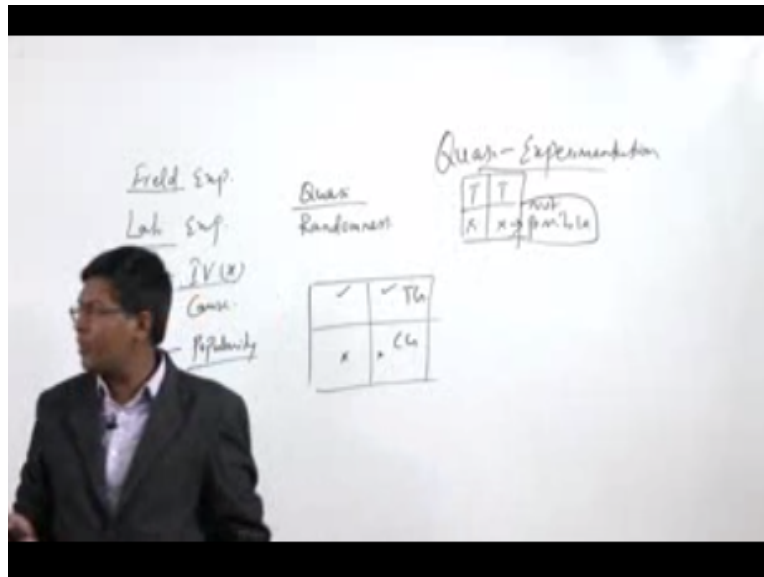
Right basically does not have the element of randomization or randomness right so that randomness is missing in the quasi experiment so why does it what how can we explain this let us say there are situations where we do not have the ability to randomly place somebody because in fact the biggest advantage of experimentation is to have randomization right that means what you can say as I was showing in the last session.

So let us say let us say there is a field in which you have divided the feed into several levels right and you want to randomly put in the let us say fertilizer so you may put it here and here and you do not want to put here so this may be like a control group and this is your treatment group right so this thing is very helpful in research because it helps us to find out key what exactly is the effect of the treatment ah or is there any real effect of the treatment or there is no effect by just measuring the difference between this and this group and this group okay.

So but the quasi experimental group is something but a given example if you see the time series and the multiple tension let us take an example very few a very nice example suppose you want to check give what happens when you k people are given different doses of medicine right so in those cases when medicine dosages are given it is impossible for you to have attest like for example let us say suppose we give treatment right.

And we will not give any treatment so this is not possible why it is not possible this is not possible because the simple reason is unethical how will you allow somebody not to be treated right just to make an experiment we can do that right so in such conditions this is the difficulty which we have and that is why studies which fall into this category where you are not able to do and random experiment right in those cases are called come under the quasi integration because not cross the integration sorry quasi experimentation okay quasi experimentation.

So let us take these two basic examples so as I said one you and I think I hope you understood that you when you do not give a treatment always it is not possible so randomly you are you that random factor is missing in this Posse right.

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So as it says look these are the this is a time series design which you have taken right there is no randomization of the test units through the treatments so this is the biggest difficulty for example

one of classic is suppose you want to test it on the person right you want to see the effect of a particular drug or a particular promotion on people's age right here the biggest problem is that suppose we try to effect on we try to test it on.

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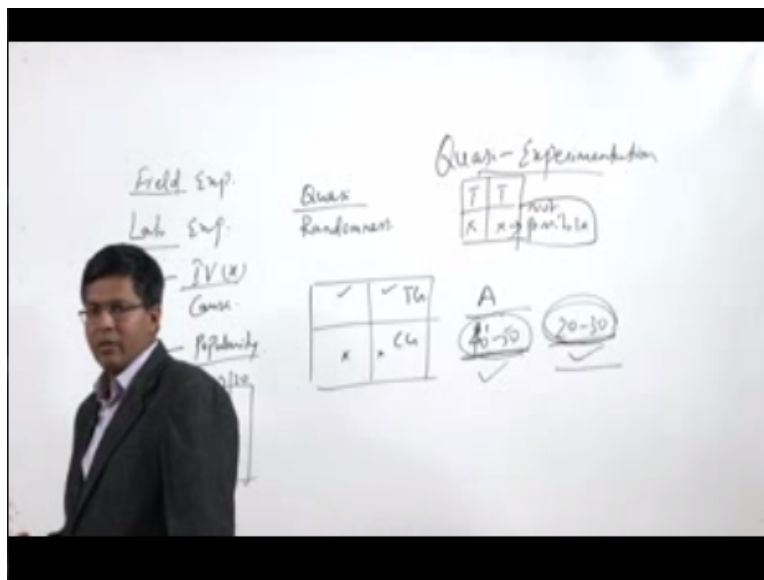
A let us say A being an individual right we can do one thing suppose a is A particular age group of let us say 40 to 50 let us assume and we want to see how it varies for 40 to 50and 20 to 30 let us say okay the problem which what kind of studies is that 40 to 50 if we do and this is supposed to arrange that to different people please understand this there are two different people so twenty to thirty is one percent whose behavior although we are saying advised they are different but there are two different people whose characteristics might be entirely different but we don't have an option why we do not have an option.

