>chapter 3

Thinking Like a Researcher

>learningobjectives

After reading this chapter, you should understand . . .

1. The terminology used by professional researchers employing scientific thinking.
2. What you need to formulate a solid research hypothesis.
3. The need for sound reasoning to enhance business research results.

"Brand communities play a pivotal role for a brand connecting with its consumers, and as one of our Never Ending Friending focus group respondent notes: "I want brands to be my friends," which means that consumers would like to have common ideas, conversations and benefits delivered to them on their own terms."

Judit Nagy, vice president, consumer insights,
MySpace/Fox Interactive Media

>bringingresearchtolife

MindWriter

Truly effective research is more likely to result when a marketing research supplier works collaboratively with its client throughout the research process. However, not all clients are trained in research methodology, and some come from backgrounds other than marketing. The supplier needs to understand the client's background in order to effectively develop the collaboration. We rejoin Henry and Associates as Jason Henry strives to profile the research knowledge, if any, of his client's representative—Myra Wines—the individual with whom he will be working on the MindWriter CompleteCare laptop servicing assessment project.

"Myra, have you had any experience with research suppliers?" asks Jason.

"Some. Actually, I worked for one of your competitors for a short time after college, on a project with the U.S. Army. That project helped me decide that research wasn't my life's work—not that it wasn't and isn't an important field and an important part of my new responsibilities."

"No need to apologize. Some of us have what it takes and others don't."

"Actually, there wasn't anything missing in my ability to observe data, or build rapport with study participants, or find insights," shares Myra. "The project made all the papers; you probably read about it."

"Refresh my memory."

"The death rate near one Army munitions testing area was unexplainably high. Local activists were trying to shut it down, fearing it was an environmental hazard. The Army had a vested interest in keeping it open. Besides, it didn't think the civilian deaths had anything to do with the firing range. U.S. Senator Sly forced the Army to investigate. Since the Army thought it had a public relations job on its hands, my firm was a logical choice; PR campaigns were a specialty.

"The firing range was a played-out mine, strip-mined until it was worse than a moonscape. The area had once been a prosperous mining region, where the people were known for fearlessly and proudly going out to dig and produce. The nearest town was so severely economically depressed that, for the pitifully few jobs the Army provided, the folks welcomed the military in to bomb their backyard to cinders.

"The cannon the Army was testing was impressive. Troops armed it with 3-inch shells, put on ear protectors and goggles, and lobbed shells into the range. There would be a tremendous flash and boom, and the shells would go roaring and soaring out of sight. We would soon hear a tremendous boom coming back to us and see dust and ash kicked up several hundred feet. We were all very happy not to be downrange. When we went downrange later, we found a huge crater and a fused puddle of iron, but nothing else but slag and molten rocks.

"There was one problem. About every 20th shell would be a dud. It would fly off and land, and maybe kick up some dust, but explode it would not.

"On paper, this was not supposed to be a problem. The Army sent an officious second lieutenant to brief us. He showed us reports that the Army had dropped such duds from hundred-foot platforms, from helicopters, had applied torches to them—everything—and had discovered them to be completely inert. The only thing he claimed would ignite one of these duds was to drop another live bomb on it.

"Regrettably, this proved not to be the case. My team had barely finished its initial briefing when in the middle of the night we heard one of these so-called duds explode. We rushed out at dawn and, sure enough, found a new crater, molten slag, molten rock, and so forth. It was quite a mystery.

"Our team took shifts doing an all-night observation study. During my two-hour stint, my partner and I saw people with flashlights moving around in there.

"We didn't know if the people were military or civilian. We learned later that locals were coming in at night, intending to crack open the bombs and scavenge for copper wire or anything they thought was salvageable. Except, of course, their actions occasionally ignited one of the beauties and erased any evidence of a crime being committed by vaporizing the perpetrators on the spot.

"Part of our research was to measure public sentiment about the firing range among the locals. During our stay in the area, we discovered the locals were involved in every kind of thrill sport. It was not unusual to see a 50-mile auto race with four ambulances on hand on the edge of the oval, to cart off the carnage to the surgical hospital in the next county. I saw men leap into cars with threadbare tires, loose wheels, malfunctioning brakes, with brake fluid and transmission fluid drooling all over the track. They could wheel their cars out onto the track on a tire they knew was thin as tissue, and if it blew out and put them in the hospital, their reaction was 'Some days you can't win for losin'.' Nobody thought anything of this. If we asked, their answer was, 'I'll go when my number is up,' or 'It's not in my hands.'

"Their attitude made sense, from a cultural-economic view. That attitude had permitted the men to go down in the mines year after year. Even the local sheriff wouldn't stop their daredevil behavior. 'They are going to die anyway,' he was overheard remarking. 'We all are going to die. People die every month that never go out on that dirt track.' Of course, unlike driving a car, messing with a potentially live bomb didn't leave much to skill but left everything to chance.

"The Army had considered an educational campaign to keep the scavengers out but, given our findings, decided it couldn't deal with such thinking by applying logic. Instead, it changed its procedure. The troops would now fire the shells in the morning and spend the afternoon finding the duds, to which they attached kerosene lanterns. At dusk, a fighter-bomber would fly over the area and bomb the lanterns—and the duds—to a molecular state. It was neat and it worked. And the death rate of the locals dropped dramatically."

As Myra finished her story, Jason asks, "It sounds like a successful project. By studying the locals' attitudes and behavior, you could discard the alternative of the education campaign. Why did you decide research wasn't for you?"

"My boss didn't like the idea that I broke confidentiality and told a local reporter what the locals were doing. I'd seen someone's dad or brother blown to pieces and felt I had to act. My dismissal taught me one of the rules of good research—the client always gets to choose whether to use, or release, the findings of any study."

> The Language of Research

When we do research, we seek to know what is in order to understand, explain, and predict phenomena. We might want to answer the question "What will be the department's reaction to the new flexible work schedule?" or "Why did the stock market price surge higher when all normal indicators suggested it would go down?" When dealing with such questions, we must agree on definitions. Which members of the department: clerical or professional? What kind of reaction? What are normal indicators? These questions require the use of concepts, constructs, and definitions.

Concepts

To understand and communicate information about objects and events, there must be a common ground on which to do it. Concepts serve this purpose. A **concept** is a generally accepted collection of meanings or characteristics associated with certain events, objects, conditions, situations, and behaviors. Classifying and categorizing objects or events that have common characteristics beyond any single observation creates concepts. When you think of a spreadsheet or a warranty card, what comes to mind is not a single example but your collected memories of all spreadsheets and warranty cards, from which you abstract a set of specific and definable characteristics.

We abstract such meanings from our experiences and use words as labels to designate them. For example, we see a man passing and identify that he is running, walking, skipping, crawling, or hopping. These movements all represent concepts. We also have abstracted certain visual elements by which we identify that the moving object is an adult male, rather than an adult female or a truck or a horse. We use numerous concepts daily in our thinking, conversing, and other activities.

Sources of Concepts

Concepts that are in frequent and general use have been developed over time through shared language usage. We acquire them through personal experience. Ordinary concepts make up the bulk of communication even in research, but we often run into difficulty trying to deal with an uncommon concept or a newly advanced idea. One way to handle this problem is to borrow from other languages (e.g., *gestalt*) or to borrow from other fields (e.g., from art, *impressionism*). The concept of gravitation is borrowed from physics and used in marketing in an attempt to explain why people shop where they do. The concept of distance is used in attitude measurement to describe degree of variability between the attitudes of two or more persons. Threshold is used effectively to describe a concept about the way we perceive.

Sometimes we need to adopt new meanings for words (make a word cover a different concept) or develop new labels for concepts. The recent broadening of the meaning of *model* is an example of the first instance; the development of concepts such as *sibling* and *status-stress* is an example of the second. When we adopt new meanings or develop new labels, we begin to develop a specialized jargon or terminology. Jargon no doubt contributes to efficiency of communication among specialists, but it excludes everyone else.

Importance to Research

In research, special problems grow out of the need for concept precision and inventiveness. We design hypotheses using concepts. We devise measurement concepts by which to test these hypothetical statements. We gather data using these measurement concepts. The success of research hinges on (1) how clearly we conceptualize and (2) how well others understand the concepts we use. For example, when we survey people on the question of customer loyalty, the questions we use need to tap faithfully the attitudes of the participants. Attitudes are abstract, yet we must attempt to measure them using carefully selected concepts.

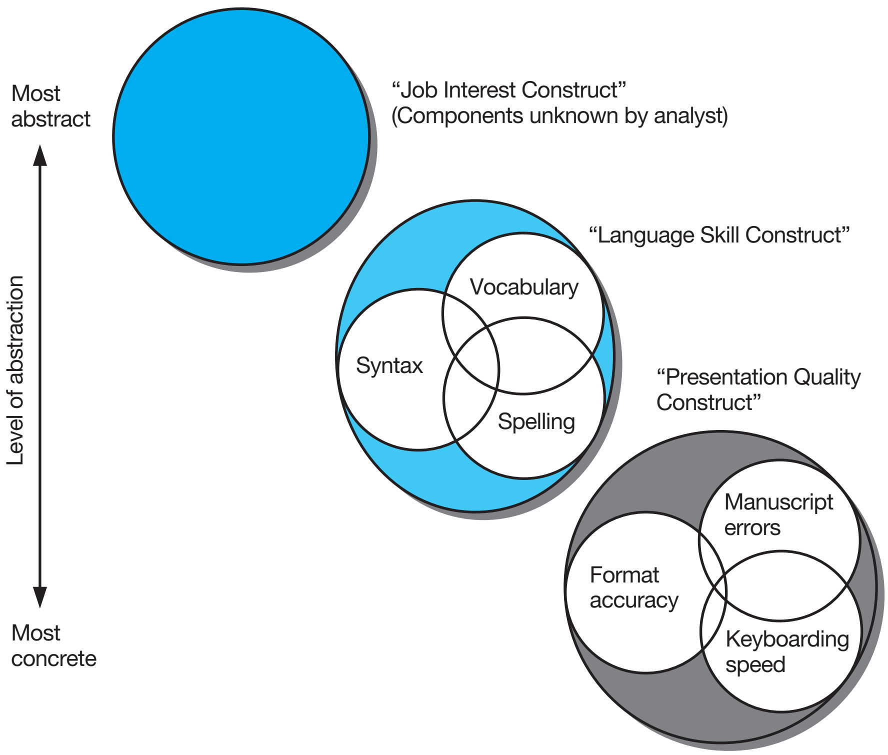
The challenge is to develop concepts that others will clearly understand. We might, for example, ask participants for an estimate of their family's total income. This may seem to be a simple, unambiguous concept, but we will receive varying and confusing answers unless we restrict or narrow the concept by specifying:

- Time period, such as weekly, monthly, or annually.
- Before or after income taxes.
- For head of family only or for all family members.
- For salary and wages only or also for dividends, interest, and capital gains.
- Income in kind, such as free rent, employee discounts, or food stamps.

