Marketing Research and Analysis-II (Application Oriented)
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Lecture – 16
Research Design - VI

Welcome friends. We are continuing with the lecture on experiments, basically the causal research design and the type of experimental designs. So in the last lecture, we talked about the pre-experimental and then we talked about quasi-experimental, we talked about truly experimental designs, and now we are continuing with the statistical designs. Statistical designs are an improvement over the first 3 in the sense that it allows you and allow the researches to make statistical controls.

That means through a number of experiments through a number of series of tests. It allows you to make some statistical controls, so that is why it is one of the most popular designs used by researchers everywhere.

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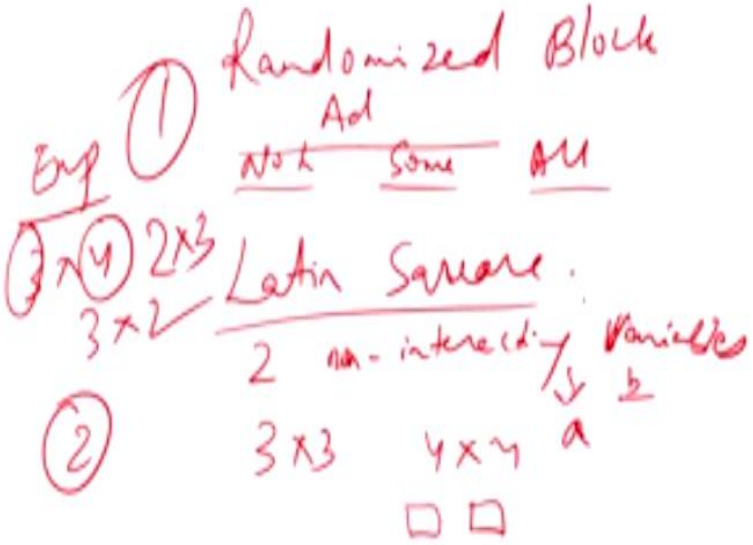

So what is the statistical design and what are the types in which we discussed the first one we said was the randomized block design. The randomized block design we said where 1 variable was taken and was measured on basis of some kind of a treatment level. So in our case you remember we have taken the experience of a driver and the effect of treatments like the advertisement. So 3 levels of advertisement we had chosen where no humor and some

humor right and all humor was taken and then it was tried to check what is the effect of this advertisements on the experience of the drivers basically.

So the experience of the drivers and what kind of impact was it making basically these kind of advertisements when you take different levels of experience of the drivers. The second case we talked about was an improvement over the first one, the Latin square. So the Latin square design said that you try to make a test or an experiment on basis of taking 2 non-interacting variables. So we are taking 2 variables here. Here in the randomized we had taken only 1 variable, here we are allowing for 2 variables but not more than 2.

So that is a good thing as well as a bad thing also, so you cannot take more than 2. One more problem with the Latin square design was that the number of rows and columns and treatments had to be same. So in the randomized but that was allowing you for a different kind of combinations, for example a 3 x 4 matrix, it is 3 experience levels and 4 was let us say the humor kind of advertisement levels or it could be 2 x 3 whatever or 3 x 2 whatever, but in this case, it has to be a 3 x 3 or a 4 x 4 whatever, in this kind it has to go.

So the Latin square design had some improvement over the randomized block design by taking 2 variables at one time, but then the problem was that it did not allow for interaction and it did not allow you a free hand to make a different combinations of matrix. So now we will come to the third which is called the factorial design and the factorial design is the one which is used mostly in all kind of research studies where the researcher wants to see the effect of an interaction.

So what is an interaction basically? Interaction means understand there is some effect which is a main effect or a direct effect, main effect for example. What is the main effect? The effect of one variable of an independent variable on the dependent variable, but then what is the interaction effect in that case. The interaction effect says that whenever there is a presence of another variable and due to the presence or absence of another variable, whatever change in the dependent variable's value comes is due to an interaction among the independent variables.

So this is what it says, suppose a is an independent variable which has an effect on the dependent variable and then you bring in another variable b. Generally I tell it in my class

suppose for example just imagine there is one person in the class sitting, a group of boys sitting, and they are attending the class very patiently, they are listening, they are participating. Suddenly another group of girls come to the class because of a gender, because boys and girls come together, they start feeling better and they start talking to each other.

