UNIT 1

1

ROLE OF BUSINESS RESEARCH

Unit Structure

1.1 Overview

After studying this chapter, the learner should be able to:

- Understand how research contributes to business success.
- Know how to define business research.
- Understand the difference between basic and applied business research.
- Understand how research activities can be used to address business decisions.
- Know when business research should be conducted.

1.2 Introduction

Research is perhaps as old as mankind. If necessity was the mother of invention, it was also the mother of discovery. The primitive man's need must have sent him in search not only of food, but also of knowledge. The process was basically the

acquisition of knowledge, the quest for truth, the exploration of the unexplored. Since the area unexplored was at that time vast, every discovery must have been a grand thrill.

As per Grinell, "*The word research is composed of two syllables,* ***re*** *and* ***search****. The dictionary defines the former as a prefix meaning again, a new or over again and the latter as a verb meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles*."

According to Robert Ross, "*Research is essentially an investigation, a recording and an analysis of evidence for the purpose of gaining knowledge*." It can generally be defined as a systematic method of finding solutions to problems. In the opinion of Redman and Mory, "*It is a systematized effort to gain new Knowledge*."

A research may need not only lead to ideal solution but also give rise to new problems which may require further research. In other words, research may not be an end to a problem since every research could have the capability of pointing to a new question. It is carried on both for discovering new facts and verification of old ones.

Further, being knowledgeable about research and research methods helps professional managers to:

1. Identify and effectively solve minor problems in the work setting.
2. Know how to discriminate good from bad research.
3. Appreciate and be constantly aware of the multiple influences and multiple effects of factors impinging on a situation.
4. Take calculated risks in decision making, knowing full well the probabilities associated with the different possible outcomes.
5. Prevent possible vested interests from exercising their influence in a situation.
6. Relate to hired researchers and consultants more effectively.
7. Combine experience with scientific knowledge while making decisions.

1.3 The Nature of Business Research

Business research covers a wide range of phenomena. For managers, the purpose of research is to provide knowledge regarding the organization, the market, the economy, or another area of uncertainty. A financial manager may ask, "Will the environment for long-term financing be better two years from now?" A personnel manager may ask, "What kind of training is necessary for production employees?" or "What is the reason for the company's high employee turnover?" A marketing manager may ask, "How can I monitor my retail sales and retail trade activities?" Each of these questions requires information about how the environment, employees, customers, or the economy will respond to executives' decisions. Research is one of the principal tools for answering these practical questions.

Within an organization, a business researcher may be referred to as a marketing researcher, an organizational researcher, a director of financial and economic research, or one of many other titles. Although business researchers are often specialized, the term business research encompasses all these functional specialties. While researchers in different functional areas may investigate different phenomena, they are like one another because they share similar research methods.

It has been said that "every business issue ultimately boils down to an information problem." Can the right information be delivered? The goal of research is to supply accurate information that reduces the uncertainty in managerial decision making. Very often, decisions are made with little information for various reasons, including cost considerations, insufficient time to conduct research, or management's belief that enough is already known. Relying on seat-of-the pants decision making—decision making without research—is like betting on a long shot at the racetrack because the horse's name is appealing. Occasionally there are successes, but in the long run, intuition without research leads to losses. Business research helps decision makers shift from intuitive information gathering to systematic and objective investigation.

1.3.1 Business Research Defined

Business research is the application of the scientific method in searching for the truth about business phenomena. These activities include defining business opportunities and problems, generating, and evaluating alternative courses of action, and monitoring employee and organizational performance. Business research is more than conducting surveys. This process includes idea and theory development, problem definition, searching for and collecting information, analyzing data, and communicating the findings and their implications.

This definition suggests that business research information is not intuitive or haphazardly gathered. Literally, research (re-search) means "to search again." The term connotes patient study and scientific investigation wherein the researcher takes another, more careful look at the data to discover all that is known about the subject. Ultimately, all findings are tied back to the underlying theory.

The definition also emphasizes, through reference to the scientific method, that any information generated should be accurate and objective. The nineteenth-century American humorist Artemus Ward claimed, "It ain't the things we don't know that gets us in trouble. It's the things we know that ain't so." In other words, research is not performed to support preconceived ideas but to test them. The researcher must be personally detached and free of bias in attempting to find truth. If bias enters the research process, the value of the research is considerably reduced. We will discuss this further in a subsequent chapter.