We cannot do is that we will we will try to you bring this man back to 20 or 30 and do the experiment again yes one thing is possible that if you can do like for example 20 to 30 when at this time period you do it and then again you do it this time period maybe it is possible but otherwise the reverse is not possible okay so the timing of the treatment presentation as well as which test units are exposed to the treatment may not be within the researchers control so why I will be saying time-series designs if you seen times these designs are basically where let us say the in a typical time series design.

Which you say the people are you there s what you say treated you can say that treated to for example on a particular there is said that the income of people are being measured for example this is the income of people what we are doing for your voice we are doing it16 17 18 19 20so when we are doing it basically right we are keeping the same people right so keeping the same people helps us to atleast do our research in a better way to understand because this researcher has not changed he has been more or less the same right so that is why we have been able to control it to some measure otherwise we cannot most of the studies in economics you cannot put it in truly experimental condition it is very difficult to place in a very truly experimental condition see what happens.

 If they are not given and what happens if they are given so if you do that there will be two different elements altogether right so that becomes end lesson the same person you cannot make the experiment twice it is impossible because you cannot tear a regress the person the age of the person right so that is one problem but one multiple Co time see design is one where we have two groups.

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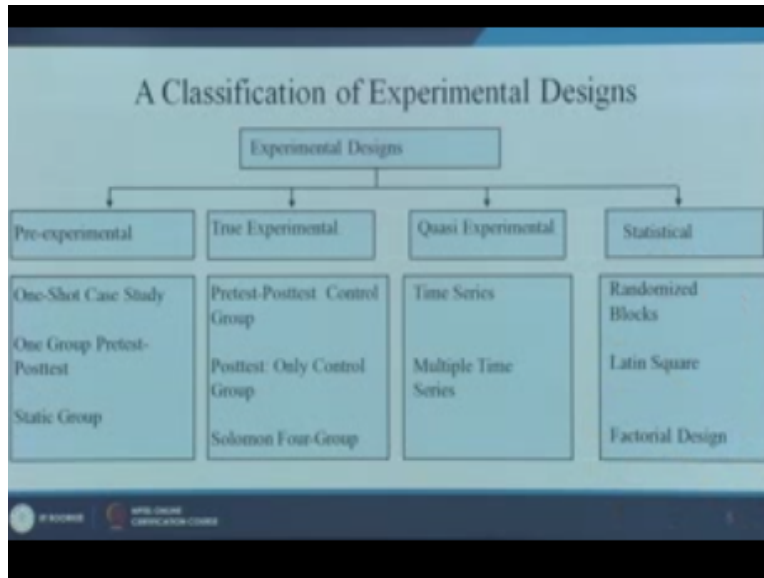
So one what the observation is taken for the experimental group and there is a control group what is saying if the control group is carefully selected this design my can be an improvement although the flaw will remain. What I said right you cannot take back the person to is to age of coordinator 30 again when it is already 40 can be an improvement over the simple time series experiment right can test the treatment effect twice against the pretreatment measures pretreatment measures in the experimental group and against the control group in the experimental group you had that freak precondition and post condition which exactly might not be able to replicate but at least we can figure out what is the best possible solution that we can achieve.

So quasi integration across the experimentation are basically experiments where you do not have that randomness to or to user of the randomness characteristics okay ,the fourth is it comes to these three which comes in the randomized block right.