So now there is an interaction effect. So had these girls not been there, the boys would have been silent and they would have may be participated. Had only girls been there, boys would not have been there, again they would have participated in the class, but now since the girls and boys together they are sitting, they are talking to themselves and they are listening to the class less. So this is just an example, please understand.

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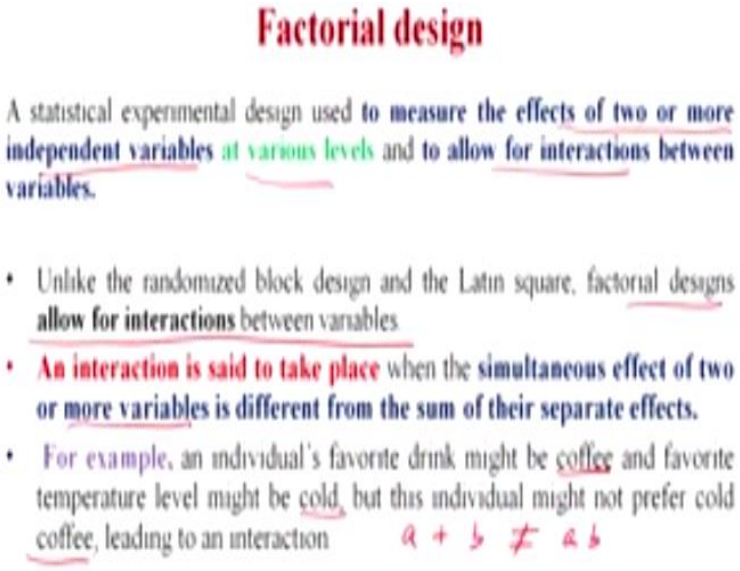

So what it says is experimental design used to measure the effect of 2 or more independent variables at various levels and to allow for interactions. So it allows you to study more than 2 variables even and at various levels for example in the humor case; no humor, some humor, all humor, it also allows you for interaction. So this is the best kind of design that you can think of. Unlike the randomized block design and the Latin square, factorial designs allow for interactions between the variables and this is the truth in life.

Many a times, we feel a affects b, but actually the effect of a does not remain the same when another variable c or d or e comes into the picture. It is like a chemical reaction where you just imagine the presence of another or the kind of weather let say or the presence or absence of a chemical or some element will change the entire reaction. So these things happen in real

life most of the time. So interaction variable's effect should be studied, they are very important.

An interaction is said to take place when the simultaneous effect of 2 variables is different from the sum of their separate effects, that means effect of a effect of b individually is a + b is not equal to the effect of ab together. So now take this example an individual's favorite drink might be coffee, he likes coffee, and favorite temperature level might be cold. So he loves coffee, he likes cold things, but same individual will not prefer cold coffee, this is what is an interaction effect. So you may love coffee, you may love he cold things, but you do not love a cold coffee.

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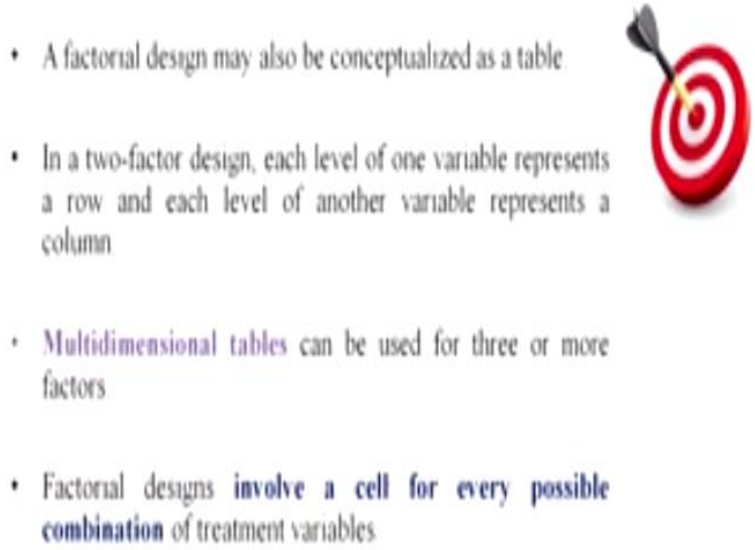

A factorial design may be conceptualized as a table, okay as table I will show you. In a 2-factor design, each level of 1 variable represents a row and each level of another variable represents a column. So we will see in the table I will go the next slide. Multidimensional tables can be used for 3 or more factors. Factorial designs involve a cell for every possible combination of treatment variables. So let see.