Our definition makes it clear that business research is designed to facilitate the managerial decision-making process for all aspects of the business: finance, marketing, human resources, and so on. Business research is an essential tool for management in virtually all problem-solving and decision-making activities. By providing the necessary information on which to base business decisions, research can decrease the risk of making a wrong decision in each area. However, it is important to note that research is an aid to managerial decision making, never a substitute for it.

Finally, this definition of business research is limited by one's definition of business. Certainly, research regarding production, finance, marketing, and management in for-profit corporations like DuPont is business research. However, business research also profits, and governmental agencies can use research in much the same way as managers at Starbucks, Jelly Belly, or DuPont. While the focus is on for-profit organizations, this book explores business research as it applies to all institutions.

1.4 Managerial Value of Business Research

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A. Identifying the existence of problems and opportunities

Before any strategy can be developed, an organization must determine where it wants to go and how it will get there. Business research can help managers plan strategies by determining the nature of situations by identifying the existence of problems or opportunities present in the organization.

B. Diagnosis and Assessment

After an organization recognizes a problem or identifies a potential opportunity, an important aspect of business research is often the provision of diagnostic information that clarifies the situation. Managers need to gain insight about the underlying factors causing the situation. If there is a problem, they need to specify what happened and why. If an opportunity exists, they may need to explore, clarify, and refine the nature of the opportunity.

C. Selecting and implementing a course of action

Business research is often conducted to obtain specific information to help evaluate the various alternatives, and to select the best course of action based on certain performance criteria.

D. Evaluation of the course of action

Evaluation research is conducted to inform managers whether planned activities were properly executed and whether they accomplished what they were expected to do. It serves an evaluation and control function. Evaluation research is a formal, objective appraisal that provides information about objectives and whether the planned activities accomplished what they were expected to accomplish. This can be done through performance-monitoring research, which is a form of research that regularly provides feedback for evaluation and control of business activity. If this research indicates things are not going as planned, further research may be required to explain why something "went wrong."

Some organizations have their own consulting or research department, which might be called the Management Services Department, the Organization and Methods Department, R & D (research and development department), or some other name. This department serves as the internal consultant to subunits of the organization

that face certain problems and seek help. Such a unit within the organization, if it exists, is useful in several ways, and enlisting its help might be advantageous under some circumstances, but not others.

The manager often must decide whether to use internal or external researchers. To reach a decision, the manager should be aware of the strengths and weaknesses of both, and weigh the advantages and disadvantages of using either, based on the needs of the situation. Some of the advantages and disadvantages of both internal and external teams are discussed below:

Advantages of internal consultants/researchers

There are at least four advantages in engaging an internal team to do the research project:

1. The internal team stands a better chance of being readily accepted by the employees in the sub-unit of the organization where research needs to be done.

2. The team requires much less time to understand the structure, the philosophy and climate, and the functioning and work systems of the organization.

3. They are available to implement their recommendations after the research findings have been accepted. This is very important because any "bugs" in the implementation of the recommendations may be removed with their help. They are also available to evaluate the effectiveness of the changes, and to consider further changes when necessary.

4. The internal team might cost considerably less than an external team for the department enlisting help in problem solving, because they will need less time to understand the system due to their continuous involvement with various units of the organization. For problems of low complexity, the internal team would be ideal.

Disadvantages of internal consultants/researchers

There are also certain disadvantages to engaging internal research teams for the purposes of problem solving. The four most critical ones are:

1. In view of their long tenure as internal consultants, the internal team may quite possibly fall into a stereotyped way of looking at the organization and its problems. This inhibits any fresh ideas and perspectives that might be needed to correct the problem. This is a handicap for situations in which weighty issues and complex problems are to be investigated.

2. There is scope for certain powerful coalitions in the organization to influence the internal team to conceal, distort, or misrepresent certain facts. In other words, certain vested interests could dominate, especially in securing a sizable portion of the available scant resources.

3. There is also a possibility that even the most highly qualified internal research teams are not perceived as "experts" by the staff and management, and hence their recommendation may not get the consideration and attention they deserve.

4. Certain organizational biases of the internal research team might, in some instances, make the findings less objective and consequently less scientific.

Advantages of external consultants/researchers

1. For decades, large consulting firms have maintained their reputation for having the best strategy consulting practices. However, along with the expertise comes a hefty price tag that many client companies are not so willing to cough up. Yet their reputation precedes them for good reason, after working with multiple large, influential corporations. Despite the cost, external consultants have advantages which internal consultants cannot necessarily replicate due to their long-term reputation for good work and for hiring the best graduates from best schools.

