Chapter-2

Business Research Design

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The Meaning of Business Research Design

Business research design can be defined as the arrangement of conditions for collection and analysis of data in a manner that aims to be relevant to the research purpose with economy in procedure.

The design helps a researcher to utilize available resources efficiently to achieve research objectives.

NEED FOR RESEARCH DESIGN

The research design is essential for planning research activities. It facilitates the smooth flow of various research processes.

CLASSIFICATION OF RESEARCH DESIGNS

The research design can be classified as follows:

- Exploratory studies, which include techniques like secondary data analysis, experience surveys, focus groups and two stage design.
- Descriptive studies
- Causal studies under which causal relationships such as symmetrical, reciprocal and asymmetrical relationships are studied.

Exploratory research studies

- Exploratory research is the first step in research process and is formulating a problem for more precise investigation.
- Survey of existing research
- Survey of experience individuals
- Analysis of selected cases situations

Descriptive and Diagnostic Research

 Descriptive research studies are concerned with describing and characteristics of certain individual or a group. The descriptive as well as diagnostic research studies share common requirement. In both the studies, the researcher must be able to define clearly, what he wants to measure and must fine adequate method of measuring it.

- Following are the steps involved in both studies
- Data collection must be relevant with sufficient precision
- Techniques of data must be devised and questions must be well examined and must be unambiguous (Clear cut).
- Designing samples should be accurate information with a minimum amount of research effort.

Basic Principles of Experimental Design

- Experimental Validity: Internal Validity, External Validity.
- Experimental Environment: Laboratory Environment, Field Environment
- Types of Experimental Designs: Pre-Experimental Designs, True Experimental Designs, Quasi-experimental Designs. Statistical Designs, Completely randomized design (CBD), Randomized block design, Latin square design, and Factorial design.

Experimental Design

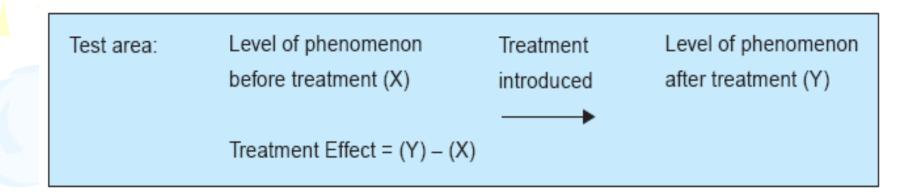
- 1.Informal Experimental Designs
- Before and after without control
- After only with control
- Before and after with control
- Ex-post facto design
- 2. Formal Experimental Design
- a) Completely randomized design
- b) Randomized Block design
- c) Latin square Design
- d) Factorial design

- Important experiment designs
 - (a) Informal experimental designs
 - (i) Before-and-after without control design.
 - (ii) After-only with control design.
 - (iii) Before-and-after with control design.
 - (b) Formal experimental designs
 - (i) Completely randomized design (C.R. Design).
 - (ii) Randomized block design (R.B. Design).
 - (iii) Latin square design (L.S. Design).
 - (iv) Factorial designs.

1. Before-and-after without control design

- A single test group or area is selected,
 and the dependent variable is measured
- The treatment is then introduced and then the dependent variable is measured again
- The effect of the treatment
 - the level of the phenomenon <u>after</u> the treatment - the level of the phenomenon(fact or experience) <u>before</u> the treatment

The design can be represented thus:



2. After-only with control design

 Two groups or areas (test area and control area) are selected and the treatment is introduced into the test area only

Test area: Treatment introduced Level of phenomenon after treatment (Y)

Control area: Level of phenomenon without treatment (Z)

Treatment Effect = (Y) – (Z)

3. Before-and-after with control design

Time Period I			Time Period II
Test area:	Level of phenomenon before treatment (X)	Treatment	Level of phenomenon after treatment (Y)
Control area:	Level of phenomenon without treatment (A) Treatment Effect = (Y – X	() – (Z – A)	Level of phenomenon without treatment (Z)

Completely randomized design

 A completely randomized design, which is the simplest type of the basic designs, may be defined as a design in which the treatments are assigned to experimental units completely flexible, i.e any number of treatments and any number of units per treatment may be used.