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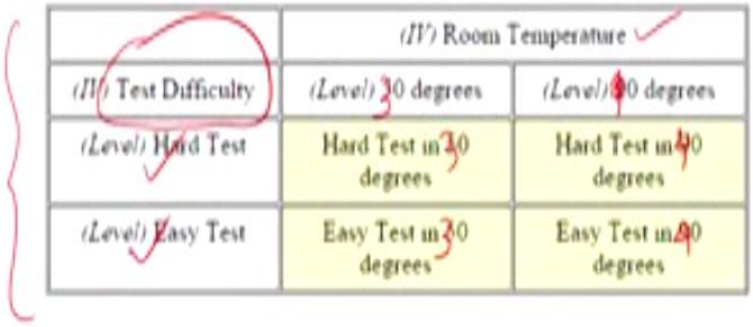
What about another factor?



	(IV) Room Temperature	
(IV) Test Difficulty	(Level) 30 degrees	(Level) 40 degrees
(Level) Hard Test	Hard Test in 30 degrees	Hard Test in 40 degrees
(Level) Easy Test	Easy Test in 30 degrees	Easy Test in 40 degrees

What about another factor. Let say now this is a case, this is simple to understand I brought it. An exam is being taken. The level of difficulty of the exam is hard and easy. Now the effect of, forget it for a second, now we are trying to study the effect of the level of difficulty of the test on the score the student is getting. Now what we are doing is, we are trying to bring in another variable the room temperature in which the student is appearing the exam.

The student is appearing in a temperature let us say level is, this 50 and 90 degrees is very very high, we will not take it so high it is just an example. Let us assume this is 30 degrees and this is let us say 40 degrees and let us say there is no air conditioner in the room. So a hard test in 30 degrees, hard test in 40 degrees, easy test in 30 degrees, easy test in 40 degrees. So when I am taking this level, will the score that a student will get be the same, had he taken only a hard test at let us say and room temperature is not taken or only taken the room temperature then the level of test could have been anything.

So this will vary. Now if I ask him to take a hard test a high degree, may be his performance might be very poor or it could be even better, I do not know, sometimes people react positively in an adverse condition, but generally speaking, the result will be bad because he is sweating and at the same time the test is also very hard. So these kind of studies help you to find an interaction effect okay.

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EXAMPLE

- Suppose that in the previous example, in addition to examining the effect of humor, **the researcher was also interested in simultaneously examining the effect of the amount of information about the performance** of the Renault Laguna that came over in the advertisement
- Further, the amount of information was also varied at three levels (high, medium and low). As shown in Table, this would require 3 × 3 = 9 cells
- The respondents would be randomly selected and randomly assigned to the nine cells. Respondents in each cell would receive a specific treatment combination

In addition to examining the effect of humor in the last case which we had discussed, the researcher was also interested in simultaneously examining the effect of the amount of information about the performance of the vehicle Renault Laguna that came over in the advertisement. So what had we taken in the last you know case, we had taken the effect of the experience and the amount of information. Further the amount of information was varied at three levels.

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An example of a factorial design

Amount of Renault Laguna information	Amount of humour		
	No humour	Some humour	High humour
Low	A	B	C
Medium	D	E	F
High	G	H	I

So let us look at this. So the amount of information, amount of humour right. So the information is let us say low, medium, and high, low information about the vehicle, medium, so this is the experience you can say. The humour has been taken as no humour, some humour, high humour and now each test unit is placed. So what happens here is now if you

see the respondents would be randomly selected and randomly assigned to the 9 cells, so 9 cells; 1, 2, 3, 3, so 3 x 3, 9 so randomly they are assigned.

Respondents in each cell would receive a specific treatment combination and then the results would be measured. So you can take may be this is one or you can take even more number of cases. For example you may take let say for this case for example, now let say hard test 30 degrees, hard test 40 degrees, easy test 30 degrees, easy test 40 degrees and we can also put in some kind of some treatment also within this. So when you do these kind of a combination of test, then we say it is a case of a factorial design.

Now coming to once we are over, so you understood the factorial design. Factorial design allows you for an interaction effect that is the basic advantage and it has no conditions like in the Latin square design that it has to be a 3 x 3, 3 x4, it can be of any size.