2. Coming from an outside perspective allows consultants to have a more objective, bird's eye view of the company and the industry. Instead of becoming too engrossed within a specific company, external consultants should be on top of the industry. Not only do they have a broad perspective, but an experienced consultant will have had multiple experiences working with other companies in the same industry and that faced similar challenges. Therefore, they can apply experience from the past into their current projects and engagements.

3. Another advantage of not being as integrated into the work project environment is the ability to be regarded as an expert and not a peer. Due to the lack of concrete understanding of the role, internal consultants can be viewed just another pair of hands to make changes within the organization. Instead, external consultants are hired for the sole purpose of their expertise and ability to create change for a specific business problem. This brings more clarity and focus to the role, and helps concentrate efforts on the project at hand, and often, helps ensure client buy-in.

Disadvantages of external consultants/researchers

1. While internal consultants battle company politics from inside the company, employees often regard external consultants with suspicion. This reputation, unfortunately, is often deserved. Many consultants come into an organization without an understanding of the company or a willingness to hear opinions. Instead, they often try to implement one-size-fits-all strategies either taught to them by their consulting firms or from past consulting experiences. While knowledge from other consultants can often be helpful, it does not necessarily apply in all similar situations.

2. External consultants also face the bad rap of coming in, presenting solutions, and leaving. This conduct leaves many firms without a solid game plan and causes them to flounder in the implementation process. External consultants do not tend to stay aboard after proposing their various strategies, and most clients do not want to pay them afterward either. Unfortunately, this leaves clients spending far too much money for too little change.

1.5 When Is Business Research Needed?

The need to make intelligent, informed decisions ultimately motivates an organization to engage in business research. Not every decision requires research. Thus, when confronting a key decision, a manager must initially decide whether to conduct business research. The determination of the need for research centers on:

(1) time constraints

(2) the availability of data

(3) the nature of the decision to be made.

(4) the value of the research information in relation to costs

Most work in business organizations, in whatever sector or ownership, will require research activities. When choosing an area for research, we usually start either with a broad area of management, which particularly interests us, say, marketing or operations management, or we start with practical questions, which need answers to help with managerial decision-making. Refining from this point to a researchable question or objective is not easy.

We need to do several things:

- Narrow down the study topic to one which we are both interested in and have the time to investigate thoroughly.

- Choose a topic context where we can find some access to practitioners if possible; either a direct connection with an organization or professional body, or a context which is well documented either on the web or in the literature.
- Identify relevant theory or domains of knowledge around the question for reading and background understanding.
- Write and re-write the question or working title, checking thoroughly the implications of each phrase or word to check assumptions and ensure we really mean what we write. This is often best done with other people to help us check assumptions and see the topic more clearly.
- Use the published literature and discussion with others to help us narrow down firmly to an angle or gap in the business literature, which will be worthwhile to explore.
- Identify the possible outcomes from this research topic, both theoretical and practical. If they are not clear, can we refine the topic so that they become clear?

1.6 Business Research in The Twenty-First Century

We can now define business research as an organized, systematic, data-based, critical, objective, scientific inquiry, or investigation into a specific problem, undertaken with the purpose of finding answers or solutions to it. Some commonly researched topical areas in business are specified below:

- Employee behaviors such as performance, absenteeism, and turnover.
- Employee attitudes such as job satisfaction, loyalty, and organizational commitment.
- Supervisory performance, managerial leadership style, and performance appraisal systems.
- Employee selection, recruitment, training, and retention.
- Validation of performance appraisal systems.
- Human resource management choices and organizational strategy.
- Evaluation of assessment centers.
- The dynamics of rating and rating errors in the judgment of human performance.
- Strategy formulation and implementation.