- A completely randomized design is considered to be most useful in situations where 1.the experimental units are homogeneous.
- 2. The experiments are small such as laboratory experiments, and
- 3. some experimental units are likely to be destroyed or to tail to respond
- Exp: ANOVA (ONE WAY ANOVA)

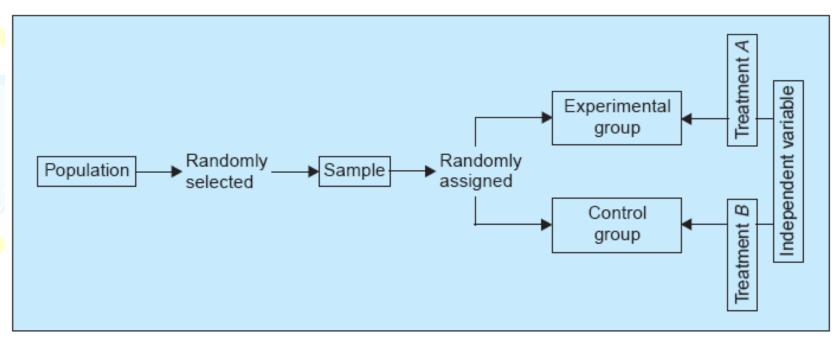
 A fast food franchise is test marketing 3 new menu items. To find out if they the same popularity, 18 franchisee restaurants are randomly chosen for participation in the study. In accordance with the completely randomized design, 6 of the restaurants are randomly chosen to test market the first new menu item, another 6 for the second menu item, and the remaining 6 for the last menu item.

Problem

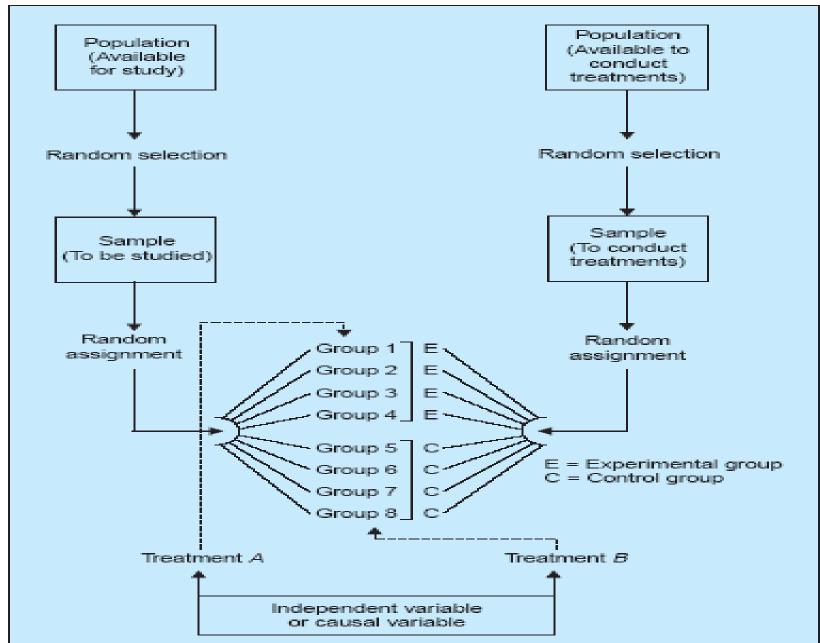
 Suppose the following table represents the sales figures of the 3 new menu items in the 18 restaurants after a week of test marketing. At .05 level of significance, test whether the mean sales volume for the 3 new menu items are all equal.

4. Completely randomized design (C.R. design)

(i) Two-group simple randomized



(ii) Random replications design



Randomized block design

 RBD takes advantage of grouping similar experimental units into blocks or replicates. One requirement of RBD is that the blocks of experimental units to be as uniform as possible. The reason for groping experimental units is so that the observed difference between treatments will be largely due to true differences between treatments and not random occurrences or chance. (two way of

 A fast food franchise is test marketing 3 new menu items. To find out if they have the same popularity, 6 franchisee restaurants are randomly chosen for participation in the study. In accordance with the randomized block design, each restaurant will be test marketing all 3 new menu items. Furthermore, a restaurant will test market only one menu item per week, and it takes 3 weeks to test market all menu items. The testing order of the menu items for each restaurant is randomly assigned as well.

 Suppose each row in the following table represents the sales figures of the 3 new menu in a restaurant after a week of test marketing. At .05 level of significance, test whether the mean sales volume for the 3 new menu items are all equal.

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5. Randomized block design (R.B. design)

	Very low I.Q.	Low I.Q.	Average I.Q.	High I.Q.	Very high I.Q.
	Student A	Student B	Student C	Student D	Student E
Form 1	82	67	57	71	73
Form 2	90	68	54	70	81
Form 3	86	73	51	69	84
Form 4	93	77	60	65	71

RANDOMIZED BLOCK DESIGN

 experimental units into blocks or replicates. One requirement of RBD is that the block of experimental units be as uniform as possible. Suppose that we want to test five drugs A;B;C;D;E for their effect in alleviating the symptoms of a chronic disease. Five patients are available for a trial, and each will be available for five weeks. Testing a single drug requires a week. Thus an experimental unit is a 'patient-week'.