Constructs

Concepts have progressive levels of abstraction—that is, the degree to which the concept does or does not have something objective to refer to. *Table* is an objective concept. We can point to a table, and we have images of the characteristics of all tables in our mind. An abstraction like *personality* is much more difficult to visualize. Such abstract concepts are often called constructs. A **construct** is an image or abstract idea specifically invented for a given research and/or theory-building purpose. We build

>Exhibit 3-1 Constructs Composed of Concepts in a Job Redesign



constructs by combining the simpler, more concrete concepts, especially when the idea or image we intend to convey is not subject to direct observation. When Jason and Myra tackle MindWriter's research study, they will struggle with the construct of *satisfied service customer.*

Concepts and constructs are easily confused. Consider this example: Heather is a human resource analyst at CadSoft, an architectural software company that employs technical writers to write product manuals, and she is analyzing task attributes of a job in need of redesign. She knows the job description for technical writer consists of three components: presentation quality, language skill, and job interest. Her job analysis reveals even more characteristics.

Exhibit 3-1 illustrates some of the concepts and constructs Heather is dealing with. The concepts at the bottom of the exhibit (format accuracy, manuscript errors, and keyboarding speed) are the most concrete and easily measured. We are able to observe keyboarding speed, for example, and even with crude measures agree on what constitutes slow and fast keyboarders. Keyboarding speed is one concept in the group that defines a construct that the human resource analyst calls "presentation quality." Presentation quality is really not directly observable. It is a nonexistent entity, a "constructed type," used to communicate the combination of meanings presented by the three concepts. Heather uses it only as a label for the concepts she has discovered are related empirically.

Concepts at the next level in Exhibit 3-1 are vocabulary, syntax, and spelling. Heather also finds them to be related. They form a construct that she calls "language skill." She has chosen this term because the three concepts together define the language requirement in the job description. Language skill is placed at a higher level of abstraction in the exhibit because two of the concepts it comprises, vocabulary and syntax, are more difficult to observe and their measures are more complex.

Heather has not yet measured the last construct, "job interest." It is the least observable and the most difficult to measure. It will likely be composed of numerous concepts—many of which will be quite abstract. Researchers sometimes refer to such entities as **hypothetical constructs** because they can be inferred only from the data; thus, they are presumed to exist but must await further testing to see what they actually consist of. If research shows the concepts and constructs in this example to be interrelated, and if their connections can be supported, then Heather will have the beginning of a

conceptual scheme. In graphic form, it would depict the relationships among the knowledge and skill requirements necessary to clarify the job redesign effort.

Definitions

Confusion about the meaning of concepts can destroy a research study's value without the researcher or client even knowing it. If words have different meanings to the parties involved, then the parties are not communicating well. Definitions are one way to reduce this danger.

Researchers struggle with two types of definitions: dictionary definitions and operational definitions. In the more familiar dictionary definition, a concept is defined with a synonym. For example, a customer is defined as a patron; a patron, in turn, is defined as a customer or client of an establishment; a client is defined as one who employs the services of any professional and, loosely, as a patron of any shop.[1] Circular definitions may be adequate for general communication but not for research. In research, we measure concepts and constructs, and this requires more rigorous definitions.

Operational Definitions

An **operational definition** is a definition stated in terms of specific criteria for testing or measurement. These terms must refer to empirical standards (i.e., we must be able to count, measure, or in some other way gather the information through our senses). Whether the object to be defined is physical (e.g., a can of soup) or highly abstract (e.g., achievement motivation), the definition must specify the characteristics and how they are to be observed. The specifications and procedures must be so clear that any competent person using them would classify the object in the same way.

During her research project with the military, Myra observed numerous shells that, when fired, did not explode on impact. She knew the Army attached the operational definition "a shell that does not explode on impact" to the construct dud shell. But if asked, Myra would have applied the operational term *dud shell* only to "a shell that, once fired from a cannon, could not be made to explode by any amount of manipulation, human or mechanical." Based on her operational definition, the town's residents rarely encountered "duds" during their excursions onto the firing range.

Suppose college undergraduates are classified by class. No one has much trouble understanding such terms as *freshman, sophomore,* and so forth. But the task may not be that simple if you must determine which students fall in each class. To do this, you need operational definitions.

Operational definitions may vary, depending on your purpose and the way you choose to measure them. Here are two different situations requiring different definitions of the same concepts:

1. You conduct a survey among students and wish to classify their answers by their class levels. You merely ask them to report their class status and you record it. In this case, class is freshman, sophomore, junior, or senior; and you accept the answer each respondent gives as correct. This is a rather casual definition process but nonetheless an operational definition. It is probably adequate even though some of the respondents report inaccurately.
2. You make a tabulation of the class level of students from the university registrar's annual report. The measurement task here is more critical, so your operational definition needs to be more precise. You decide to define class levels in terms of semester hours of credit completed by the end of the spring semester and recorded in each student's record in the registrar's office:

Freshman	Fewer than 30 hours' credit
Sophomore	30 to 59 hours' credit
Junior	60 to 89 hours' credit
Senior	90 or more hours' credit

Those examples deal with relatively concrete concepts, but operational definitions are even more critical for treating abstract ideas. Suppose one tries to measure a construct called "consumer

>snapshot

Using Scientific Definitions to Shape Political Debate over BioMed

When politics trumps science in defining critical research terminology, legislators intentionally or unwittingly fail to communicate information accurately. This could be critical in discovering products for breakthrough cures, tracking the progression of diseases (thus affecting decisions about hospital staffing and insurance), and finding better ways to test new drugs to discover their various applications.

One example is The National Academies, which advises the federal government and public on scientific issues. It has "created voluntary guidelines for embryonic stem cell research." These guidelines also "provide a comprehensive definition of terms that are accepted by every major research body in the U.S." Because stem-cell research and human cloning are such volatile political issues, the federal government hasn't proposed countrywide guidelines. As a result, individual states opportunistically exploit scientific terminology and fill the void with altered definitions that operationally join humans with embryos and add overarching definitions of human cloning.

Another example relates to the Kansas House of Representatives, which has two bills in process. H.B. 2098 claims "to define terms related to human cloning." The companion bill, H.B. 2255, seeks to ban public funding for *somatic cell nuclear transfer* (SCNT), the bill's term for creating cloned embryonic stem cells. Opponents of embryonic stem-cell research (who contend that embryos are human beings and wish to ban such research) find the definition credible. While "68 percent of Kansans support *somatic cell nuclear transfer*, there is also strong opposition to *reproductive cloning*." Thus, by combining both techniques in the public's mind in a single operational definition, opponents aim to ban SCNT.

Paul Terranova, vice chancellor for research at Kansas University Medical Center, is critical of the many scientific inaccuracies in the definitions used in both bills. When politics collide with science, should politics triumph?

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socialization." We may intuitively understand what this means, but to attempt to measure it among consumers is difficult. We would probably develop questions on skills, knowledge, and attitudes; or we may use a scale that has already been developed and validated by someone else. This scale then operationally defines the construct.

Whether you use a definitional or operational definition, its purpose in research is basically the same—to provide an understanding and measurement of concepts. We may need to provide operational definitions for only a few critical concepts, but these will almost always be the definitions used to develop the relationships found in hypotheses and theories.

Variables

In practice, the term **variable** is used as a synonym for *construct,* or the property being studied. In this context, a variable is a symbol of an event, act, characteristic, trait, or attribute that can be measured and to which we assign categorical values.[2]

For purposes of data entry and analysis, we assign numerical value to a variable based on the variable's properties. For example, some variables, said to be *dichotomous,* have only two values, reflecting the presence or absence of a property: employed–unemployed or male–female have two values, generally 0 and 1. When Myra Wines observed the cannon shells, they were exploded or unexploded. Variables also take on values representing added categories, such as the demographic variables of race or religion. All such variables that produce data that fit into categories are said to be discrete, because only certain values are possible. An automotive variable, for example, where "Chevrolet" is assigned a 5 and "Honda" is assigned a 6, provides no option for a 5.5.

Income, temperature, age, and a test score are examples of *continuous* variables. These variables may take on values within a given range or, in some cases, an infinite set. Your test score may range from 0 to 100, your age may be 23.5, and your present income could be $35,000. The procedure for assigning values to variables is described in detail in Chapter 11.