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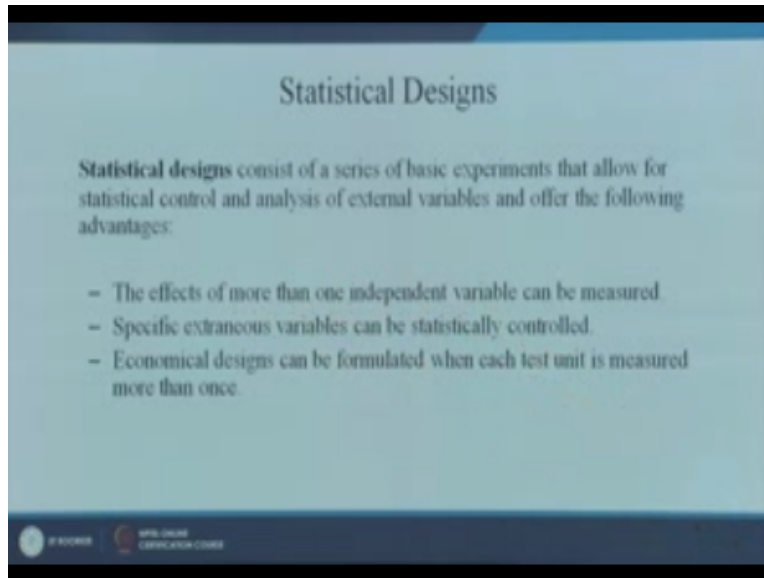
Let us see what a statistical design statistical designs for example are basically used for a series of basic experience that allow for statistical control and analysis of the variables and offer the following what are the advantages the effect of more than one independent variable can be measured please understand when you hear something called like a factorial design.

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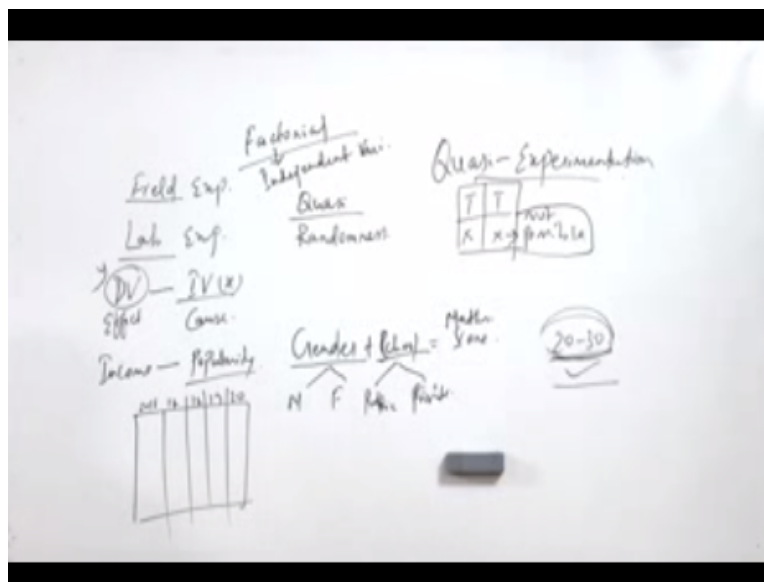
Factorial design right if factorial design is nothing but a one factor is nothing but an independent variable one factor is nothing but an independent variable so if you are doing factorial design or even a Latin square which is nothing but kind of natural design what we do is basically we are
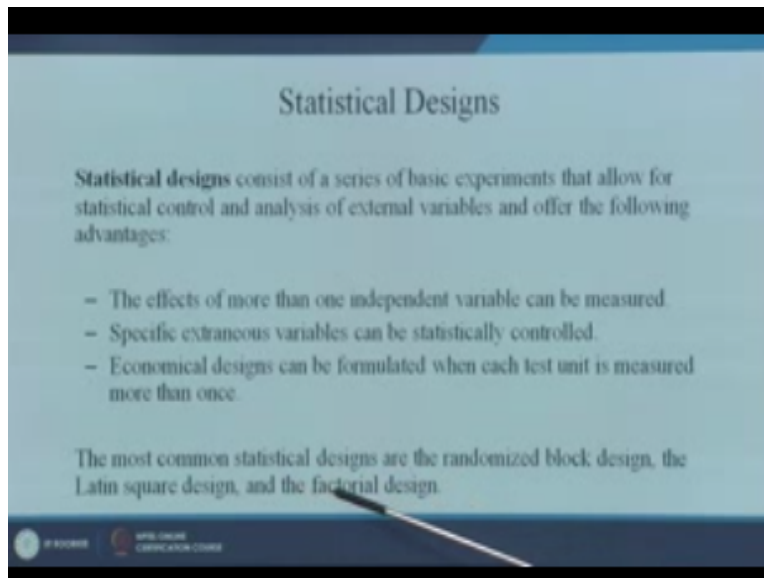
saying the effect of here more than one independent variable can be measured what are the let us say independent variables you want to measure let us say you want to see Q.