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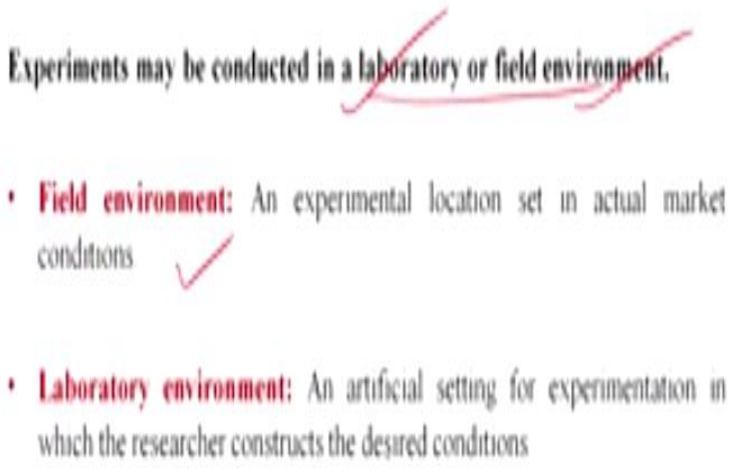

Now coming to laboratory versus field experiments. So what is this? So we have understood experiments may be conducted in both, psychological experiments are conducted on the field laboratory physical experiments. So field environment, an experimental condition set in actual market conditions and laboratory is an artificial setting for experimental in which the researcher constructs the desired conditions. So in a lab these are simulated conditions where kind of a real situation is being created, but it is not exactly the real condition, and this is the real one.

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Laboratory versus field experiments

Factor	Laboratory	Field
Environment	Artificial	Realistic
Control	H	L
Internal validity	H	L
External validity	L	H
Time	Short	Long
Number of units	Small	Large
Ease of implementation	H	L
Cost	L	H

So if you look at the difference between the 2 in terms of environment, laboratory is artificial, this is realistic. Control, you have a high control in the laboratory, in the field you do not have any control. Internal validity means the independent variables are actually effecting the dependent variable, is high in the laboratory and in the field you may not be able to have because there is no control.

External validity is low because what you do in the lab might not happen true in the general public or in the population, but here this is what happens if something is inferred that would be true because it is in a very uncontrolled place and if this result comes true that means it could might be possible for the entire population. Time, this is short and it takes long time. Units; small, large, the large population that you have to test because you do not know to make the study to make it more reliable you may have to extend the test and on the number of samples.

Ease of implementation is high and this is low because obviously it is tricky to work in a real time in a field. The cost is low here and high. So these are the basic differences okay.

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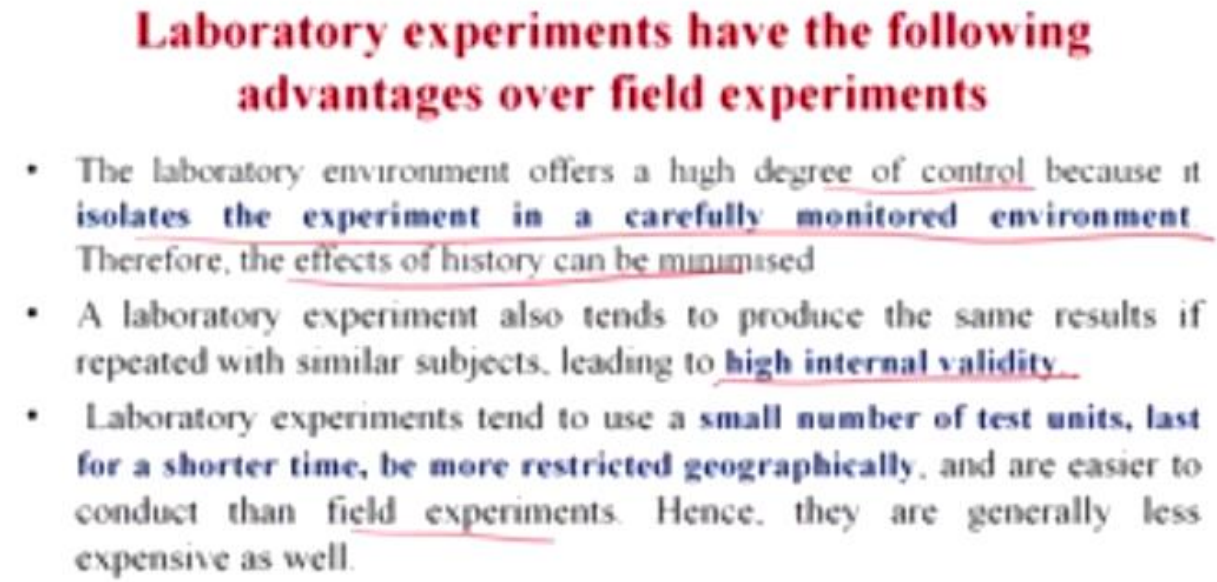