>Exhibit 3-2 Independent and Dependent Variables: Synonyms

Independent Variable	Dependent Variable
Predictor	Criterion
Presumed cause	Presumed effect
Stimulus	Response
Predicted from . . .	Predicted to . . .
Antecedent	Consequence
Manipulated	Measured outcome

Independent and Dependent Variables

Researchers are most interested in relationships among variables. For example, does a newspaper coupon (independent variable) influence product purchase (dependent variable), or can a salesperson's ethical standards influence her ability to maintain customer relationships? As one writer notes:

> There's nothing very tricky about the notion of independence and dependence. But there is something tricky about the fact that the relationship of independence and dependence is a figment of the researcher's imagination until demonstrated convincingly. Researchers hypothesize relationships of independence and dependence: They invent them, and then they try by reality testing to see if the relationships actually work out that way.[3]

Many textbooks use the term *predictor variable* as a synonym for **independent variable (IV).** This variable is manipulated by the researcher, and the manipulation causes an effect on the dependent variable. We recognize that there are often several independent variables and that they are probably at least somewhat "correlated" and therefore not independent among themselves. Similarly, the term *criterion variable* is used synonymously with **dependent variable (DV).** This variable is measured, predicted, or otherwise monitored and is expected to be affected by manipulation of an independent variable. Exhibit 3-2 lists some terms that have become synonyms for *independent variable* and *dependent variable*.

In each relationship, there is at least one independent variable (IV) and one dependent variable (DV). It is normally hypothesized that, in some way, the IV "causes" the DV to occur. It should be noted, however, that although it is easy to establish whether an IV influences a DV, it is much harder to show that the relationship between an IV and DV is a causal relationship (see also Chapter 6). In Exhibit 3-3a, this relationship is illustrated by an arrow pointing from the independent variable to the dependent variable. For simple relationships, all other variables are considered extraneous and are ignored.

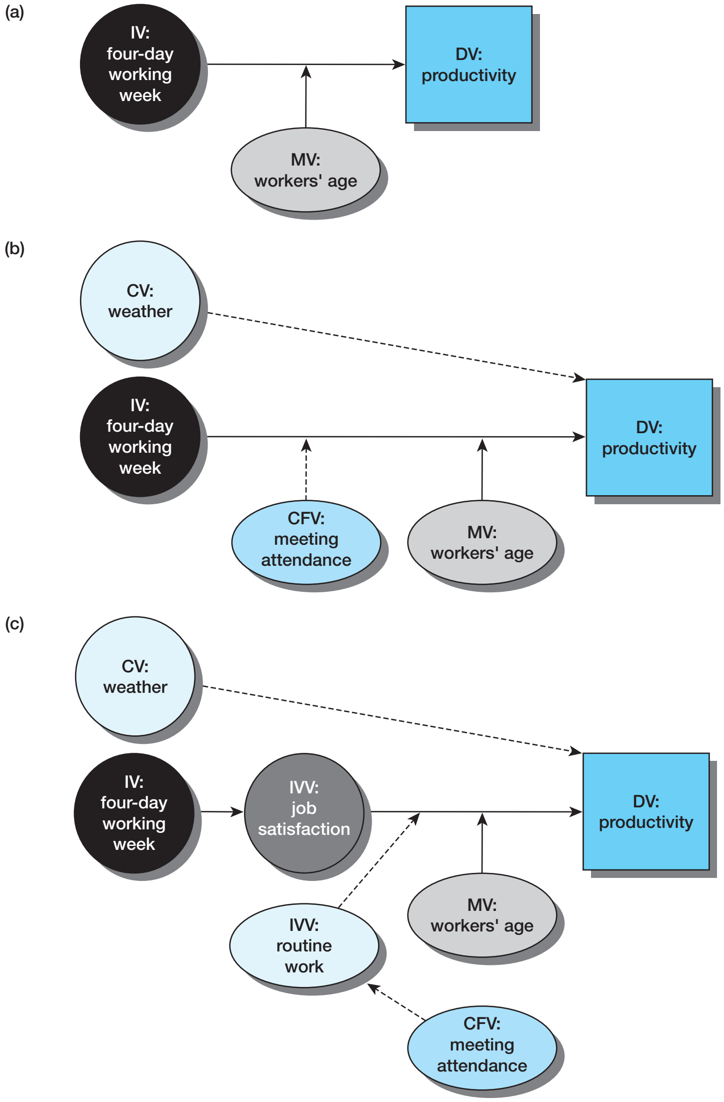
Moderating or Interaction Variables

In actual study situations, however, such a simple one-to-one relationship needs to be conditioned or revised to take other variables into account. Often, we can use another type of explanatory variable that is of value here: the **moderating variable** (MV). A moderating or interaction variable is a second independent variable that is included because it is believed to have a significant contributory or contingent effect on the original IV–DV relationship. The arrow pointing from the moderating variable to the arrow between the IV and DV in Exhibit 3-3a shows the difference between an IV directly impacting the DV and an MV affecting the relationship between an IV and the DV. For example, one might hypothesize that in an office situation:

> The introduction of a four-day working week (IV) will lead to higher productivity (DV), especially among younger workers (MV).

In this case, there is a differential pattern of relationship between the four-day week and productivity that results from age differences among the workers. Hence, after introduction of a four-day working week, the productivity gain for younger workers is higher than that for older workers. It should be noted that the effect of the moderating or interaction variable is the "surplus" of the combined occurrence of introducing a four-day working week and being a younger worker. For example, let's assume that the

>**Exhibit 3-3** Relationships among Types of Variables



productivity of younger workers is 12 percentage points higher than that for older workers, and that the productivity of workers having a four-day working week is 6 percentage points higher than those of workers having a five-day working week. If the productivity of a younger worker having a four-day working week is only 18 percentage points higher than the productivity of a older worker with a five-day working week, there is no interaction effect, because the 18 percentage points are the sum of the main effects. There would be an interaction effect if the productivity of the younger worker on a four-day week was, say, 25 percentage points higher than the productivity of the older worker on a five-day week.

Whether a given variable is treated as an independent or moderating variable depends on the hypothesis under investigation. If you were interested in studying the impact of the length of the working week, you would make the length of week the IV. If you were focusing on the relationship between age of worker and productivity, you might use working week length as an MV.

Extraneous Variables

An almost infinite number of **extraneous variables** (EVs) exists that might conceivably affect a given relationship. Some can be treated as IVs or MVs, but most must either be assumed or excluded from the study. Fortunately, an infinite number of variables has little or no effect on a given situation. Most can

>snapshot

Forrester Research: Can an Auto Dealership Go Lean?

Not all research is driven by a specific client problem. Some firms specialize in researching emerging issues when the issue is more idea than reality. Forrester Research is one such research firm. As senior analyst Mark Bunger explains, research problems often come from taking an issue in one field and transplanting it into another arena. "The genesis of Forrester's 'Making Auto Retail Lean' study was a book I was reading by James Womack and Daniel Jones, *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*." In their book the authors describe lean thinking as the "elimination of unnecessary waste in business" and explain that if lean principles are applied to the whole product cycle, from suppliers to customers, firms can demonstrate significant increases in productivity and sales. "I knew lean principles were being applied in the manufacturing of cars. I wondered if such principles were applied at the level of the auto dealership and with what effect." Bunger's question led Forrester to launch a study that had Bunger and his team of research associates conducting hour-long phone interviews with vendors of products and services related to supply chain enhancement (e.g., IBM), followed by a 15-minute, 20-question phone survey of 50 auto dealer CEOs. Bunger also visited dealers in his immediate area to flesh out ideas from the phone interviews. Data revealed that "dealers have the wrong cars 40 percent of the time." Yet if they applied the lean principles so effective for car manufacturers, they could lower their demand chain–related costs up to 53 percent.

The Forrester study followed a fairly standard model for the firm: approximately two weeks to define and refine the problem—a stage that involves significant secondary data analysis; two to four weeks for data collection—a stage that involves selecting at least two sample segments (usually "experts" and users; for this study, vendors and dealers); and 2 to 30 hours to prepare a brief or report. Forrester's research is purchased by subscription. Subscribing companies related to the automotive industry have "whole-view" access to any report on any study that Forrester develops at an approximate cost of $7,000 per *seat*. When a subscriber wants numerous people to have direct access to Forrester research, a firm's subscription could be worth several million dollars.

Should auto dealers go lean? What reasoning approaches did you use to reach your conclusion? What concepts and constructs are embedded in this example? What hypotheses could you form from this example?

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safely be ignored because their impact occurs in such a random fashion as to have little effect. Others might influence the DV, but their effect is not at the core of the problem we investigate. Still, we want to check whether our results are influenced by them. Therefore, we include them as **control variables** (CVs) in our investigation to ensure that our results are not biased by not including them. Taking the example of the effect of the four-day working week again, one would normally think that weather conditions, the imposition of a local sales tax, the election of a new mayor, and thousands of similar events and conditions would have little effect on working week and office productivity.

Extraneous variables can also be **confounding variables** (CFVs) to our hypothesized IV–DV relationship, similar to moderating variables. You may consider that the kind of work being done might have an effect on the impact of working week length on office productivity. This might lead you to introducing time spent in a meeting to coordinate the work as a confounding variable (CFV). In our office example, we would attempt to control for type of work by studying the effect of the four-day working week within groups attending meetings with different intensity. In Exhibit 3-3b, weather is shown as an extraneous variable; the broken line indicates that we included it in our research because it might influence the DV, but we consider the CV as irrelevant for the investigation of our research problem. Similarly we included the type of work as a CFV.

Intervening Variables

The variables mentioned with regard to causal relationships are concrete and clearly measurable—that is, they can be seen, counted, or observed in some way. Sometimes, however, one may not be completely satisfied by the explanations they give. Thus, while we may recognize that a four-day working week results in higher productivity, we might think that this is not the whole story—that working week length affects some **intervening variable** (IVV) that, in turn, results in higher productivity. An IVV is a conceptual mechanism through which the IV and MV might affect the DV. The IVV can be defined as a factor that theoretically affects the DV but cannot be observed or has not been measured; its effect must be inferred from the effects of the independent and moderator variables on the observed phenomenon.[4]

In the case of the working week hypothesis, one might view the intervening variable (IVV) to be job satisfaction, giving a hypothesis such as:

The introduction of a four-day working week (IV) will lead to higher productivity (DV) by increasing job satisfaction (IVV).