Whether below score you k gender right and plus hard work right first let us take one gender affects the let us say as core of a person how much is scoring in Melissa mathematics the match score or any score for example match score example we will say that gender has an effect on the smash score that means girls let us say in terms of mass we say boys score better than girls in math and it had it been let us say English or something or a subject like that with a lot of abstracts and theory is required and the you k the logical understanding is required.

So there may be a girls would have better but in math's we say suppose a key that lets hypothesis it could be wrong also that gender does an effect that means male we are saying are having a bigger better role to score better and the girls okay but that is no enough so gender has two levels let us say male female okay plus we are saying suppose we want to also okay, key the amount of hard work let us say amount of hard work or hard work also plays an important or you can say the school in which school we are studying the kind of school they are studying they say public school private school.

So school right so the school they are studying also we are having a say public medium and a state medium let us say or public and private the simple because I do not want to get into this thing so public and private so when I am having I want to check the effect of the people score I feel key one that gender has an effect on the mascot second is the type of school also has an effect on the score people do get in math right so when I am doing this is basically what Falls you k where we are trying to test more than one independent variable okay and here the advantage is that extraneous variable.

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Statistical Designs

Statistical designs consist of a series of basic experiments that allow for statistical control and analysis of external variables and offer the following advantages:

- The effects of more than one independent variable can be measured.
- Specific extraneous variables can be statistically controlled.
- Economical designs can be formulated when each test unit is measured more than once.

The most common statistical designs are the randomized block design, the Latin square design, and the factorial design.

Which if you remember in the last session we are discussed extraneous variables are those variables which are basically not exactly the independent variables but they are still variables which affects the entire you k experiment or the x intercept II right so okay so there are basically the statistical design have been done to bring in the randomness factored into it and reduce the number of experiments to a limited number okay the most common syndical designs are the randomized block design the Latin square design and the factorial design okay.

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Randomized Block Design

- Is useful when there is only one major external variable, such as store size, that might influence the dependent variable.
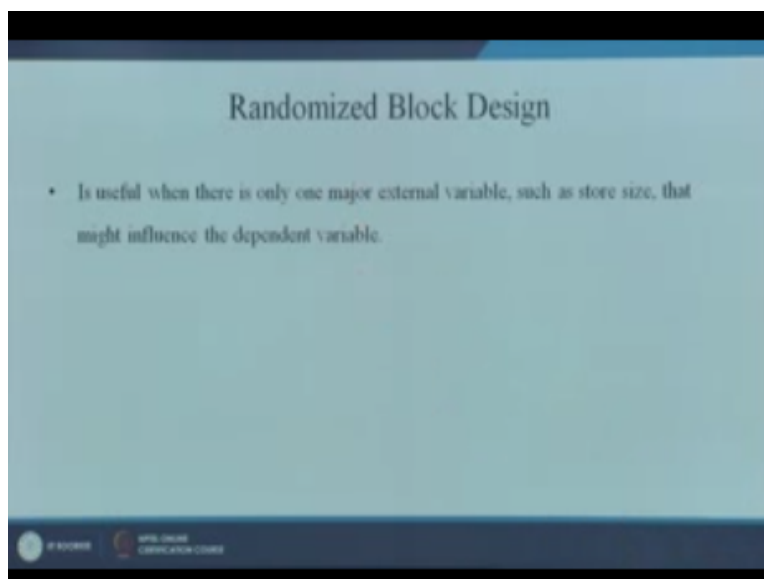
Let us see it is useful when only one major external variable such as Tour size might influence the dependent variable what it is saying there is only one factor in the randomized block design you have only one factor you are taking let us say the factor could be Store size.

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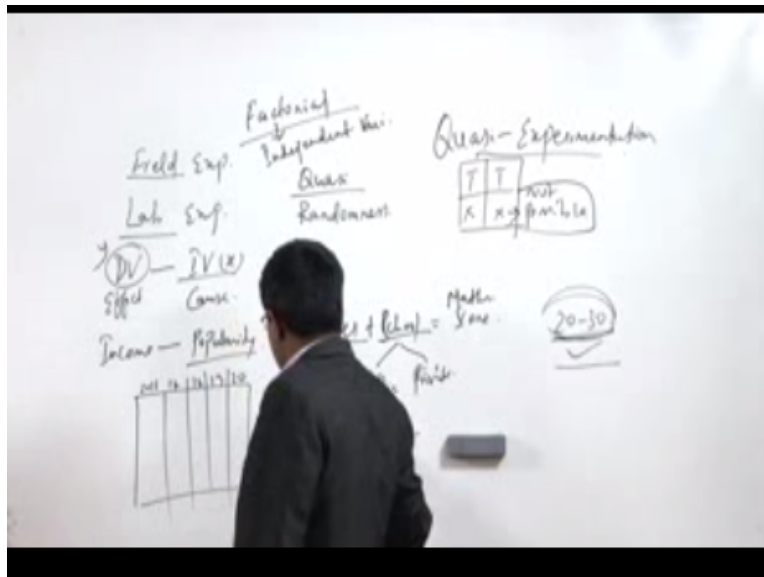
The size of store could be a big store medium-size store small stores right that can have an effect on the let us say the dependent variable that is let us say for example okay so when you have such kind of a block you are trying to study the impact of store size then the what we do here is the test.