So the laboratory experiment environment offers a high degree of control because it isolates the experiment in a carefully monitored environment. Therefore, the effect of history can be minimized. You remember history, history is for example what was happening in the environment at the same time. So we got an example, for example you want to know the impact of income of a person and the economy is going down at the same time, so that is an effect of history.

So laboratory experiment also tends to produce the same results if repeated with similar subjects leading to a high internal validity, if you repeat it then it will give you a high internal validity. Laboratory experiments tends to use a small number of test units, last for a short time, be more restricted geographically and are easier to conduct than field experiments I have explained that, and they are generally less expensive.

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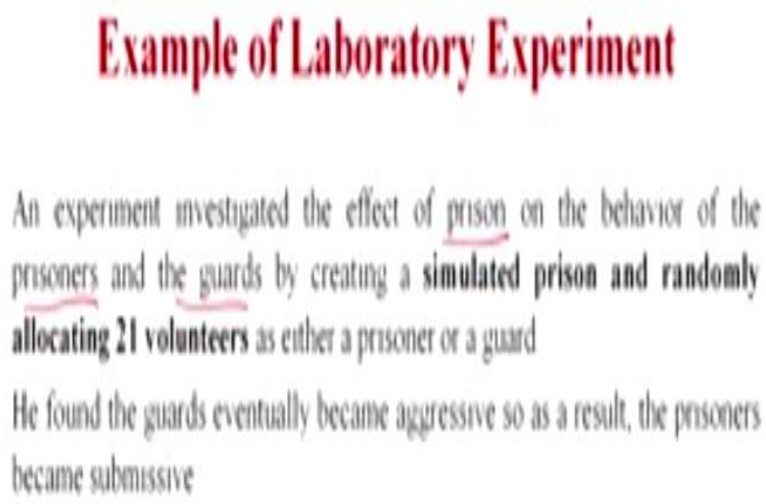

So an example. An experiment investigated the effect of prison on the behavior of the prisoners and the guards by creating a simulated prison and randomly allocated 21 volunteers now that is true but that is not a real prison and these volunteers were divided into either prisoners or guards. So the experiment found that the guards eventually became aggressive, so as a result the prisoners became submissive, so this was an example of laboratory. You are trying to create a simulated environment in a lab condition.

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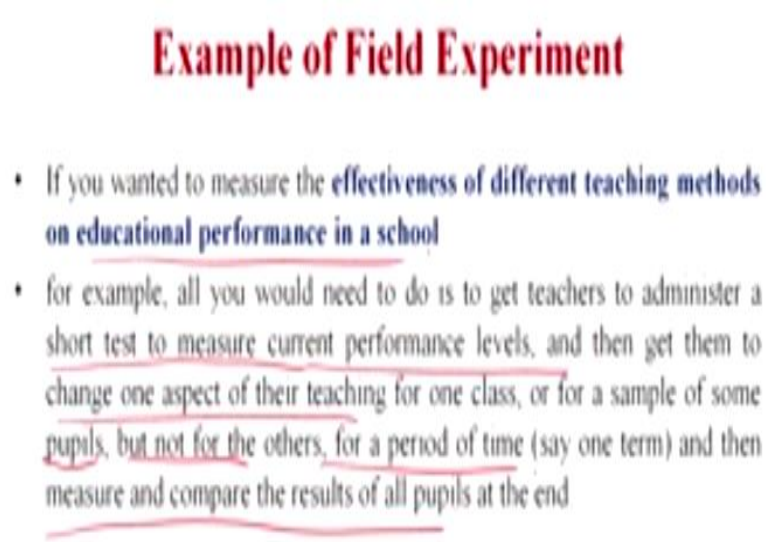

Field condition. You wanted to measure the effectiveness of different teaching methods on educational performance in a school, so it is a real life situation. All you would need to do is to get teachers to administer a short test to measure current performance levels and then get them to change one aspect of the teaching for one class or for a sample of some pupils or

students but not for the others, that means the treatment is given at different levels for a period of time and then measure and compare the results of all the students at the end.