55 The percent of executives who admitted that their companies do not have an official policy for social networks.

Here we assume that a four-day working week increases job satisfaction; similarly, we can assume that attending internal meetings is an indicator negatively related to the routine character of work. Exhibit 3-3c illustrates how theoretical constructs, which are not directly observed, fit into our model.

Propositions and Hypotheses

We define a **proposition** as a statement about observable phenomena (concepts) that may be judged as true or false. When a proposition is formulated for empirical testing, we call it a **hypothesis.** As a declarative statement about the relationship between two or more variables, a hypothesis is of a tentative and conjectural nature.

Hypotheses have also been described as statements in which we assign variables to cases. A **case** is defined in this sense as the entity or thing the hypothesis talks about. The variable is the characteristic, trait, or attribute that, in the hypothesis, is imputed to the case.[5] For example, we might create the following hypothesis:

Brand Manager Jones (case) has a higher-than-average achievement motivation (variable).

If our hypothesis was based on more than one case, it would be a generalization. For example:

Brand managers in Company Z (cases) have a higher-than-average achievement motivation (variable).

Descriptive Hypotheses

Both of the preceding hypotheses are examples of **descriptive hypotheses.** They state the existence, size, form, or distribution of some variable. Researchers often use a research question rather than a descriptive hypothesis. For example:

Descriptive Hypothesis Format	*Research Question Format*
In Detroit (case), our potato chip market share (variable) stands at 13.7 percent.	What is the market share for our potato chips in Detroit?
American cities (cases) are experiencing budget difficulties (variable).	Are American cities experiencing budget difficulties?
Eighty percent of Company Z stockholders (cases) favor increasing the company's cash dividend (variable).	Do stockholders of Company Z favor an increased cash dividend?
Seventy percent of the high school–educated males (cases) scavenge in the Army firing range for salvageable metals (variable).	Do a majority of high school–educated male residents scavenge in the Army firing range for salvageable metals?

Either format is acceptable, but the descriptive hypothesis format has several advantages:

- It encourages researchers to crystallize their thinking about the likely relationships to be found.
- It encourages them to think about the implications of a supported or rejected finding.
- It is useful for testing statistical significance.

Relational Hypotheses

The research question format is less frequently used with a situation calling for **relational hypotheses.** These are statements that describe a relationship between two variables with respect to some case. For example, "Foreign (variable) cars are perceived by American consumers (case) to be of better quality (variable) than domestic cars." In this instance, the nature of the relationship between the two variables ("country of origin" and "perceived quality") is not specified. Is there only an implication that the variables occur in some predictable relationship, or is one variable somehow responsible for the other? The first interpretation (unspecified relationship) indicates a correlational relationship; the second (predictable relationship) indicates an explanatory, or causal, relationship.

Correlational hypotheses state that the variables occur together in some specified manner without implying that one causes the other. Such weak claims are often made when we believe there are more basic causal forces that affect both variables or when we have not developed enough evidence to claim a stronger linkage. Here are three sample correlational hypotheses:

> Young women (under 35 years of age) purchase fewer units of our product than women who are 35 years of age or older.
>
> The number of suits sold varies directly with the level of the business cycle.
>
> People in Atlanta give the president a more favorable rating than do people in St. Louis.

By labeling these as correlational hypotheses, we make no claim that one variable causes the other to change or take on different values.

With **explanatory (causal) hypotheses,** there is an implication that the existence of or a change in one variable causes or leads to a change in the other variable. As we noted previously, the causal variable is typically called the independent variable (IV) and the other the dependent variable (DV). Cause means roughly to "help make happen." So the IV need not be the sole reason for the existence of or change in the DV. Here are four examples of explanatory hypotheses:

> An increase in family income (IV) leads to an increase in the percentage of income saved (DV).
>
> Exposure to the company's messages concerning industry problems (IV) leads to more favorable attitudes (DV) by employees toward the company.
>
> Loyalty to a particular grocery store (IV) increases the probability of purchasing the private brands (DV) sponsored by that store.
>
> An increase in the price of salvaged copper wire (IV) leads to an increase in scavenging (DV) on the Army firing range.

In proposing or interpreting causal hypotheses, the researcher must consider the direction of influence. In many cases, the direction is obvious from the nature of the variables. Thus, one would assume that family income influences savings rate rather than the reverse. This also holds true for the Army example. Sometimes our ability to identify the direction of influence depends on the research design. In the worker attitude hypothesis, if the exposure to the message clearly precedes the attitude measurement, then the direction of exposure to attitude seems clear. If information about both exposure and attitude was collected at the same time, the researcher might be justified in saying that different attitudes led to selective message perception or nonperception. Store loyalty and purchasing of store brands appear to be interdependent. Loyalty to a store may increase the probability of one's buying the store's private brands, but satisfaction with the store's private brand may also lead to greater store loyalty.

The Role of the Hypothesis

In research, a hypothesis serves several important functions:

- It guides the direction of the study.
- It identifies facts that are relevant and those that are not.
- It suggests which form of research design is likely to be most appropriate.
- It provides a framework for organizing the conclusions that result.

Unless the researcher curbs the urge to include additional elements, a study can be diluted by trivial concerns that do not answer the basic questions posed by the management dilemma. The virtue of the hypothesis is that, if taken seriously, it limits what shall be studied and what shall not. To consider specifically the role of the hypothesis in determining the direction of the research, suppose we use this:

Husbands and wives agree in their perceptions of their respective roles in purchase decisions.

The hypothesis specifies who shall be studied (married couples), in what context they shall be studied (their consumer decision making), and what shall be studied (their individual perceptions of their roles).

The nature of this hypothesis and the implications of the statement suggest that the best research design is a communication-based study, probably a survey or interview. We have at this time no other practical means to ascertain perceptions of people except to ask about them in one way or another. In addition, we are interested only in the roles that are assumed in the purchase or consumer decision-making situation. The study should not, therefore, involve itself in seeking information about other types of roles husbands and wives might play. Reflection upon this hypothesis might also reveal that husbands and wives disagree on their perceptions of roles, but the differences may be explained in terms of additional variables, such as age, social class, background, personality, and other factors not associated with their difference in gender.

What Is a Strong Hypothesis?

A strong hypothesis should fulfill three conditions:

- Adequate for its purpose.
- Testable.
- Better than its rivals.

The conditions for developing a strong hypothesis are developed more fully in Exhibit 3-4.

>Exhibit 3-4 Checklist for Developing a Strong Hypothesis

Criteria	Interpretation
Adequate for Its Purpose	❑ Does the hypothesis reveal the original problem condition? ❑ Does the hypothesis clearly identify facts that are relevant and those that are not? ❑ Does the hypothesis clearly state the condition, size, or distribution of some variable in terms of values meaningful to the research problem (descriptive)? ❑ Does the hypothesis explain facts that gave rise to the need for explanation (explanatory)? ❑ Does the hypothesis suggest which form of research design is likely to be most appropriate? ❑ Does the hypothesis provide a framework for organizing the conclusions that result?
Testable	❑ Does the hypothesis use acceptable techniques? ❑ Does the hypothesis require an explanation that is plausible given known physical or psychological laws? ❑ Does the hypothesis reveal consequences or derivatives that can be deduced for testing purposes? ❑ Is the hypothesis simple, requiring few conditions or assumptions?
Better Than Its Rivals	❑ Does the hypothesis explain more facts than its rivals? ❑ Does the hypothesis explain a greater variety or scope of facts than its rivals? ❑ Is the hypothesis one that informed judges would accept as being the most likely?

>snapshot

Radio Chips versus Retinal Scans: Which Theory Offers the Best Protection?

When the first confirmed case of bovine spongiform encephalopathy (BSE—known as "mad cow" disease) was discovered in a Washington state dairy cow in December 2003, numerous countries banned U.S. beef imports, bringing the $3.2 billion export industry to a standstill. That year, the United States Department of Agriculture (USDA) performed random tests on approximately 0.03 percent of all slaughtered cattle, about 20,000 cows of the nearly 40 million head of cattle slaughtered annually. In comparison, western European countries tested 10 million cows and Japan tested each of its 1.2 million slaughtered cows.

Theories are essential to a researcher's quest to explain and predict phenomena while creating business opportunities and informing public policy. One USDA theory is that the best way to identify sources of cattle-born disease is to monitor a cow from birth to slaughter. Thus, the USDA wanted a national livestock database. After evaluating the options, the USDA proposed another theory: Cows tagged with radio frequency identification devices (RFID) would create the most accurate database.

About the size of a quarter, the RFID tag is stapled to the base of the animal's ear. It is programmed with a numeric code that is scanned by a stationary or handheld device when a cow reaches a new location in the production process. As cows move from farm to feeding lot to slaughterhouse, each animal's origin and location can be updated in the national database.

But RFID tags can be damaged, dislodged, or tampered with. Slaughterhouses need additional safeguards to be certain these devices don't end up in the meat. "All you need is one chip in someone's burger and you've got a problem," says Brian Bolton, vice president of marketing for Optibrand. This Colorado company offers a different theory for the best identification and tracking: A camera that records the unique vascular patterns in a cow's retina at each stage of the beef production chain is the most reliable. With retinal scanning, Bolton says, "the tracking technology is contained in the handheld reader. It takes a tiny picture of a cow's retina and then links it to that animal's computerized record." Meatpacker Swift & Co., the nation's third-largest beef processor, has been using Optibrand's devices for several years. Retinal scan wands also read RFID tags, access global positioning receivers, and stamp each scan with a location record. However, retinal scanning is not always practical because scans must be taken about an inch from an animal's eye.