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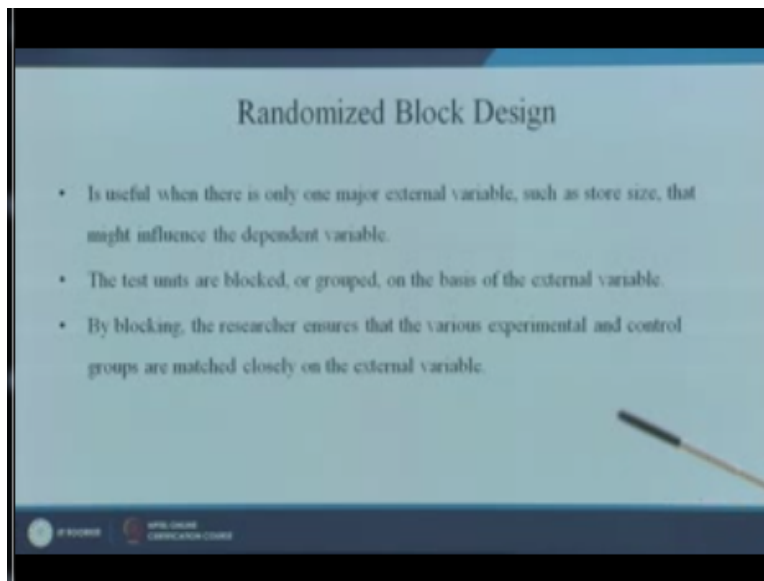
Units are blocked or group right and then they are tested the blocking the researcher ensures that previous the various experimental and control groups are matched closely on the external variable right so basically what is happening if you look at this randomized.

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This is for example this is a treatment group let us seek basic commercials okay commercial ABC we are saying patronage is heavy medium low and nope no law pattern is basically oil tea okay none how to under scim plea understand so what we are saying does the commercial have an effect on the loyalty of a store what is our lower bottle oil T is loyalty or pattern it is our dependent variable so we are saying that means the equation would look something like this key P is equal.

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Let us say a plus B of the type of commercial from the expert experience commercial may be right so the patronages affecting is getting affected by the type of commercial we are trying to see this so this is one block this is the second block this is the third block but this although this is a randomized route design sometimes we also use before which is not there in this slide is something we call a completely randomized design which is not shown here but I will show you on the board there is something called a completely randomized design.

What is a completely randomized design in suppose in this case only suppose you would have taken left a heavy medium and low let us forget the fourth word and let us say we take the commercials okay the commercials what we do in a randomly design random is we try to put it randomly anything right the first A Sina a b c a c b b a c so we do anything so what happens is when we randomly assign the values it is very simple this is going to completely randomized it is very simple this free of bias everything is good.

But the problem here comes is that when you do a completely random there is a problem that two elements might be tested at one a point of time and maybe some other element is not checked equally so there might be unequal or weighted given so that can be one of the worrisome factors okay look at this for hi there is ABC for in terms of everyone is there but here there are two is right and here there are two C's right so this could be a problem which can happen so then comes the randomized block design where what it was done was to randomly the one block is made and then they are tested okay completely random first block A block B Block C so by doing this a

complete block is been tested for example okay the second is the Latin square design which is very close to the you can say similar to the factorial design so here we are able to manipulate.