So this is a field experiment where you are able to control the experiment and run the experiment better in a more random manner, so that randomization thing is possible which allows you to create a high external validity of the research. That means whatever answer we will get from this research can be said to be universally acceptable or true.

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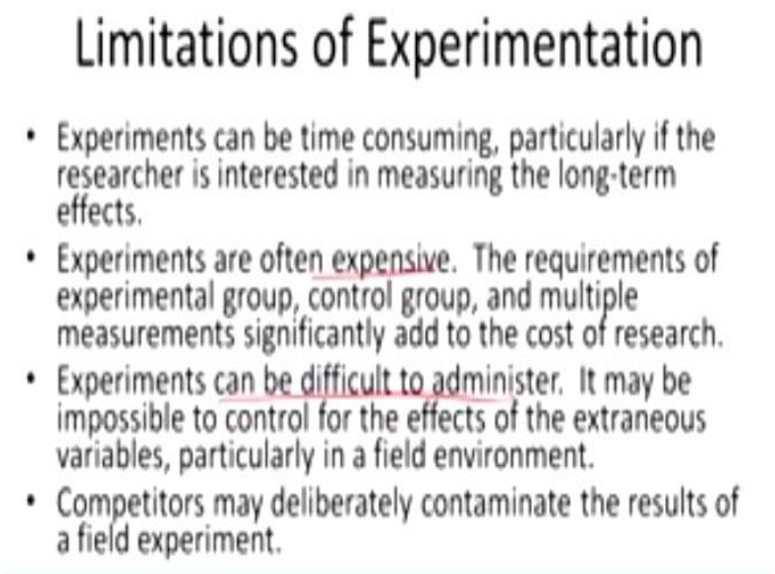

Limitations. Experiments can be time consuming particularly if the researcher is interested in measuring the long term effects. If you want to measure a long term effect, it is time consuming. They are often expensive right and they can be difficult to administer also. Competitors may deliberately contaminate the results of a field experiment. These are the limitations.

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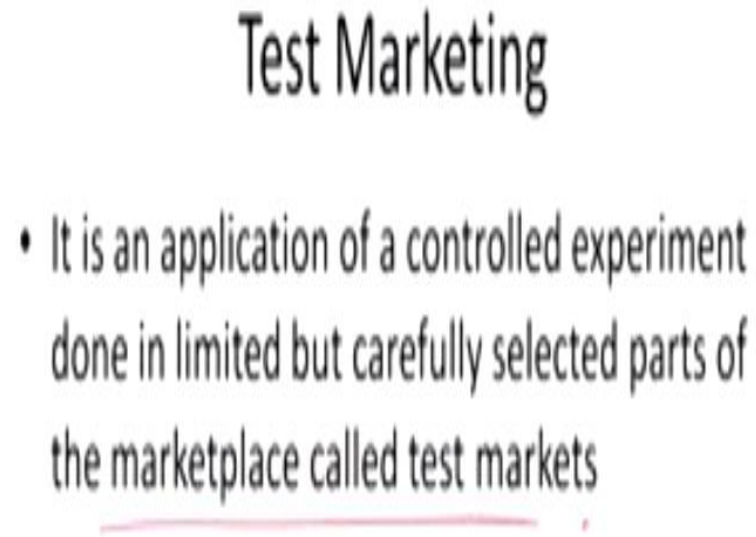

Now coming to something called a test market. Now test marketing when we are talking about his course called marketing research, so we need to understand this term test marketing very well. So what is this test marketing? Test marketing is an application of a controlled experiment done in limited but carefully selected parts of the market place called test markets. For example, a company wants to test a new product, it wants to launch a new product and it wants to test whether this new product will do well in the market or not.

In such a condition, it goes for a test market. So it does a controlled experiment in some limited place, in some place which is actually a true sample or a representative of the entire population that they are interested in of the target segments. So this process is called test marketing.