In addition to RFID and retinal scanning, beef producers and processors implement other tracking systems, thus implementing their own theories. Some use implantable computer chips and others use DNA matching systems. While still preferring RFID technology, the USDA's director of national animal identification, John F. Wiemers, concedes, "We think there's room for all these technologies."

Which tracking theory do you favor? What are the most important variables you would consider in justifying your decision?

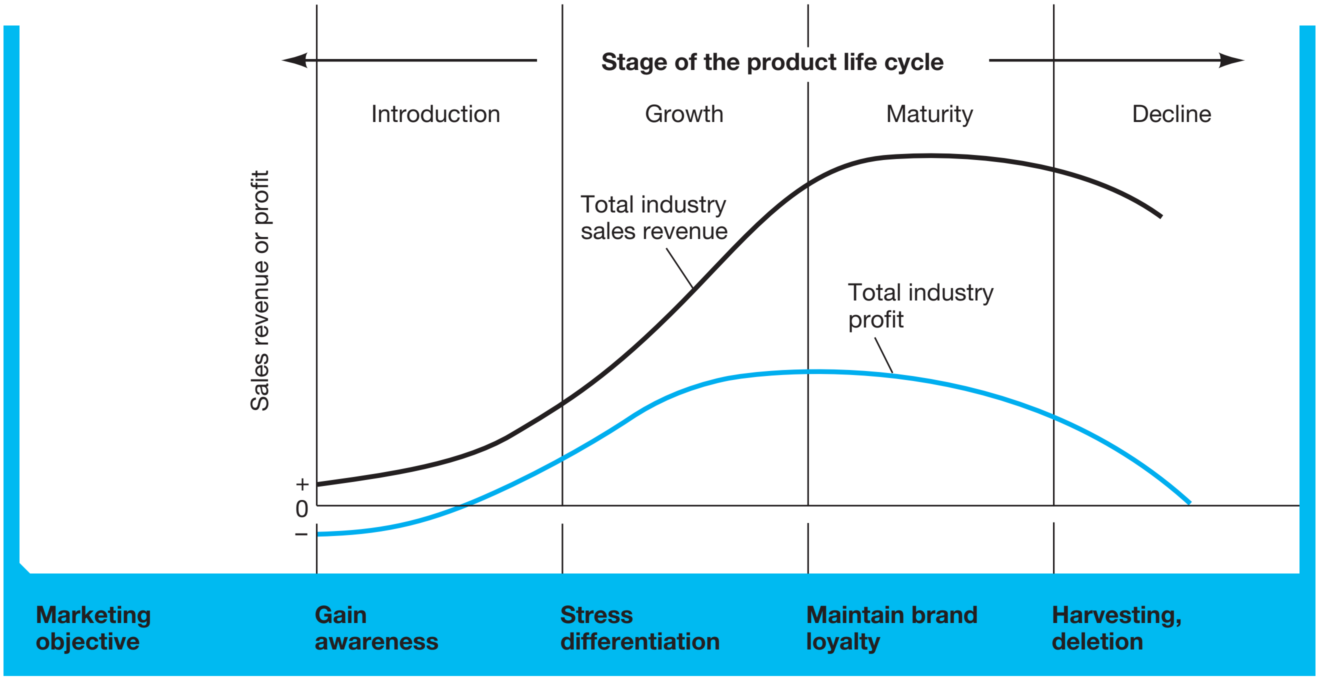
www.usda.gov; www.optibrand.com; http://www.jbsswift.com/

Theory

Hypotheses play an important role in the development of theory. How theory differs from hypothesis may cause confusion. We make the general distinction that the difference between theory and hypothesis is one of degree of complexity and abstraction. In general, theories tend to be complex and abstract and to involve multiple variables. Hypotheses, on the other hand, tend to be more simple, limited-variable statements involving concrete instances.

A person not familiar with research uses the term *theory* to express the opposite of *fact*. In this sense, theory is viewed as being speculative or "ivory tower." One hears that managers need to be less theoretical or that some idea will not work because it is too theoretical. This is an incorrect picture of the relationship between fact and theory to the researcher. In truth, fact and theory are each necessary for the other to be of value. Our ability to make rational decisions, as well as to develop scientific knowledge, is measured by the degree to which we combine fact and theory. We all operate on the basis of theories we hold. In one sense, theories are the generalizations we make about variables and the relationships among them. We use these generalizations to make decisions and predict outcomes. For example, it is midday and you note that the outside natural light is dimming, dark clouds are moving rapidly in from the west, the breeze is freshening, and the air temperature is cooling. Would your understanding of the relationship among these variables (your weather theory) lead you to predict that something decidedly wet will probably occur in a short time?

>Exhibit 3-5 Traditional Product Life Cycle



Source: Adapted from Roger Kerin, Eric Berkowitz, Steven Hartley, and William Rudelius, *Marketing*, 7th ed. (Burr Ridge, IL: McGraw-Hill, 2003), p. 295.

A **theory** is a set of systematically interrelated concepts, definitions, and propositions that are advanced to explain and predict phenomena (facts). In this sense, we have many theories and use them continually to explain or predict what goes on around us. To the degree that our theories are sound and fit the situation, we are successful in our explanations and predictions.

In marketing, the product life cycle describes the stages that a product category goes through in the marketplace.[6] The generalized product life cycle has four stages (although the length and shape of product life cycles differ): introduction, growth, maturity, and decline (Exhibit 3-5). In each stage, many concepts, constructs, and hypotheses describe the influences that change revenue and profit. Definitions are also needed for communicating about the claims of the theory and its consistency in testing to reality.

For example, in the growth stage, companies spend heavily on advertising and promotion to create product awareness. In the early period of this stage these expenditures may be made to fuel *primary demand* (construct), improving product class awareness rather than brand awareness. Also, high pricing may reflect *skimming* (concept) to help the company recover developmental costs. The product manager may alternatively use low pricing, or *penetration pricing* (concept), to build unit volume. In the growth stage, sales increase rapidly because many consumers are trying or actually using the product; and those who tried (were satisfied) and bought again—*repeat purchasers* (concept)—are swelling the ranks. If the company is unable to attract repeat purchasers, this usually means death for the product (proposition). The maturity stage is a good time for the company in terms of generating cash (proposition). The costs of developing the product and establishing its position in the marketplace are paid and it tends to be profitable. Firms will often try to use *extension strategies* (constructs). These are attempts to delay the decline stage of the product life cycle by introducing new versions of the product. In the decline stage, "products will consume a disproportionate share of management time and financial resources relative to their potential future worth"[7] (hypothesis). To make this hypothesis fully testable, we would need operational definitions for disproportionate share, time, resources, and future worth.

The challenge for the researcher in this example is to build more comprehensive theories to explain and predict how modifying the product and other variables will benefit the firm.

Models

The term *model* is used in business research and other fields of business to represent phenomena through the use of analogy. A **model** is defined here as a representation of a system that is constructed to study some aspect of that system or the system as a whole. Models differ from theories in that a theory's role is explanation whereas a model's role is representation.

Early models (and even those created as recently as the 1990s for mainframe computers) were enormously expensive and often incomprehensible to all but their developers. Modeling software, such as Excel, has made modeling more inexpensive and accessible.

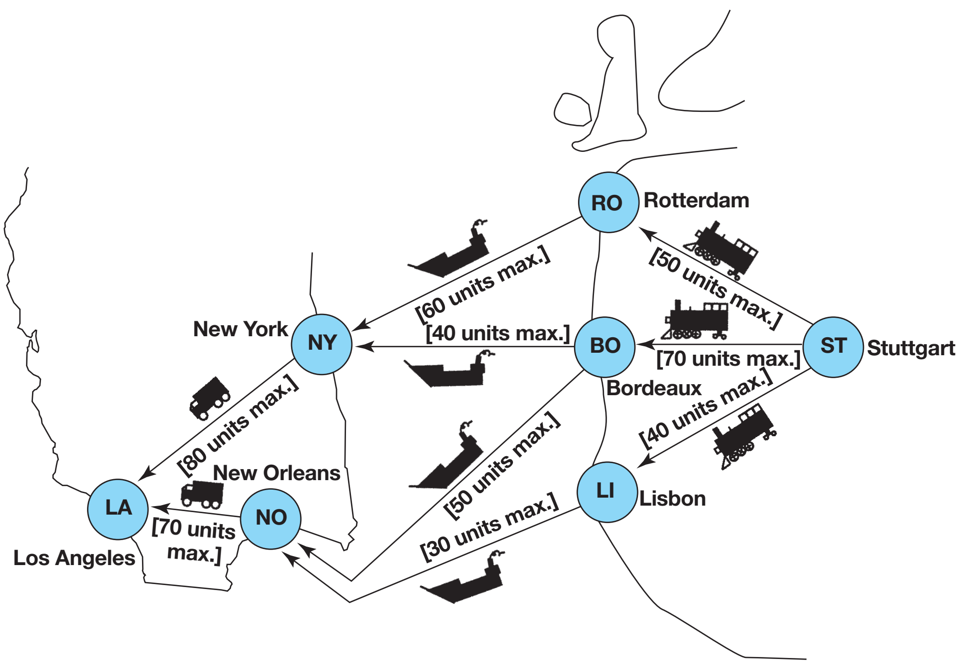
Models allow researchers and managers to characterize present or future conditions: the effect of advertising on consumer awareness or intention to purchase, a product distribution channel, brand switching behavior, an employee training program, and many other aspects of business. A model's purpose is to increase our understanding, prediction, and control of the complexities of the environment.

Exhibit 3-6 provides an example of a *maximum-flow* model used in management science. In this example, a European manufacturer of automobiles needs an increased flow of shipping to its Los Angeles distribution center to meet demand. However, the primary distribution channel is saturated and alternatives must be sought. Although this is a geographic model, more sophisticated network, mathematical, and path diagrams are subsequently created so that researchers can create hypotheses about the nature, relationship, and direction of causality among variables.