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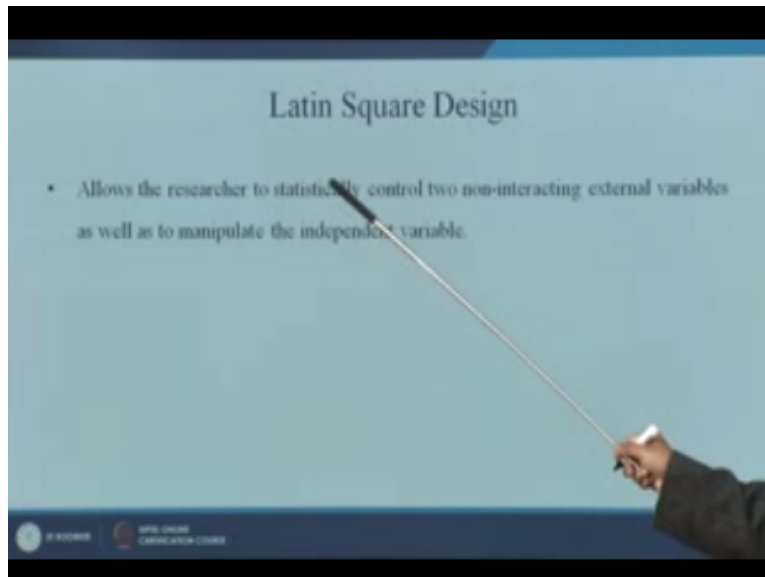
The independent variable right to non interacting external variables the statistically the researcher is able to control the two non external non controlling statistically controlling two non interacting external variables so the inter interaction F what you mean by interaction effect first let us understand interaction effort means Oh a fix let us say .

Something like this let us say a FX B or B is affected by a okay a effects FX b c FX b right although these are independently affecting together may not be but which there can be third thing that a and C together also have a way of affecting B what why are we doing it sometimes in life it happens that two things which is sometimes you talk it in terms of simms energy also right – or let us go to science we understand it like a reaction in which a fusion reaction where when two elements are meeting together the interaction effect is larger than the main effect right or sometimes it could be also that the interaction effect is actually negative their values and it is pulling.

The overall effect downright so the presence of any more than one variable is generally one should test for the interacting effects interaction effects which is very important in research and in most of the research publications and all or you will see that there will be question why the

researcher has not gone for a test of variance why he had not gone for a interact you okay, I am checking the interaction effects of the variables.

So that is basically to understand key is a simple zero it is like when you and your wife is there and your mother-in-law is there and they independently have an effect on you but when they come together in the same house the effect becomes either very detrimental or very humorous in humorous side or very highly positive okay so that is what okay.

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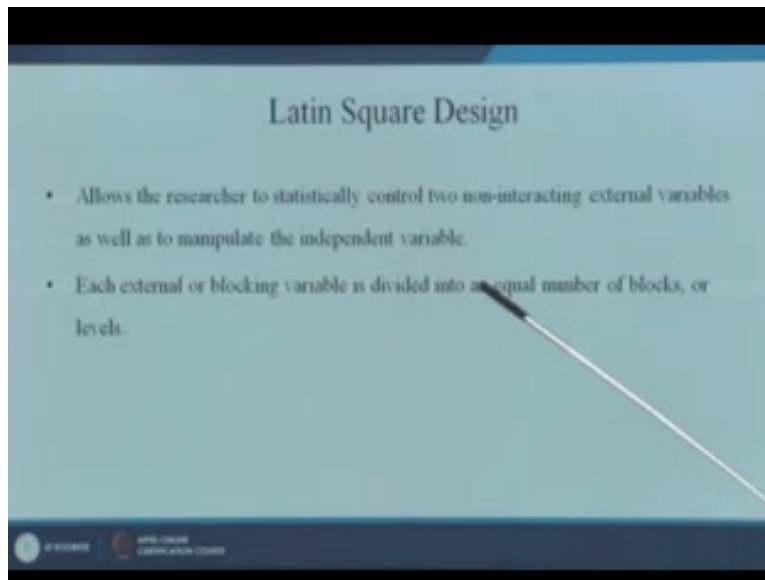
So each blocking variable is defined one equal number of blocks or levels.
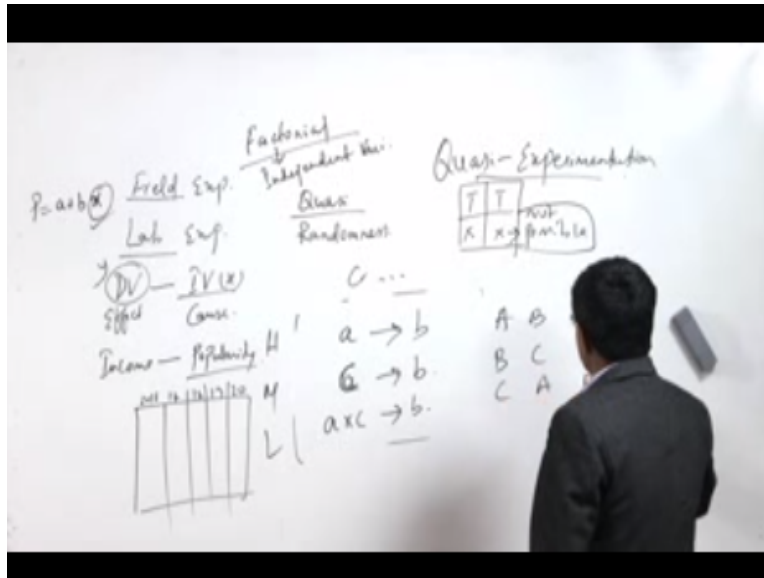
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Latin Square Design