6. Latin square design (L.S. design)

An experimental design very frequently used in agricultural research

FERTILITY LEVEL

IV

19/42

	•				*
X,	Α	В	С	D	Е
X ₂	В	O	D	Е	Α
X,	O	D	Е	Α	В
X,	D	Е	А	В	U
X,	Е	Α	В	О	D

Seeds differences

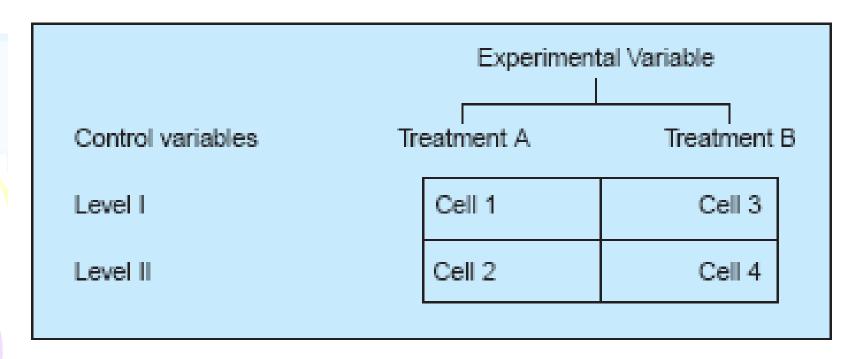
The structure of the experimental units is a rectangular grid (which happens to be square in this case); there is no structure on the set of treatments. We can use the Latin square to allocate treatments. If the rows of the square represent patients and the columns are weeks, then for example the second patient, in the third week of the trial, will be given drug *D. Now each patient* receives all five drugs, and in each week all five drugs are tested.

7. Factorial designs

- where the effects of varying more than
 one factor are to be determined.
- important in several economic and social phenomena
- Factorial designs can be of two types:
 - (i) simple factorial designs
 - (ii) complex factorial designs

 Illustration 1: (2 × 2 simple factorial design). A 2 × 2 simple factorial design can graphically be depicted as follows:

2 × 2 SIMPLE FACTORIAL DESIGN

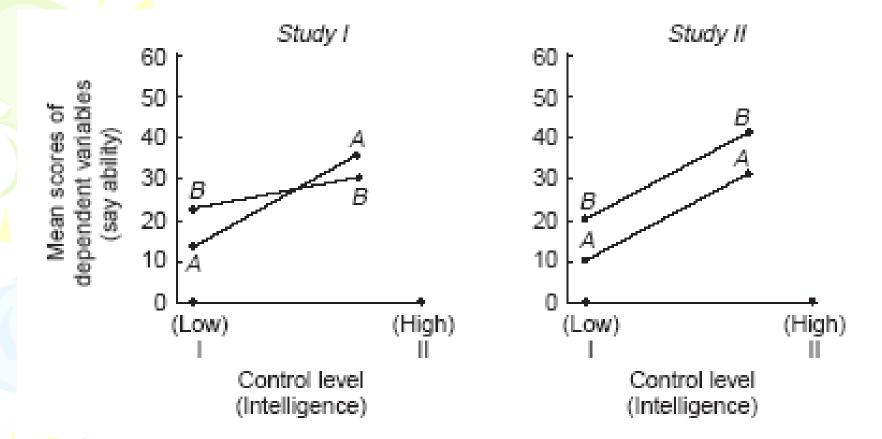


STUDY I DATA

		Trai		
		Treatment A	Treatment B	Row Mean
Control (Intelligence)	Level I (Low)	15.5	23.3	19.4
	Level II (High)	35.8	30.2	33.0
	Column mean	25.6	26.7	

STUDY II DATA

		Trai		
		Treatment A	Treatment B	Row Mean
Control (Intelligence)	Level I (Low)	10.4	20.6	15.5
	Level II (High)	30.6	40.4	35.5
	Column mean	20.5	30.5	



