

University of Mumbai



M.Sc in Information Technology
Revised Syllabus 2019-2020

PSIT101 & PSIT1P1 - Research in Computing

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UNIT III - RESEARCH METHODS AND DATA COLLECTION

BASED ON WILLIAM G. ZIKMUND

Chapter 12:

Experimental Research

An experiment can capture whether or not managers can increase self-efficacy and enhance employee attitudes toward their job

EXPERIMENTAL SUBJECTS

- The sampling units for an experiment, usually human respondents who provide measures based on the experimental manipulation.

INDEPENDENT VARIABLES

Blocking variables : A categorical (less than interval) variable that is not manipulated as is an experimental variable but is included in the statistical analysis of experiments

Job Satisfaction Means in Self-Efficacy Experiment

Blocking Variable		Experimental Treatment		
		No Feedback	Received Feedback	
Employment	Newcomers (New Employees)	5.80	5.93	5.87
	Insiders (Current Employees)	4.77	5.45	5.10
		5.38	5.68	

INDEPENDENT VARIABLE MAIN EFFECTS AND INTERACTION

Main effect : The experimental difference in dependent variable means between the different levels of any single experimental variable.

interaction effect : Differences in dependent variable means due to a specific combination of independent variables

Designing an Experiment to Minimize Experimental Error

Manipulation of the Independent Variable

Experimental treatment : The term referring to the way an experimental variable is manipulated.

EXPERIMENTAL AND CONTROL GROUPS

- Experimental group : A group of subjects to whom an experimental treatment is administered.
- Control group : A group of subjects to whom no experimental treatment is administered

SEVERAL EXPERIMENTAL TREATMENT LEVELS

MORE THAN ONE INDEPENDENT VARIABLE : cell which refers to a specific treatment combination associated with an experimental group.

REPEATED MEASURES : Experiments in which an individual subject is exposed to more than one level of an experimental treatment.

Selection and Measurement of the Dependent Variable

Selection and Assignment of Test Units : The subjects or entities whose responses to the experimental treatment are measured or observed.

SAMPLE SELECTION AND RANDOM SAMPLING ERRORS

- systematic or nonsampling error : Occurs if the sampling units in an experimental cell are somehow different than the units in another cell, and this difference affects the dependent variable.

RANDOMIZATION

- The random assignment of subject and treatments to groups; it is one device for equally distributing the effects of extraneous variables to all conditions
- nuisance variables : Items that may affect the dependent measure but are not of primary interest.

MATCHING

CONTROL OVER EXTRANEIOUS VARIABLES

EXPERIMENTAL CONFOUNDS

Demand Characteristics

- Experimental design element or procedure that unintentionally provides subjects with hints about the research hypothesis.
- Experimenter Bias and Demand Effects
- Hawthorne Effect : People will perform differently from normal when they know they are experimental subjects.
- Reducing Demand Characteristics
 1. Use an experimental disguise.
 - a) Placebo : A false experimental condition aimed at creating the impression of an effect.
 - b) placebo effect : The effect in a dependent variable associated with the psychological impact that goes along with knowledge of some treatment being administered
 2. Isolate experimental subjects.
 3. Use a “blind” experimental administrator.
 4. Administer only one experimental treatment level to each subject.

Establishing Control

constancy of conditions : Means that subjects in all experimental groups are exposed to identical conditions except for the differing experimental treatments

Counterbalancing : Attempts to eliminate the confounding effects of order of presentation by requiring that one-fourth of the subjects be exposed to treatment A first, one-fourth to treatment B first, one-fourth to treatment C first, and finally one-fourth to treatment D first

Ethical Issues in Experimentation

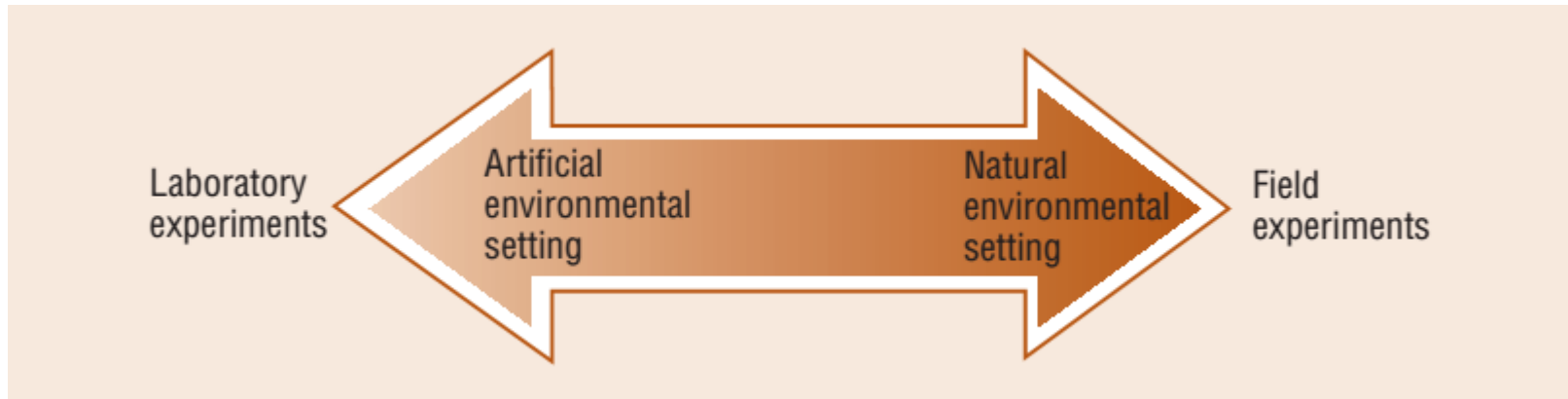
Debriefing experimental subjects by communicating the purpose of the experiment and the researcher's hypotheses is expected to counteract negative effects of deception, relieve stress, and provide an educational experience for the subject.

Practical Experimental Design Issues

Basic versus Factorial Experimental Designs

Laboratory Experiments

Field Experiments



Within-Subjects and Between-Subjects Designs

within-subjects design : Involves repeated measures because with each treatment the same subject is measured

between-subjects design : Each subject receives only one treatment combination.

Issues of Experimental Validity

internal validity : Exists to the extent that an experimental variable is truly responsible for any variance in the dependent variable.

MANIPULATION CHECKS : A validity test of an experimental manipulation to make sure that the manipulation does produce differences in the independent variable

HISTORY : Effect Occurs when some change other than the experimental treatment occurs during the course of an experiment that affects the dependent variable.

- cohort effect : Refers to a change in the dependent variable that occurs because members of one experimental group experienced different historical situations than members of other experimental groups

MATURATION , TESTING, INSTRUMENTATION, SELECTION, MORTALITY

Issues of Experimental Validity

External Validity : Is the accuracy with which experimental results can be generalized beyond the experimental subjects

STUDENT SUBJECTS

Trade-Offs Between Internal and External Validity

Classification of Experimental Designs

basic experimental design : An experimental design in which only one variable is manipulated

Symbolism for Diagramming Experimental Designs

quasi-experimental designs : Experimental designs that do not involve random allocation of subjects to treatment combinations

ONE-SHOT DESIGN

ONE-GROUP PRETEST-POSTTEST DESIGN

STATIC GROUP DESIGN

Three Alternative Experimental Designs

Experimental group: \boxed{R} O_1 X O_2
Control group: \boxed{R} O_3 O_4

Experimental group: \boxed{R} X O_1
Control group: \boxed{R} O_2

Pre Observation
Post Observation
Randomized Block Designs
Factorial Designs