- Just-in-time systems, continuous-improvement strategies, and production efficiencies.
- Updating policies and procedures in keeping with latest government regulations and organizational changes.
- Organizational outcomes such as increased sales, market share, profits, growth, and effectiveness.
- Consumer decision making.
- Customer relationship management.
- Consumer satisfaction, complaints, customer loyalty, and word-of-mouth communication.
- Complaint handling.
- Delivering and performing service.
- Product life cycle, and product innovation.
- Impression management, logos, and image building.
- Product positioning, product modification, and new product development.
- Cost of capital, valuation of firms, dividend policies, and investment decisions.
- Risk assessment, exchange rate fluctuations, and foreign investment.
- Tax implications of reorganization of firms or acquisition of companies.
- Collection of accounts receivable.
- Development of effective cost accounting procedures.
- Qualified pension plans and cafeteria-type benefits for employees.
- Deferred compensation plans.
- Installation of effective management information systems.
- Advanced manufacturing technologies and information systems.
- Design of career paths for spouses in dual-career families.
- Creative management of a diverse workforce.
- Cultural differences and the dynamics of managing a multinational firm.
- Alternative work patterns: job sharing, flexitime, flexiplace, and part-time work.

- Downsizing.
- Participative management and performance effectiveness.
- Differences in leadership positions, salaries, and leadership styles.
- Instrument development for assessing "true" gender differences.
- Installation, adaptation, and updating of computer networks and software suitable for creating effective information systems for organizations.
- Installation of an effective data warehouse and data mining system for the organization.
- Keeping ahead of the competition

Business research, like all business activity, continues to change. Changes in communication technologies and the trend toward an ever more global marketplace have played a large role in many of these changes. Like all business activities, business research has become increasingly global as more and more firms operate with few, if any, geographic boundaries. Some companies have extensive international research operations.

With the constantly evolving data inputs, data types and changing customer behavior, it is important for any business research to remain managerial relevant and timely. With the emergence of digital data, researchers have shifted toward collecting objective, secondary data. Archival or proprietary information, such as historical data, is readily available to researchers (Verma, Agarwal, Kachroo & Krishen 2017). Academicians and practitioners are increasingly using sophisticated software to execute predictive analytics.

The era of big data has provided new and varied sources of data and has placed additional requirements on the analytical techniques that must handle these data sources. There are, therefore, unique challenges facing today's analyst with the many issues in big data and analytics.

With an expanded focus on data challenges and data analytics, data scientists will be able to create awareness and motivate management to invest in these promising developments. If this happens, business research and business decisions in general will be based on better data and more effective analytical techniques, and thus be more knowledge based.

An article of economic times dated Dec 03, 2020 stated: "Firms have accelerated the adoption of automation, digital business models: Infosys-HFS Research study".

Another article dated Jan 07, 2021 read: "Digital Identity Research Initiative collaborates with Transerve for its India Pulse Program".

1.7 Information Systems and Knowledge Management

Terms like information and data are often used interchangeably. Researchers use these terms in specific ways that emphasize how useful each can be. Data are simply facts or recorded measures of certain phenomena (things or events). Information is data formatted (structured) to support decision making or define the relationship between two facts. Business intelligence is the subset of data and information that has some explanatory power enabling effective managerial decisions to be made. So, there is more data than information, and more information than intelligence.

The question of defining knowledge has occupied the minds of philosophers since the classical Greek era and has led to many epistemological debates. It is unnecessary for the purposes of this paper to engage in a debate to probe, question, or reframe the term knowledge, or discover the "universal truth" from the perspective of ancient or modern philosophy. This is because such an understanding of knowledge was neither a determinant factor in building the knowledge-based theory of the firm nor in triggering researcher and practitioner interest in managing organizational knowledge. It is, however, useful to consider the manifold views of knowledge as discussed in the information technology (IT), strategic management, and organizational theory literature. This will enable us to uncover some assumptions about knowledge that underlie organizational knowledge management processes and KMS.

A great deal of emphasis is given to understanding the difference among data, information, and knowledge and drawing implications from the difference. Because knowledge is personalized, for an individual's or a group's knowledge to be useful for others, it must be expressed in such a manner as to be interpretable by the receivers. Hordes of information are of little value; only that information which is actively processed in the mind of an individual through a process of reflection, enlightenment, or learning can be useful.

The recent interest in organizational knowledge has prompted the issue of managing the knowledge to the organization's benefit. Knowledge management refers to identifying and leveraging the collective knowledge in an organization to help the organization compete (von Krogh 1998). Knowledge management is purported to increase innovativeness and responsiveness (Hackbarth 1998).

A survey of European firms by KPMG Peat Marwick (1998b) found that almost half of the companies reported having suffered a significant setback from losing key staff with 43% experiencing impaired client or supplier relations and 13% facing a loss of income because of the departure of a single employee. In another survey, most organizations believed that much of the knowledge they needed existed inside the organization, but that identifying that it existed, finding it, and leveraging it remained problematic (Cranfield University 1998). Such problems maintaining, locating, and applying knowledge have led to systematic attempts to manage knowledge.