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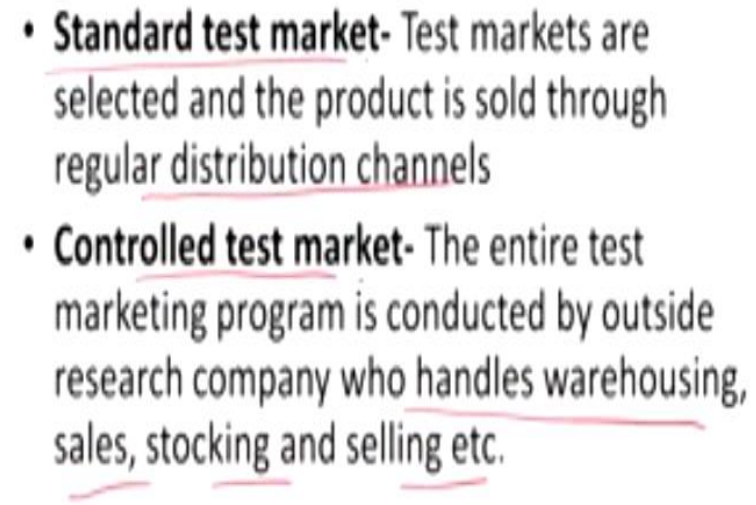

So there are various conditions in a test market. First of all we say what is a standard test market. Test markets are selected, that means you select out of the may test markets, that means what a test market is one which has got a very much resemblance or similarity to the target segment that you are interested in. So test markets are selected and the product is sold through regular distribution channels, so it is more or less like a real time situation.

Controlled test markets on the other hand is conducted by outside research companies for another company who handles warehousing, sales, stocking, and selling etc., but remember this is not done by the company itself, it is conducted by some outside agency.

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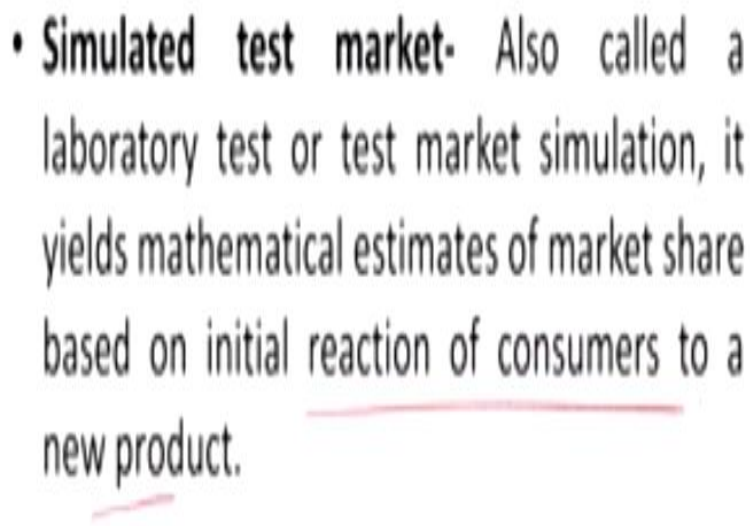

Simulated test markets are third condition which actually in fact if you see the first condition while going for a test marketing process, also called as laboratory test or test market simulation. It yields mathematical estimates of market share or demand based on initial reaction of consumers to a new. How do consumers react, from that reaction we try to assume how much will be the sales or the future demand of this product. So this is what we talk about in a test market. So let see this.

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So how it looks like? First a new product development or research on existing products is going on. So the first stage is you create a simulated test market. So what is the simulated test market, we just say is a laboratory or a test market simulation where you try to mathematically see how the consumers are reacting and as per the reaction what should be the future sales or the demand.

Then the next step is a control, so after the simulation test market, you go for control test market where you hire some agency and ask them to test that after that suppose we launch the product in the market, then how would it be, how will the consumers react to it, how would the market react to it. The third is the next step which is standard test marketing where the company is trying to see for itself how it actually would run, how it actually would behave, had it gone through a process which is a very close to the original or the actual or true process.

That means if I actually launch it and then try to distribute extensively in the entire distribution channel and promote it and all, how would it be, a very closer situation is the standard test market. So here the company is trying to do everything but in a limited space, and then finally after this, what you do is you do a national introduction, that means you launch the product simply.