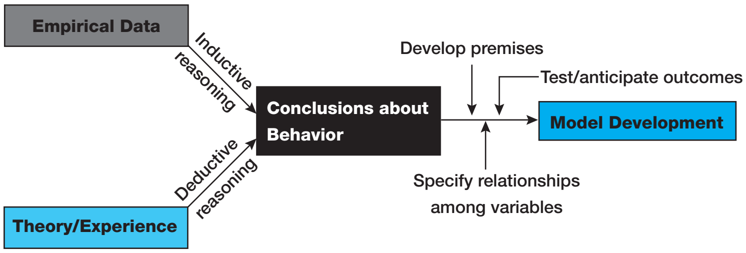
Descriptive, predictive, and normative models are found in business research.[8] *Descriptive models* are used frequently for more complex systems, such as the one in Exhibit 3-6. They allow visualization of numerous variables and relationships. *Predictive* models forecast future events (e.g., the Fourt and Woodlock model could be used to forecast basketball shoes for a market segment).[9] *Normative* models are used chiefly for control, informing us about what actions should be taken. Models may also be static, representing a system at one point in time, or dynamic, representing the evolution of a system over time.

Models are developed through the use of inductive and deductive reasoning, which we suggested previously is integral to accurate conclusions about business decisions. As illustrated in Exhibit 3-7, a model may originate from empirical observations about behavior based on researched facts and relationships among variables. Inductive reasoning allows the modeler to draw conclusions from the

>Exhibit 3-6 A Distribution Network Model



>Exhibit 3-7 The Role of Reasoning in Model Development



facts or evidence in planning the dynamics of the model. The modeler may also use existing theory, managerial experience, judgment, or facts deduced from known laws of nature. In this case, deductive reasoning serves to create particular conclusions derived from general premises.

Models are an important means of advancing theories and aiding decision makers. Because the inputs are often unknown, imprecise, or temporal estimates of complex variables, creating and using models in the decision-making process can be a time-consuming endeavor.

> Research and the Scientific Method

Good business research is based on sound reasoning. Competent researchers and astute managers alike practice thinking habits that reflect **sound reasoning**—finding correct premises, testing the connections between their facts and assumptions, making claims based on adequate evidence. In the reasoning process, induction and deduction, observation, and hypothesis testing can be combined in a systematic way. In this chapter we illustrate how this works and why careful reasoning is essential for producing scientific results.

If the tools of thinking are the mind of science, then the **scientific attitude** is the spirit. The scientific attitude unleashes the creative drive that makes discovery possible. The portraits of scientists involved in some of the most spectacular discoveries of the last century—Crick, Watson, and Pauling (who developed the foundations of DNA structure), and others—are the stories of imagination, intuition, curiosity, suspicion, anguish, the rage to know, and self-doubt. A good business researcher must also possess these essential predispositions. Each must exercise imagination in the discovery process in capturing the most essential aspect of the problem, or in selecting a technique that reveals the phenomenon in its most natural state.

Curiosity in its many forms characterizes the persistent effort to understand relationships. For example, consider the Hawthorne studies discovering a relationship between the seemingly unrelated entities of productivity and levels of light in the workplace. Exemplars like Weber, Taylor, Fayol, Gulick, Mayo, Maslow, McGregor, Argyris, Simon, Likert, Katz, and Kahn (among others in organizational studies) have all typified the curiosity to ask questions with the passion not to quit and a discomfort with existing answers. From applied researchers addressing managers' practical needs to academics fascinated with the construction of grand theories, the attitude of science is the enabling spirit of discovery.

The **scientific method,** as practiced in business research, guides our approach to problem solving. The essential tenets of the scientific method are:

- Direct observation of phenomena.
- Clearly defined variables, methods, and procedures.
- Empirically testable hypotheses.
- The ability to rule out rival hypotheses.
- Statistical rather than linguistic justification of conclusions.
- The self-correcting process.

>snapshot

Business and Battlefield: Scientific Evidence Supports "Gut-Hunches"

A team of researchers at Leeds University Business School conducted studies on how intuition and hunches result from the way our brains store, process, and retrieve information on a subconscious level.[a] Their research is important to executives and managers, who often claim that hunches are preferred over deliberate analysis when a quick decision is required. Gerald Hodgkinson, the lead researcher remarked, "People usually experience true intuition when they are under severe time pressure or in a situation of information overload or acute danger, where conscious analysis of the situation may be difficult or impossible."[b]

If we consider the analogy of the business executive attempting to avoid fatal decisions in a fast-moving, turbulent environment with a soldier scanning the landscape for any evidence of improvised explosive devices (IEDs) in a treacherous neighborhood, then the importance to organizations comes into focus. This aspect of decision-making research seeks to understand how to channel and fine-tune intuitive skills. Being able to identify when managers and executives switch from an intuitive mode to deliberate analysis, and why, may shed light on which decisions are likely to be correct for their environments.

In an article on the importance of hunches in battle, Benedict Carey described how hunches were critical to military survival in threat environments like Iraq and Afghanistan, especially clearing roads of IEDs. Fighting a war-within-a-war, insurgents and U.S. bomb teams have improved their IED tactics: insurgents by better placing, concealing, and detonating and U.S. teams with better recognition and diffusion. Reduced casualties, it was found, could be attributed to some soldiers who could sense danger in a life-or-death situation well before others.[c]

Army research psychologist Steven Burnett led a study involving approximately 800 military men and women that focused on how some soldiers see what others miss. They found that two types of personnel are particularly good at spotting anomalies: those with hunting backgrounds and those from tough urban neighborhoods, where knowing what gang controls a block is a survival necessity. These latter troops also seemed to have innate "threat-assessment" abilities.[d]

Martin P. Paulus, a psychiatrist at the University of California, San Diego found that the brains of elite military units appear to record apparent threats differently from the average enlistee.[e] When presented with the sight of angry faces, Navy Seals show significantly higher activation in the insula (the brain location that collects sensations from around the body and interprets them cohesively) than regular soldiers.

Not long ago, management academics thought of hunches and intuition as folklore, or as just feelings. Feelings have "little to do with rational decision making, or that got in the way of it," said Dr. Antonio Damasio, director of the Brain and Creativity Institute.[f] Notwithstanding that hunches are still not part of scientific orthodoxy,[g] they are supported by strong evidence in neuroscience and psychology.

The technical evidence is complicated but fascinating. Here is a glimpse.

> *Each of us was born with two brains—the cranial brain between our ears, and a second brain with just as many neurons and neurotransmitters as the first, but located in the sheaths of tissue lining our stomach, small intestine, and colon. During early fetal development the same clump of embryonic tissue constituted both our primary brain and our gut brain. In later development the two brains separated yet remained connected (and in communication) through the vagus nerve extending from the brain stem through the enteric nervous system, otherwise known as our gut brain.*[h]

Receptors for the gut that process serotonin (a neurotransmitter) are identical to those found in the bilateral part of the brain where intuitive thinking is believed to originate. Professor Wolfgang Prinz of the Max Planck Institute in Munich reveals that our gut brain "may be the source for unconscious decisions which the main brain later claims as conscious decisions of its own."[i]

There is a lot of research to support gut brain intuition; however, a few examples are illustrative.[j] At the Institute of Noetic Sciences, researchers showed how the human gut reacts to emotionally alarming information seconds before the conscious mind is aware of the information. Previous experiments found similar evidence of reaction times four to seven seconds before conscious awareness of emotionally disturbing images.[k] In another study by Professor Ronald Rensink of the University of British Columbia, one-third of the subjects could sense changes in the patterns of a series of images before the actual changes occurred.[l] "It's like a gut feeling," said Rensink. "It's like using the force. The point of this is that these kinds of feelings are often correct."[m]

Stephen Jay Gould, the eminent paleontologist, biologist, and historian of science said, "Science . . . progresses by hunch, vision, and intuition."[n] Let's not forget the hunches.

An important term in this list is *empirical.* Empirical testing or **empiricism** is said "to denote observations and propositions based on sensory experience and/or derived from such experience by methods of inductive logic, including mathematics and statistics."[10] Researchers using this approach attempt to describe, explain, and make predictions by relying on information gained through observation. This book is fundamentally concerned with empiricism—with the design of procedures to collect factual information about hypothesized relationships that can be used to decide if a particular understanding of a problem and its possible solution are correct.

The scientific method, and scientific inquiry generally, is described as a puzzle-solving activity.[11] For the researcher, puzzles are solvable problems that may be clarified or resolved through reasoning processes. The steps that follow represent one approach to assessing the validity of conclusions about observable events.[12] They are particularly appropriate for business researchers whose conclusions result from empirical data. The researcher:

1. Encounters a curiosity, doubt, barrier, suspicion, or obstacle.
2. Struggles to state the problem—asks questions, contemplates existing knowledge, gathers facts, and moves from an emotional to an intellectual confrontation with the problem.
3. Proposes a hypothesis, a plausible explanation, to explain the facts that are believed to be logically related to the problem.
4. Deduces outcomes or consequences of the hypothesis—attempts to discover what happens if the results are in the opposite direction of that predicted or if the results support the expectations.
5. Formulates several rival hypotheses.
6. Devises and conducts a crucial empirical test with various possible outcomes, each of which selectively excludes one or more hypotheses.
7. Draws a conclusion (an inductive inference) based on acceptance or rejection of the hypotheses.
8. Feeds information back into the original problem, modifying it according to the strength of the evidence.

Clearly, reasoning is pivotal to much of the researcher's success: gathering facts consistent with the problem, proposing and eliminating rival hypotheses, deducing outcomes, developing crucial empirical tests, and deriving the conclusion.