Store Patronage	Interest in the Store		
	High	Medium	Low
Heavy	B	A	C
Medium	C	B	A
Low and none	A	C	B

So let us see the how it looks like this letting square design the simplest way of making a Latin square design is you just have to remember is have this way suppose B AC then you start from here see a B right then see a B so what is left from you start again from here so suppose you would have you do not Okay, how to design a Latin square design you can just remember like this ABC.

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Now leave A come BC a right so BC a leaves a so C A B so this is how simply you can design Latin square so that every item is given an opportunity okay so when you do this in the Latin square design a Latin Square design is called an improper factorial design sometimes it is said okay.

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Latin Square Design

Store Patronage	Interest in the Store		
	High	Medium	Low
Heavy	B	A	C
Medium	C	B	A
Low and none	A	C	B

So basically it is nothing but a kind of a trail design only right so you what has happened every element you see has been given there is a kind of equal opportunity so B A C nothing is being repeated okay so Latin Square head got one requirement please understand that is why the name square comes into here so a Latin square design.

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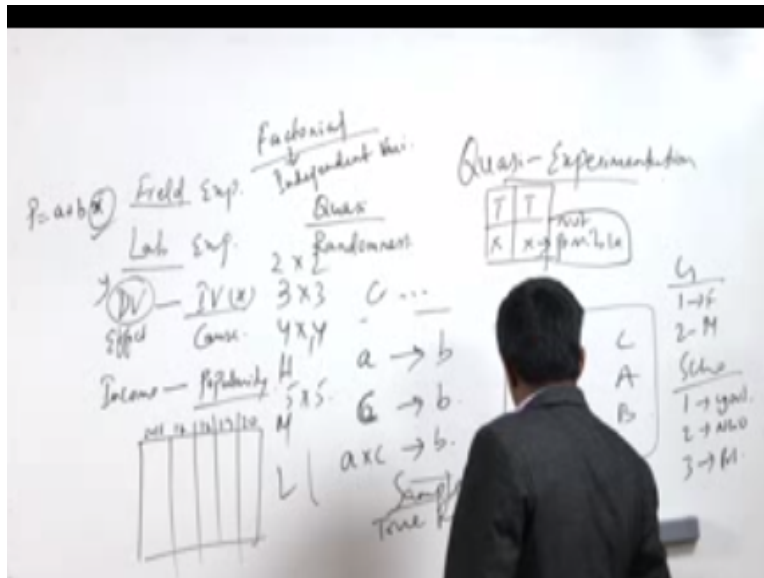
Whenever you make you have to have equal number of rows and columns suppose. you make three rows then three columns four rows four columns to rows two columns five rows five colors but you cannot take it to a very large extent because the test will become to come column and complicated okay .This is also this is the factorial design I have got a larger you k benefit than the others what is happening here it is used to measure the effect of two or more independent variables or factors at various levels see that is the basic advantage in other studies and experimentations we are not we were missing out the labels so in these statistical designs we are measuring the labels.

So let us say gender had two levels one to let a one female to male right school so we had two levels it could be - why – it could be three levels right so one two three let us say government something you okay, NGO run schools let us say that private schools so the number of labels at various levels factorial design helps you in improving exactly allowing you for the interaction effects basically so that interaction effect was not possible in the Latin square design write a factorial design may be conceptualized as a table in a two-factor design each label of one variable represents a row and each level of one variable represents a column.

So what is saying each level of one variable right represents a row and each level represents a column for example let us say this is a factorial design in which what we have done is the although it looks very similar like it looks very similar but the advantage is that in every element has been given an equal opportunity right has been given an equal opportunity so in a factorial

design what happens the interaction effect also comes into play and every the randomization happens right it is randomly the randomization factor comes into play into the system and this becomes more richer in experimenting and getting values okay so a researcher can get a better output right when he uses a factorial design because each factor or each independent variable with its level is being considered as a table in the form of a table okay.