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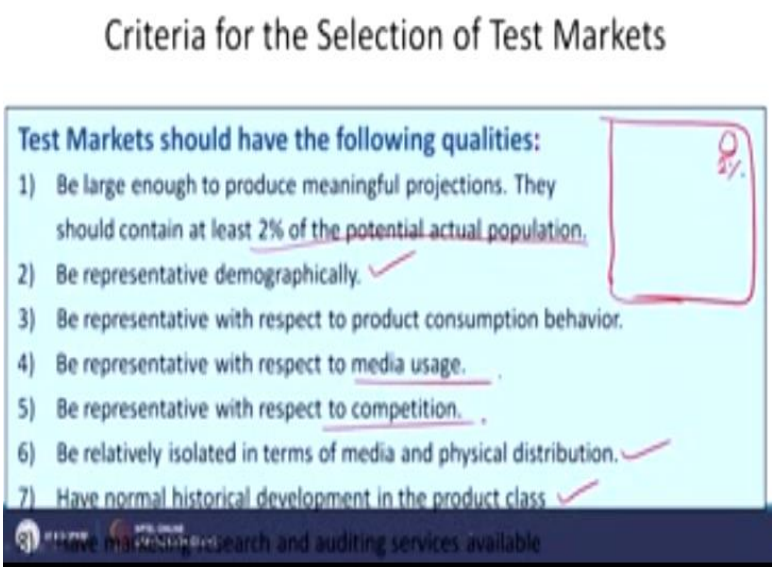

How do you select a test market? The question is how does a marketer select the test market? Test market should have the following qualities. The first it should be large enough to produce meaningful projections, they should contain at least 2% of the potential actual population. Suppose I want to, this is my entire market, now if I do, I cannot launch it obviously, so I take a small sample, though this sample is actually having a homogenous population which is similar to the entire population that I am interested in, so I take this.

So what did it say. If I select a sample, this sample should at least have 2% of the total actual population. It should be representative demographically, so it should be homogenous or it is should be representative. It should be very close to the segment of my interest. It should be representative with respect to product consumption behavior, the consumption behavior should also be more or less the same. With respect to the media usage also they should be similar.

With respect to competition also, that means it should not be like that you choose a test market where there is no competition or the competitors are not available at that place and you do it and you feel that is the true result because the true result would be different with the presence of the competitors. So if more competitors are available at the place and in your test market it is not available, then that will give a wrong figure.

Be relatively isolated in terms of media and physical distribution, so it should be isolated because you do not want to actually show it to the others, the competitors and others, and have normal historical development in the product class. So the product class that means the

range of products, it should be more or less in a normal condition that is as in a reality situation, as a real life situation. Last have a market research and auditing services available.

This place which I am testing as a test market, they should have all the facilities for conducting a research and auditing the services that I am going to give it to the consumers and my retailer and the entire distribution channel. So this is all we have. So today in this lecture, I explained about what is basically the statistical control design and in which we talked about the 3 types of basically statistical designs, the randomized design, the Latin square design and the factorial design.

The factorial design is always an improvement over the first 2 because the factorial design allows you to take more than 1 independent variable or more than 2 independent variables and then it also allows you for an interaction effect, which is not present during the Latin square design and obviously random though it is not possible because there was only one independent variable. So Latin square design had 2 variables but we were not able to check the interaction effect.

The important thing is that it also allowed for a different combination of matrix, that means the treatment levels given could be at different levels. So after this, we have learned that factorial design is widely used for example your ANOVA, analysis of variance, and such techniques. This is a case of factorial design. So the researcher uses the factorial design to statistically come to some conclusion and finally we said what is exactly, how does the experimentation happen in the field in a case of a marketing, for a marketing company or a marketing case.

In that we realized that the company needs to create a laboratory like situation or the company does a field experiment in which it creates a test market. A test market is a small market which is a representative of the market to which the company is interested to sell its product and then test whether this product will be acceptable to the consumers or not in the right spirit, to do that, they have to take into account many features.

For example, the demographic variable should be more or less the same, the condition should be more or less the same, the number of competitors available should be more or less the same. So all these conditions should be more or less like the target segment for which the

company is interested. Once they do it, then what they do is they try to do some control test, standard test and all and try to see whether how the market would actually react to when they would launch the product.

So this is all about experimentation we have done and we have understood. I hope this lecture is useful to you and you have understood what it means by experimentation and causal research so because it all started with causal research in which experimentation is one of the most important things and then we understood that with causal research, it is not only causal research can be done in the lab with only raw materials and nonliving entities but also you can do it in the field with real people and understand the psychological behavior.

The impact of certain independent variables on dependent variables such as market shares, sales, the acceptance of a product, the rejection of a product, etc, etc. I think I have tried to make justice to this lecture. I hope it is clear, in case you have doubts, you are free to ask me questions and I will try to answer you as much as possible. Thank you so much.