Sound Reasoning for Useful Answers

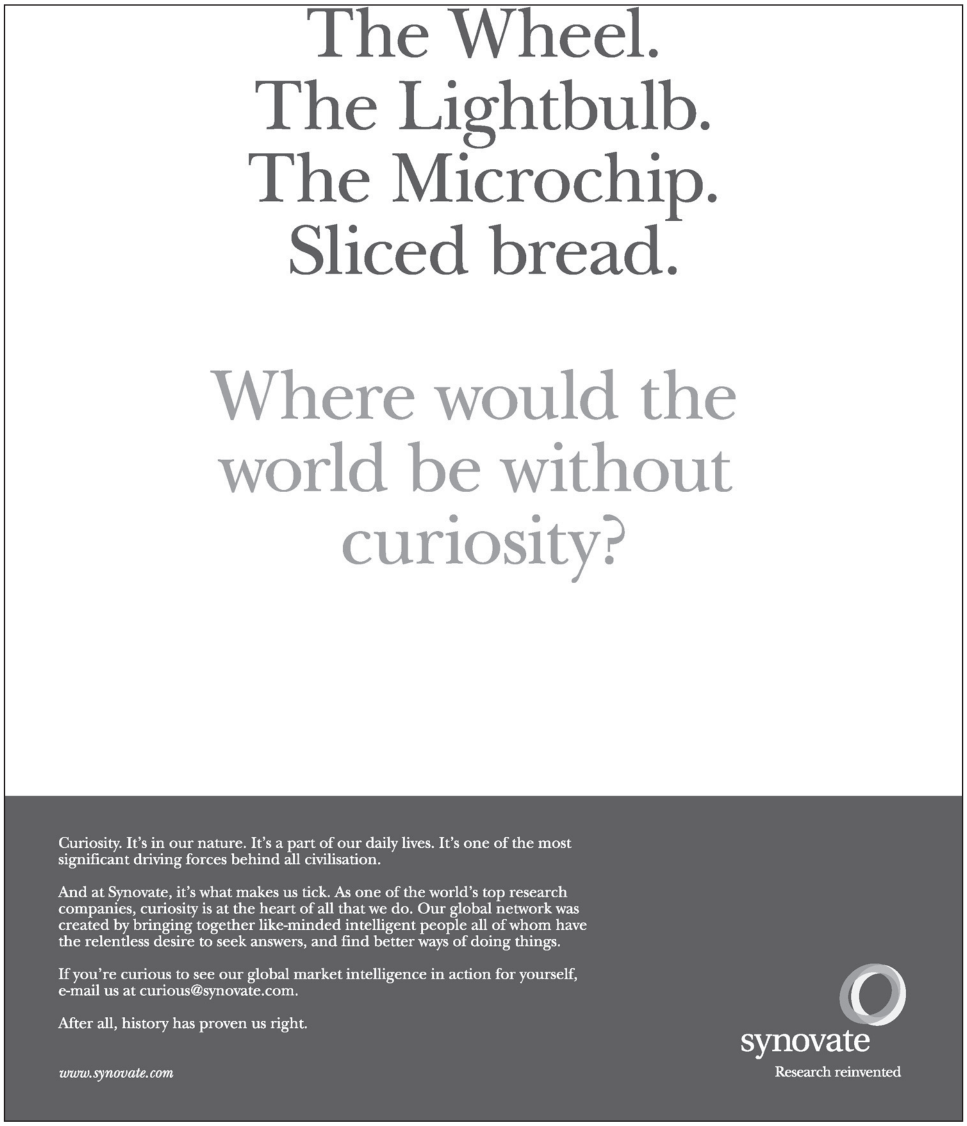
Every day we reason with varying degrees of success and communicate our meaning in ordinary language or, in special cases, in symbolic, logical form. Our meanings are conveyed through one of two types of discourse: exposition or argument. **Exposition** consists of statements that describe without attempting to explain. **Argument** allows us to explain, interpret, defend, challenge, and explore meaning. Two types of argument of great importance to research are deduction and induction.

Deduction

Deduction is a form of argument that purports to be conclusive—the conclusion must necessarily follow from the reasons given. These reasons are said to imply the conclusion and represent a proof. This is a much stronger and different bond between reasons and conclusions than is found with induction. For a deduction to be correct, it must be both true and valid:

- Premises (reasons) given for the conclusion must agree with the real world (true).
- The conclusion must necessarily follow from the premises (valid).

A deduction is valid if it is impossible for the conclusion to be false if the premises are true. Logicians have established rules by which one can judge whether a deduction is valid. Conclusions are not logically justified if one or more premises are untrue or the argument form is invalid. A conclusion may



This Synovate ad reinforces that one trait—curiosity—is necessary for someone to be a good researcher.

www.synovate.com

still be a true statement, but for reasons other than those given. For example, consider the following simple deduction:

All employees at BankChoice can be trusted to observe the ethical code.	(Premise 1)
Sara is an employee of BankChoice.	(Premise 2)
Sara can be trusted to observe the ethical code.	(Conclusion)

If we believe that Sara can be trusted, we might think this is a sound deduction. But this conclusion cannot be accepted as a sound deduction unless the form of the argument is valid and the premises are true. In this case, the form is valid, and premise 2 can be confirmed easily. However, more than a billion dollars each year in confirmed retail employee theft will challenge the premise "All employees can be trusted to observe an ethical code." And instances of employee fraud among professionals make any specific instance questionable. If one premise fails the acceptance test, then the conclusion is not a sound deduction. This is so even if we still have great confidence in Sara's honesty. Our conclusion, in this case, must be based on our confidence in Sara as an individual rather than on a general premise that all employees of BankChoice are ethical.

As researchers, we may not recognize how much we use deduction to understand the implications of various acts and conditions. For example, in planning a survey, we might reason as follows:

Inner-city household interviewing is especially difficult and expensive.	(Premise 1)
This survey involves substantial inner-city household interviewing.	(Premise 2)
The interviewing in this survey will be especially difficult and expensive.	(Conclusion)

On reflection, it should be apparent that a conclusion that results from deduction is, in a sense, already "contained in" its premises.[13]

Induction

Inductive argument is radically different. There is no such strength of relationship between reasons and conclusions in induction. In **induction** you draw a conclusion from one or more particular facts or pieces of evidence. The conclusion explains the facts, and the facts support the conclusion. To illustrate, suppose your firm spends $1 million on a regional promotional campaign and sales do not increase. This is a fact—sales did not increase during or after the promotional campaign. Under such circumstances, we ask, "Why didn't sales increase?"

One likely answer to this question is a conclusion that the promotional campaign was poorly executed. This conclusion is an induction because we know from experience that regional sales should go up during a promotional event. Also we know from experience that if the promotion is poorly executed, sales will not increase. The nature of induction, however, is that the conclusion is only a hypothesis. It is one explanation, but there are others that fit the facts just as well. For example, each of the following hypotheses might explain why sales did not increase:

- Regional retailers did not have sufficient stock to fill customer requests during the promotional period.
- A strike by the employees of our trucking firm prevented stock from arriving in time for the promotion to be effective.
- A category-five hurricane closed all our retail locations in the region for the 10 days during the promotion.

In this example, we see the essential nature of inductive reasoning. The inductive conclusion is an inferential jump beyond the evidence presented—that is, although one conclusion explains the fact of no sales increase, other conclusions also can explain the fact. It may even be that none of the conclusions we advanced correctly explain the failure of sales to increase.

For another example, let's consider the situation of Tracy Nelson, a salesperson at the Square Box Company. Tracy has one of the poorest sales records in the company. Her unsatisfactory performance prompts us to ask the question "Why is she performing so poorly?" From our knowledge of Tracy's sales practices, the nature of box selling, and the market, we might conclude (hypothesize) that her problem is that she makes too few sales calls per day to build a good sales record. Other hypotheses might also occur to us on the basis of available evidence. Among these hypotheses are the following:

- Tracy's territory does not have the market potential of other territories.
- Tracy's sales-generating skills are so poorly developed that she is not able to close sales effectively.
- Tracy does not have authority to lower prices and her territory has been the scene of intense price-cutting by competitive manufacturers, causing her to lose many sales to competitors.
- Some people just cannot sell boxes, and Tracy is one of those people.

Each of the above hypotheses is an induction we might base on the evidence of Tracy's poor sales record, plus some assumptions or beliefs we hold about her and the selling of boxes. All of them have some chance of being true, but we would probably have more confidence in some than in others. All require further confirmation before they gain our confidence. Confirmation comes with more evidence. The task of research is largely to (1) determine the nature of the evidence needed to confirm or reject hypotheses and (2) design methods by which to discover and measure this other evidence.

Researchers often use observation when evaluating toys and children. Apply deductive reasoning to this image. Develop your own conclusions concerning what will happen next.