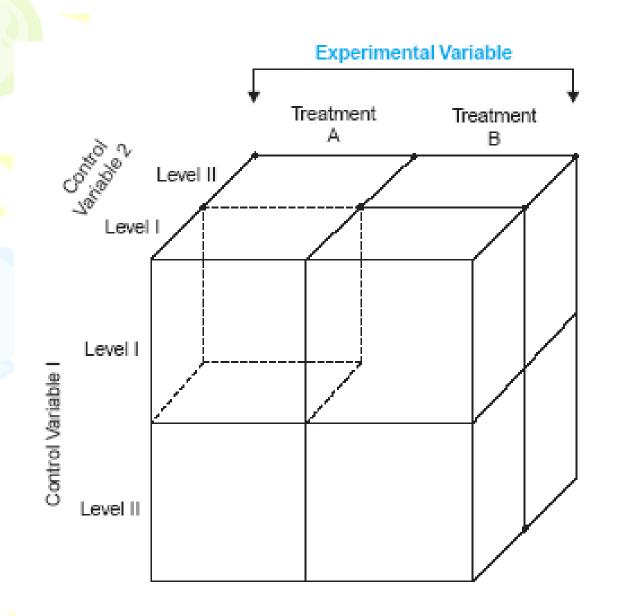
- •The graph relating to Study I indicates that there is an interaction between the treatment and the level which, in other words, means that the treatment and the level are not independent of each other.
- •The graph relating to Study II shows that there is no interaction effect which means that treatment and level in this study are relatively independent of each other.

4 × 3 SIMPLE FACTORIAL DESIGN

	Experimental Variable			
Control Variable	Treatment A	Treatment B	Treatment C	Treatment D
Level I	Cell 1	Cell 4	Cell 7	Cell 10
Level II	Cell 2	Cell 5	Cell 8	Cell 11
Level III	Cell 3	Cell 6	Cell 9	Cell 12

2 × 2 × 2 COMPLEX FACTORIAL DESIGN

	Experimental Variable			
	Treatment A		Treatment B	
	Control Variable 2 Level I	Control Variable 2 Level II	Control Variable 2 Level I	Control Variable 2 Level II
- Level I	Cell 1	Cell 3	Cell 5	Cell 7
Control Variable 1 Level	Cell 2	Cell 4	Cell 6	Cell 8



Variables

 Very simply, a VARIABLE is a measurable characteristic that varies. It may change from group to group, person to person, or even within one person over time. There are six common variable types:

DEPENDENT VARIABLES

 DV show the effect of manipulating or introducing the independent variables. For example, if the independent variable is the use or non-use of a new language teaching procedure, then the dependent variable might be students' scores on a test of the content taught using that procedure. In other words, the variation in the dependent variable depends on the variation in the independent variable.

 Example: You are interested in how stress affects heart rate in humans. Your independent variable would be the stress and the dependent variable would be the heart rate. You can directly manipulate stress levels in your human subjects and measure how those stress levels change heart rate.

INDEPENDENT VARIABLES

. . are those that the researcher has control over. This "control" may involve manipulating existing variables (e.g., modifying existing methods of instruction) or introducing new variables (e.g., adopting a totally new method for some sections of a class) in the research setting. Whatever the case may be, the researcher expects that the in dependent variable(s) will have some effect on (or relationship with) the dependent variables.

 A scientist studies how many days people can eat soup until they get sick. The independent variable is the number of days of consuming soup. The dependent variable is the onset of illness.

Intervening Variables

Intervening variables are <u>hypothetical</u> internal states that are used to explain relationships between observed variables, such independent and dependent variables.

Intervening variables are not real things. They are interpretations of observed facts, not facts themselves. But they create the illusion of being facts.

EXAMPLES: learning, memory, motivation, attitude, personality, traits, knowledge, understanding, thinking, expectation, intelligence, intention.

INTERVENING VARIABLES

 IV refer to abstract processes that are not directly observable but that link the independent and dependent variables. In language learning and teaching, they are usually inside the subjects' heads, including various language learning processes which the researcher cannot observe. For example, if the use of a particular teaching technique is the independent variable and mastery of the objectives is the dependent variable, then the language learning processes used by the subjects are the intervening variables.

MODERATOR VARIABLES

• . . affect the relationship between the independent and dependent variables by modifying the effect of the intervening variable(s). Unlike extraneous variables, moderator variables are measured and taken into consideration. Typical moderator variables in TESL and language acquisition research (when they are not the major focus of the study) include the sex, age, culture, or language proficiency of the subjects.

CONTROL VARIABLES

 Language learning and teaching are very complex processes. It is not possible to consider every variable in a single study. Therefore, the variables that are not measured in a particular study must be held constant, neutralized/balanced, or eliminated, so they will not have a biasing effect on the other variables. Variables that have been controlled in this way are called control variables. Example

EXTRANEOUS VARIABLES or external variable

 are those factors in the research environment which may have an effect on the dependent variable(s) but which are not controlled. Extraneous variables are dangerous. They may damage a study's validity, making it impossible to know whether the effects were caused by the independent and moderator variables or some extraneous factor. If they cannot be controlled, extraneous variables must at least be taken into consideration when interpreting results.