The usefulness of data to management can be described based on four characteristics: relevance, quality, timeliness, and completeness. Relevant data have the characteristic of pertinence to the situation at hand. The information is useful. The quality of information is the degree to which data represent the true situation. High-quality data are accurate, valid, and reliable. High-quality data represent reality faithfully and present a good picture of reality. Timely information is obtained at the right time.

Computerized information systems can record events and present information as a transaction takes place, improving timeliness. Complete information is the right quantity of information. Managers must have sufficient information to relate all aspects of their decisions together. A computer-based decision support system helps decision makers confront problems through direct interactions with databases and analytical models. A DSS stores data and transforms them into organized information that is easily accessible to managers.

A database is a collection of raw data arranged logically and organized in a form that can be stored and processed by a computer. Business data come from four major sources: internal records, proprietary business research, business intelligence, and outside vendors and external distributors. Each source can provide valuable input. Because most companies compile and store many different databases, they often develop data warehousing systems. Data warehousing is the process allowing important day-to-day operational data to be stored and organized for simplified access. More specifically, a data warehouse is the multitiered computer storehouse of current and historical data. Data warehouse management requires that the detailed data from operational systems be extracted, transformed, and stored (warehoused) so that the various database tables from both inside and outside the company are consistent. All this feeds into the decision support system that automates or assists business decision making.

Numerous database search and retrieval systems are available by subscription or in libraries. Computer-assisted database searching has made the collection of external data faster and easier. Managers refer to many different types of databases. Although personal computers work independently, they can connect to other computers in networks to share data and software. Electronic data interchange (EDI) allows one company's computer system to join directly to another company's system.

Knowledge management systems (KMS) refer to a class of information systems applied to managing organizational knowledge. Reviewing the literature discussing applications of IT to organizational knowledge management initiatives reveals three common applications:

(1) the coding and sharing of best practices,

(2) the creation of corporate knowledge directories, and

(3) the creation of knowledge networks. One of the most common applications is internal benchmarking with the aim of transferring internal best practices (KPMG 1998a; O'Dell and Grayson 1998).

Information systems designed to support and augment organizational knowledge management need to complement and enhance the knowledge management activities of individuals and the collectivity. To achieve this, the design of information systems should be rooted in and guided by an understanding of the nature and types of organizational knowledge.

An understanding is needed for formulating a knowledge management strategy and in analyzing the role of information technology in facilitating knowledge management. In the information systems (IS) field, it has been common to design systems primarily focused on the codified knowledge (that is, explicit organizational knowledge). Management reporting systems, decision support systems, and executive support systems have all focused on the collection and dissemination of this knowledge type.

IT as applied to KM need not be constrained to certain types of knowledge, because the advances in communication and information technologies enable greater possibilities than existed with previous classes of information systems. While the preponderance of knowledge management theory stems from strategy and organizational theory research, most knowledge management initiatives involve at least in part, if not to a significant degree, information technology. Yet little IT

research exists on the design, use, or success of systems to support knowledge management.

According to a framework, grounded in the sociology of knowledge (Berger and Luckman 1967; Gurvitch 1971; Holzner and Marx 1979, organizations as knowledge systems consist of four sets of socially enacted "knowledge processes":

(1) creation (also referred to as construction)

(2) storage/retrieval

(3) transfer

(4) application (Holzner and Marx 1979; Pentland 1995)

This view of organizations as knowledge systems represents both the cognitive and social nature of organizational knowledge and its embodiment in the individual's cognition and practices as well as the collective (i.e., organizational) practices and culture. These processes do not represent a monolithic set of activities, but an interconnected and intertwined set of activities, as explained later in this section.

Knowledge Creation

Organizational knowledge creation involves developing new content or replacing existing content within the organization's tacit and explicit knowledge (Pentland 1995). Through social and collaborative processes as well as an individual's cognitive processes (e.g., reflection), knowledge is created, shared, amplified, enlarged, and justified in organizational settings (Nonaka 1994). This model views organizational knowledge creation as involving a continual interplay between the tacit and explicit dimensions of knowledge and a growing spiral flow as knowledge moves through individual, group, and organizational levels.

Four modes of knowledge creation have been identified: socialization, externalization, internalization, and combination (Nonaka 1994).