Combining Induction and Deduction

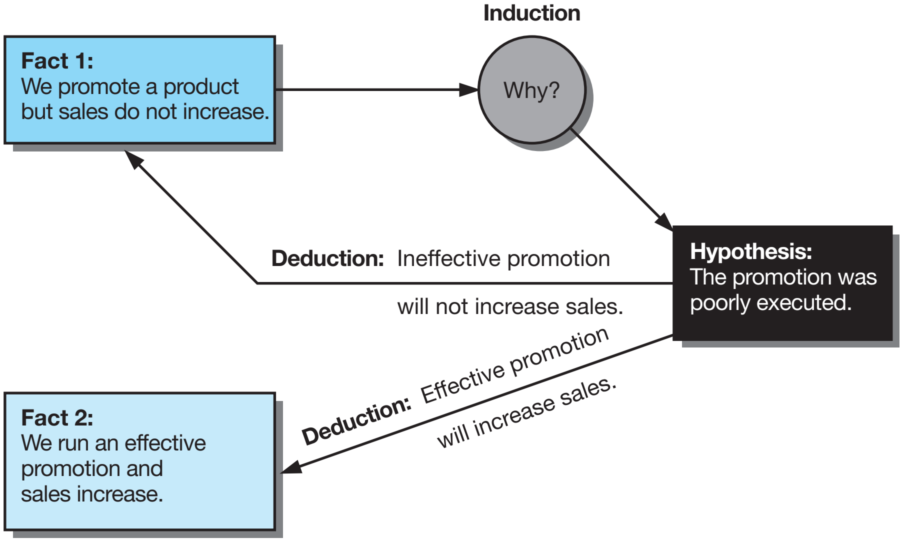
Induction and deduction are used together in research reasoning. Dewey describes this process as the "double movement of reflective thought."[14] Induction occurs when we observe a fact and ask, "Why is this?" In answer to this question, we advance a tentative explanation (hypothesis). The hypothesis is plausible if it explains the event or condition (fact) that prompted the question. Deduction is the process by which we test whether the hypothesis is capable of explaining the fact. The process is illustrated in Exhibit 3-8:

1. You promote a product but sales don't increase. (Fact 1)
2. You ask the question "Why didn't sales increase?" (Induction)
3. You infer a conclusion (hypothesis) to answer the question: The promotion was poorly executed. (Hypothesis)
4. You use this hypothesis to conclude (deduce) that sales will not increase during a poorly executed promotion. You know from experience that ineffective promotion will not increase sales. (Deduction 1)

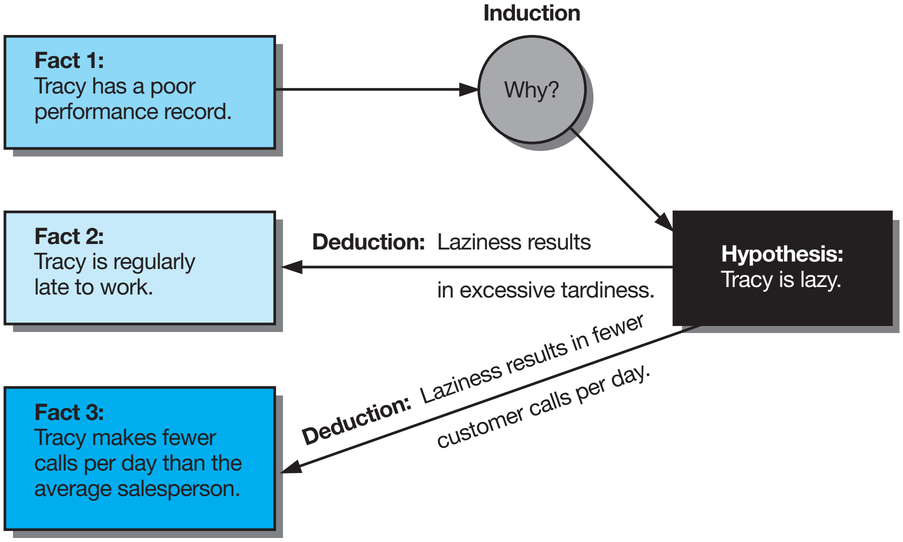
This example, an exercise in circular reasoning, points out that one must be able to deduce the initiating fact from the hypothesis advanced to explain that fact. A second critical point is also illustrated in Exhibit 3-8. To test a hypothesis, one must be able to deduce from it other facts that can then be investigated. This is what research is all about. We must deduce other specific facts or events from the hypothesis and then gather information to see if the deductions are true. In this example:

5. We deduce that a well-executed promotion will result in increased sales. (Deduction 2)
6. We run an effective promotion, and sales increase. (Fact 2)

>Exhibit 3-8 Why Didn't Sales Increase?



>Exhibit 3-9 Why Is Tracy Nelson's Performance So Poor?



How would the double movement of reflective thought work when applied to Tracy Nelson's problem? The process is illustrated in Exhibit 3-9. The initial observation (fact 1) leads to hypothesis 1 that Tracy is lazy. We deduce several other facts from the hypothesis. These are shown as fact 2 and fact 3. We use research to find out if fact 2 and fact 3 are true. If they are found to be true, they confirm our hypothesis. If they are found to be false, our hypothesis is not confirmed, and we must look for another explanation.

In most research, the process may be more complicated than these examples suggest. For instance, we often develop multiple hypotheses by which to explain the problem in question. Then we design a study to test all the hypotheses at once. Not only is this more efficient, but it is also a good way to reduce the attachment (and potential bias) of the researcher for any given hypothesis.

>summary

1 Scientific methods and scientific thinking are based on concepts, the symbols we attach to bundles of meaning that we hold and share with others. We invent concepts to think about and communicate abstractions. We also use higher-level concepts—constructs—for specialized scientific explanatory purposes that are not directly observable. Concepts, constructs, and variables may be defined descriptively or operationally. Operational definitions must specify adequately the empirical information needed and how it will be collected. In addition, they must have the proper scope or fit for the research problem at hand.

Concepts and constructs are used at the theoretical levels; variables are used at the empirical level. Variables accept numerals or values for the purpose of testing and measurement. They may be classified as explanatory, independent, dependent, moderating, extraneous, and intervening.

2 Propositions are of great interest in research because they may be used to assess the truth or falsity of relationships among observable phenomena. When we advance a proposition for testing, we are hypothesizing. A hypothesis describes the relationships between or among variables. A good hypothesis is one that can explain what it claims to explain; is testable; and has greater range, probability, and simplicity than its rivals. Sets of interrelated concepts, definitions, and propositions that are advanced to explain and predict phenomena are called theories. Models differ from theories in that models are analogies or representations of some aspect of a system or of the system as a whole. Models are used for description, prediction, and control.

3 Scientific inquiry is grounded in the inference process. This process is used for the development and testing of various propositions largely through the double movement of reflective thinking. Reflective thinking consists of sequencing induction and deduction in order to explain inductively (by hypothesis) a puzzling condition. In turn, the hypothesis is used in a deduction of further facts that can be sought to confirm or deny the truth of the hypothesis.

Researchers think of the doing of science as an orderly process that combines induction, deduction, observation, and hypothesis testing into a set of reflective thinking activities. Although the scientific method consists of neither sequential nor independent stages, the problem-solving process that it reveals provides insight into the way research is conducted.

>keyterms

>discussionquestions

Terms in Review

1 Distinguish among the following sets of items, and suggest the significance of each in a research context:
   a Concept and construct.
   b Deduction and induction.
   c Operational definition and dictionary definition.
   d Concept and variable.
   e Hypothesis and proposition.
   f Theory and model.
   g Scientific method and scientific attitude.

2 Describe the characteristics of the scientific method.

3 Below are some terms commonly found in a management setting. Are they concepts or constructs? Give two different operational definitions for each.
   a First-line supervisor.
   b Employee morale.
   c Assembly line.
   d Overdue account.
   e Line management.
   f Leadership.
   g Union democracy.
   h Ethical standards.

4 In your company's management development program, there was a heated discussion between some people who claimed, "Theory is impractical and thus no good," and others who claimed, "Good theory is the most practical approach to problems." What position would you take and why?

5 An automobile manufacturer observes the demand for its brand increasing as per capita income increases. Sales increases also follow low interest rates, which ease credit conditions. Buyer purchase behavior is seen to be dependent on age and gender. Other factors influencing sales appear to fluctuate almost randomly (competitor advertising, competitor dealer discounts, introductions of new competitive models).
   a If sales and per capita income are positively related, classify all variables as dependent, independent, moderating, extraneous, or intervening.
   b Comment on the utility of a model based on the hypothesis.

Making Research Decisions

6 You observe the following condition: "Our female sales representatives have lower customer defections than do our male sales representatives."
   a Propose the concepts and constructs you might use to study this phenomenon.
   b How might any of these concepts and/or constructs be related to explanatory hypotheses?

7 You are the office manager of a large firm. Your company prides itself on its high-quality customer service. Lately complaints have surfaced that an increased number of incoming calls are being misrouted or dropped. Yesterday, when passing by the main reception area, you noticed the receptionist fiddling with his hearing aid. In the process, a call came in and would have gone unanswered if not for your intervention. This particular receptionist had earned an unsatisfactory review three months earlier for tardiness. Your inclination is to urge this 20-year employee to retire or to fire him, if retirement is rejected, but you know the individual is well liked and seen as a fixture in the company.
   a Pose several hypotheses that might account for dropped or misrouted incoming calls.
   b Using the double movement of reflective thought, show how you would test these hypotheses.

Bringing Research to Life

8 Identify and classify all the variables in the Army's dud shell research.

9 What was Myra's hypothesis for the Army's dud shell research? What was the Army's hypothesis?

From Concept to Practice

10 Using Exhibits 3-1 and 3-9 as your guides, graph the inductions and deductions in the following statements. If there are gaps, supply what is needed to make them complete arguments.
   a Repeated studies indicate that economic conditions vary with—and lag 6 to 12 months behind—the changes in the national money supply. Therefore, we may conclude the money supply is the basic economic variable.
   b Research studies show that heavy smokers have a higher rate of lung cancer than do nonsmokers; therefore, heavy smoking causes lung cancer.
   c Show me a person who goes to church regularly, and I will show you a reliable worker.

From the Headlines

11 That investment manager Bernard Madoff's hedge fund Ascot Partners was a giant scam will likely be *the* finance story remembered from the last decade. It is estimated that Madoff stole an estimated $50 billion from noteworthy individuals and institutional investors, and he covered the crime by creating fictional financial statements for each investor. If you were an institutional investor, how might employing scientific attitude and scientific method have protected your organization from this Ponzi scheme?

>cases*

Campbell-Ewald: R-E-S-P-E-C-T Spells Loyalty

HeroBuilders.com

Open Doors: Extending Hospitality to Travelers with Disabilities

* You will find a description of each case in the Case Abstracts section of this textbook. Check the Case Index to determine whether a case provides data, the research instrument, video, or other supplementary material. Written cases are downloadable from the text website (www.mhhe.com/cooper11e). All video material and video cases are available from the Online Learning Center.