So well this is what is basically what we had for the experimentation so I hope you must have been able to understand that means in during this process we had in the experiment we try to understand you what are the types of exponential designs and why should you do it because every marketer every marketing application has a requirement of has a requirement of causal research and the experimentation right so when you do any filtration or anything you require it right.

So okay let us see when you are doing any experiment after the experiment you need to also understand you whom are you going to work on right who are your samples right so what is the sample and how what does it mean basically its sample basically let us understand a sample you have to understand it as a true representative of a population so what it is saying it true representative of a population okay so our samples.

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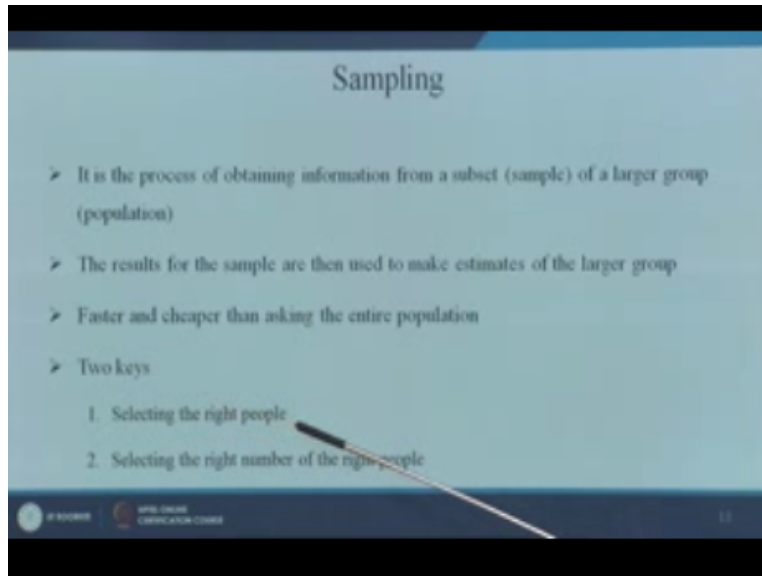
I just briefed maybe we will continue in the next session so the samples are basically in any study in any study you need to understand that you cannot you cannot measure the whole population suppose this board is the population you cannot measure the whole population so in order to avoid that we need to have a sample which actually is a part of this board you cannot take this part as your sample because this is not a part of the board right so it is it to be part of that population it is represent this population and sample basically how does it help the samples are used to make estimation of the larger group.

That means a sample tells exactly whether I actually defining the population or not right and what we do is basically we try to find out the difference between the sample and the population through its mean or something and then we say okay whether the sample is actually explaining what the population should explain or what the population would explain or not okay so two key elements it is faster and cheaper.

Obviously you cannot the population being larger selecting the right people so when we are talking about a sample a sample could be a person in marketing research we will obviously take in terms of value but a sample me does not mean poor people only my way of putting it might not be correct sample could be anything.

It could be as a sample could be a product also so it is from a population of elements let us say machines or chairs or tables or let us say this pointer so what we have so is suppose a company's manufacturing we can take out pull out a sample a few samples and tests key what should be the

standard specifications or the characteristics of the sample and whether these samples are actually defining properly the meeting those requirements and if yes then we say that actually the ten if the sample is good then the population was really good right so our sample basically helps you to identify from a small way whether the population is correct or not correct right so this is what basically is explained but in terms of marketing will say selecting.

The right people and selecting the right number of the right people two things very important so sampling says you have to first let us say if you are conducting a study let's say you want to check P let us say the use of this marker right so whether this marker is good effective or not to test it you can ask anybody right but the best people to talk about it would be people like me who are regularly using it right so although it might not be a factor but yes the profession could be a factor in deciding who this product should be using so the sample when you this when you when you take out a sample or pull as ample one issue understand.

That the sample should be a correct sample you should be able to explain the thing the phenomena and then after that if you take only maybe about 10 people that nuts might not be justified to give a true representative rate so in such situations how many what should be the some sample size right before why we can use also formula to calculate right so we say this is how from the z-score or I think this is not be visible I need to so what we will do is it is equal to X minus.

So this is one this is my standard error so through this also that this being this is equal to root or n so from here also we can find out but there are some thumb rules also which I will explain in the next session how do you understand sample how to use sample if you get a wrong sample then there is a large obviously your mystery would be a fruitless and it will be a waste so and misrepresentative.

So the point is you have to understand that who is my right sample and how many samples should be taken as a researcher or a also in a marketing research study you should be able to understand how many samples should I take collect so that my whatever I am stating at the end about the population is coming true right well this is what we will have in this session we'll meet in the next session Thanks.

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