The socialization mode refers to conversion of tacit knowledge to new tacit knowledge through social interactions and shared experience among organizational members (e.g., apprenticeship).

The combination mode refers to the creation of new explicit knowledge by merging, categorizing, reclassifying, and synthesizing existing explicit knowledge (e.g., literature survey reports).

The other two modes involve interactions and conversion between tacit and explicit knowledge. Externalization refers to converting tacit knowledge to new explicit knowledge (e.g., articulation of best practices or lessons learned).

Internalization refers to creation of new tacit knowledge from explicit knowledge (e.g., the learning and understanding that results from reading or discussion).

The four knowledge creation modes are not pure, but highly interdependent and intertwined. That is, each mode relies on, contributes to, and benefits from other modes. For example, the socialization mode can result in creation of new knowledge when an individual obtains a new insight triggered by interaction with another. On the other hand, the socialization mode may involve transferring existing tacit knowledge from one member to another through discussion of ideas.

New organizational knowledge per se may not be created, but only knowledge that is new to the recipient. The combination mode in most cases involves an intermediate step - that of an individual drawing insight from explicit sources (i.e., internalization) and then coding the new knowledge into an explicit form (externalization).

Finally, internalization may consist of the simple conversion of existing explicit knowledge to an individual's tacit knowledge as well as creation of new organizational knowledge when the explicit source triggers a new insight.

Knowledge Storage/Retrieval

Empirical studies have shown that while organizations create knowledge and learn, they also forget (i.e., do not remember or lose track of the acquired knowledge) (Argote et al. 1990; Darr et al. 1995). Thus, the storage, organization, and retrieval of organizational knowledge, also referred to as organizational memory (Stein and Zwass 1995; Walsh and Ungson 1991), constitute an important aspect of effective organizational knowledge management.

Organizational memory includes knowledge residing in various component forms, including written documentation, structured information stored in electronic databases, codified human knowledge stored in expert systems, documented organizational procedures and processes and tacit knowledge acquired by individuals and networks of individuals (Tan et al. 1999).

Like the knowledge creation process, a distinction between individual and organizational memory has been made in the literature. Individual memory is developed based on a person's observations, experiences, and actions (Argyris and

Schön 1978; Nystrom and Starbuck 1981; Sanderlands and Stablein 1987). Collective or organizational memory is defined as "the means by which knowledge from the past, experience, and events influence present organizational activities" (Stein and Zwass 1995, p. 85).

Organizational memory extends beyond the individual's memory to include other components such as organizational culture, transformations (production processes and work procedures), structure (formal organizational roles), ecology (physical work setting) and information archives (both internal and external to the organization) (Walsh and Ungson 1991).

Organizational memory is classified as semantic or episodic (El Sawy et al. 1996; Stein and Zwass 1995). Semantic memory refers to general, explicit, and articulated knowledge (e.g., organizational archives of annual reports), whereas episodic memory refers to context-specific and situated knowledge (e.g., specific circumstances of organizational decisions and their outcomes, place, and time).

Memory may have both positive and negative potential influences on behavior and performance. On the positive side, basing and relating organizational change in experience facilitates implementation of the change (Wilkins and Bristow 1987). Memory also helps in storing and reapplying workable solutions in the form of standards and procedures, which in turn avoid the waste of organizational resources in replicating previous work. On the other hand, memory has a potential negative influence on individual and organizational performance.

At the individual level, memory can result in decision-making bias (Starbuck and Hedberg 1977). At the organizational level, memory may lead to maintaining the status quo by reinforcing single loop learning (defined as a process of detecting and correcting errors) (Argyris and Schön 1978). This could in turn lead to stable, consistent organizational cultures that are resistant to change (Denison and Mishra 1995).

Knowledge Transfer

Considering the distributed nature of organizational cognition, an important process of knowledge management in organizational settings is the transfer of knowledge to locations where it is needed and can be used. However, this is not a simple process in that organizations often do not know what they know and have weak systems for locating and retrieving knowledge that resides in them (Huber 1991).

Communication processes and information flows drive knowledge transfer in organizations. Gupta and Govindarajan (2000) have conceptualized knowledge transfer (knowledge flows in their terminology) in terms of five elements:

(1) perceived value of the source unit's knowledge

(2) motivational disposition of the source (i.e., their willingness to share knowledge)

(3) existence and richness of transmission channels

(4) motivational disposition of the receiving unit (i.e., their willingness to acquire knowledge from the source)

(5) the absorptive capacity of the receiving unit, defined as the ability not only to acquire and assimilate but also to use knowledge (Cohen and Levinthal 1990)

The least controllable element is the fifth: knowledge must go through a recreation process in the mind of the receiver (El Sawy et al. 1998). This recreation depends on the recipient's cognitive capacity to process the incoming stimuli (Vance and Eynon 1998).

