

## Chapter 9: Experiments

### WHAT IS EXPERIMENTATION?

- **Experiments** are studies involving intervention by the researcher beyond that required for measurement.
  - ◆ The usual intervention is to manipulate some variable in a setting and observe how it affects the subjects being studied (e.g., people or physical entities).
  - ◆ The researcher manipulates the independent or explanatory variable and then observes whether the hypothesized dependent variable is affected by the intervention.
- There is at least one **independent variable (IV)** and one **dependent variable (DV)** in a causal relationship.
  - ◆ We hypothesize that in some way the IV “causes” the DV to occur.
  - ◆ First, there must be an agreement between independent and dependent variables.
    - The presence or absence of one is associated with the presence or absence of the other.
  - ◆ Second, the time order of the occurrence of the variables must be considered.
    - The dependent variable should not precede the independent variable; they may occur simultaneously, or the independent variable should occur before the dependent variable.
  - ◆ Third, researchers must be confident that other extraneous variables did not influence the dependent variable.
    - To ensure that other variables are not the source of influence, researchers control their ability to confound the planned comparison.
    - Under laboratory conditions, standardized conditions for control can be arranged.
- While such controls are important, further precautions are needed so that the results achieved reflect *only* the influence of the independent variable on the dependent variable.

### AN EVALUATION OF EXPERIMENTS

#### Advantages

- Causality could not be proved with certainty, but the probability of one variable being linked to another could be established convincingly.
  - ◆ The experiment comes closer than any primary data collection method to accomplishing this goal.
  - ◆ The foremost advantage is the researcher’s ability to manipulate the independent variable.

- ◆ Consequently, there is an increased probability that changes in the dependent variable are a function of that manipulation.
- ◆ A control group serves as a comparison to assess the existence and potency of the manipulation.
- The second advantage of the experiment is that contamination from extraneous variables can be controlled more effectively than in other designs.
  - ◆ This helps the researcher isolate experimental variables and evaluate their impact over time.
- Third, the convenience and cost of experimentation are superior to other methods.
  - ◆ These benefits allow opportunistic scheduling of data collection and the flexibility to adjust variables and conditions that evoke extremes not observed under routine circumstances.
  - ◆ In addition, the experimenter can assemble combinations of variables for testing, rather than searching for their unplanned appearance in the study environment.
- Fourth, **replication**—repeating an experiment with different subject groups and conditions—leads to the discovery of an average effect of the independent variable across people, situations, and times.
- Fifth, researchers can use naturally occurring events and **field experiments** to reduce subjects' perceptions of the researcher as a source of intervention or deviation in their everyday lives.

### Disadvantages

- The artificiality of the laboratory is the primary disadvantage of the experimental method.
  - ◆ Many subjects' perceptions of an unnatural environment can be improved by investment in the facility.
- Second, generalization from nonprobability samples can pose problems, despite random assignment.
  - ◆ The extent to which a study can be generalized from college students to managers or executives is open to question.
  - ◆ When an experiment is unsuccessfully masked, volunteer subjects are often those with the most interest in the topic.
- Third, the cost of experimentation can far outrun the budgets for other primary data collection methods.
- Fourth, experimentation is most effectively targeted at problems of the present or immediate future.
  - ◆ Experimental studies of the past are not feasible, and studies about intentions or predictions are difficult.
- Finally, management research is often concerned with the study of people.

- ◆ There are limits to the types of manipulation and controls that are ethical.

## CONDUCTING AN EXPERIMENT

- There are seven activities the researcher must accomplish to make the effort successful:
  - ◆ Select relevant variables.
  - ◆ Specify the level(s) of the treatment.
  - ◆ Control the experimental environment.
  - ◆ Choose the experimental design.
  - ◆ Select and assign the subjects.
  - ◆ Pilot-test, revise, and test.
  - ◆ Analyze the data.
  - ◆ Selecting Relevant Variables
- A research problem can be conceptualized as a hierarchy of questions, starting with a management problem.
  - ◆ The researcher must translate a vague problem into the question or **hypothesis** that best states the objectives of the research.
  - ◆ Depending on the complexity of the problem, investigative questions and additional hypotheses can be created to address specific facets of the study or data to be gathered.
  - ◆ A hypothesis is a relational statement because it describes a relationship between two or more variables.
  - ◆ It must also be **operationalized** (transformed into variables to make them measurable and subject to testing).
- Consider this research question:
 

*Does a sales presentation that describes product benefits in the introduction of the message lead to improved retention of product knowledge?*

  - ◆ Because a hypothesis is an unsure statement—a speculation—about the outcome of the study, it might take this form:
 

*Sales presentations in which the benefits module is placed in the introduction of a 12-minute message produce better retention of product knowledge than those where the benefits module is placed in the conclusion.*
  - ◆ The researchers' challenges at this step are to:
    - Select variables that are the best operational representations of the original concepts.
    - Determine how many variables to test.
    - Select or design appropriate measures for them.
- The number of variables in an experiment is constrained by:
  - ◆ The project budget

- ◆ The time allocated
- ◆ The availability of appropriate controls
- ◆ The number of subjects being tested
- The selection of measures for testing requires a thorough review of the available literature and instruments.
- In addition, measures must be adapted to the unique needs of the research situation without compromising their intended purpose or original meaning.

### Specifying Treatment Levels

- In an experiment, participants experience a manipulation of the independent variable, called the **experimental treatment**.
  - ◆ The **treatment levels** of the independent variable are the arbitrary or natural groups the researcher makes within the independent variable of an experiment.
    - Example: If salary is hypothesized to have an effect on employees' exercising stock purchase options, it might be divided into high, middle, and low ranges to represent three levels of the independent variable.
  - ◆ The levels assigned to an independent variable should be based on simplicity and common sense.
  - ◆ Under a different hypothesis, several levels of the independent variable may be needed to test order-of-presentation effects.
    - Alternatively, a **control group** could provide a base level for comparison.
    - The control group is composed of subjects who are not exposed to the independent variable(s).

### Controlling the Experimental Environment

- In our sales presentation experiment, extraneous variables can appear as differences in age, gender, race, dress, communications competence, and other characteristics of the *presenter*, the *message*, or the *situation*.
  - ◆ These have the potential for distorting the effect of the treatment on the dependent variable and must be controlled or eliminated.
- At this stage, however, we are principally concerned with **environmental control**.
  - ◆ The introduction of the experiment to the subjects and the instructions would likely be videotaped for consistency.
  - ◆ The arrangement of the room, the time of administration, the experimenter's contact with the subjects, and so forth, must be consistent across each experiment.
- Other forms of control involve subjects and experimenters.

- ◆ When *subjects* do not know if they are receiving the experimental treatment, they are said to be **blind**.
- ◆ When the *experimenters* do not know if they are giving the treatment to the experimental group or to the control group, the experiment is said to be **double blind**.
- ◆ Both approaches control unwanted complications, such as subjects' reactions to expected conditions or experimenter influence.

### **Choosing the Experimental Design**

- Experimental designs are unique to the experimental method.
  - ◆ They designate relationships between experimental treatments and the experimenter's observations or measurement points in the scheme of the study.
  - ◆ The researchers select one design that is best suited to the goals of the research.
  - ◆ Judicious selection of the design improves the probability that the observed change in the dependent variable was caused by the manipulation of the independent variable, not by another factor.
    - It simultaneously strengthens the generalizability of results beyond the experimental setting.