Knowledge Application

An important aspect of the knowledge-based theory of the firm is that the source of competitive advantage resides in the application of the knowledge rather than in the knowledge itself. Grant (1996b) identifies three primary mechanisms for the integration of knowledge to create organizational capability: directives, organizational routines, and self-contained task teams.

Directives refer to the specific set of rules, standards, procedures, and instructions developed through the conversion of specialists' tacit knowledge to explicit and integrated knowledge for efficient communication to non-specialists (Demsetz 1991). Examples include directives for hazardous waste disposal or airplane safety checks and maintenance.

Organizational routines refer to the development of task performance and coordination patterns, interaction protocols, and process specifications that allow individuals to apply and integrate their specialized knowledge without the need to articulate and communicate what they know to others. Routines may be relatively simple (e.g., organizing activities based on time patterned sequences such as an assembly line), or highly complex (e.g., a cockpit crew flying a large passenger airplane).

The third knowledge integration mechanism is the creation of self-contained task teams. In situations in which task uncertainty and complexity prevent the specification of directives and organizational routines, teams of individuals with prerequisite knowledge and specialty are formed for problem solving.

Technology can support knowledge application by embedding knowledge into organizational routines. Procedures that are culture-bound can be embedded into IT so that the systems themselves become examples of organizational norms.

Knowledge Management may be viewed in terms of:

- People – how do you increase the ability of an individual in the organisation to influence others with their knowledge.
- Processes – Its approach varies from organization to organization. There is no limit on the number of processes.
- Technology – It needs to be chosen only after all the requirements of a knowledge management initiative have been established.

At present knowledge and its proper management became an essential issue for every organization. In the modern globalized world, organizations cannot survive in a sustainable way without efficient knowledge management. Knowledge management cycle (KMC) is a process of transforming information into knowledge within an organization, which explains how knowledge is captured, processed, and distributed in an organization. For the better performance organizations require a practical and coherent strategy and comprehensive KMC.

Wiig (1999a) discussed about two Knowledge Management Cycles:

a) Institutional Knowledge Evolution Cycle

b) Personal Knowledge Evolution Cycle.

They can help organizations to structure their activities and priorities.

The Institutional Knowledge Evolution Cycle considers five stages as follows (Wiig, 1999b):

- **Knowledge development**: Knowledge is developed through learning, innovation, creativity, and importation from outside.
- **Knowledge acquisition**: Knowledge is captured and retained for use and further treatment.

- **Knowledge refinement**: Knowledge is organized, transformed, or included in written material, knowledge bases, and so on to make it available to be useful.

- **Knowledge distribution and deployment**: Knowledge is distributed to Points-of-Action through education, training programs, automated knowledge-based systems, expert networks, to name a few; to people, practices, embedded in technology and procedures, etc.

- **Knowledge leveraging**: Knowledge is applied or otherwise leveraged. By using knowledge, it becomes the basis for further learning and innovation as explained by other mechanisms.

The Personal Knowledge Evolution Cycle also has five stages that depict how knowledge, as it becomes better established in an individual's mind, migrates from barely perceived notions to be better understood and useful.

The five stages of this cycle are as follows (Wiig, 1999b):

- **Tacit subliminal knowledge**: This knowledge is mostly non-conscious and is not well understood. It is often the first glimpse we have of a new concept.

- **Idealistic vision and paradigm knowledge**: Part of this knowledge is well known to us and explicit and we work consciously with it. Much of it such as, our visions and mental models is not well known, it is tacit and only accessible by non-consciously.

- **Systematic schema and reference methodology knowledge**: Our knowledge of underlying systems, general principles, and problem-solving strategies is, to a large extent, explicit and mostly well known to us.

- **Pragmatic decision-making and factual knowledge**: Decision-making knowledge is practical and mostly explicit. It supports everyday work and decisions, is well known, and is used consciously.

- **Automatic routine working knowledge**: We know this knowledge so well that we have automated it. Most has become tacit and we use it to perform tasks automatically, without conscious reasoning.

A major advantage of the Wiig approach to the KMC is the clear and detailed description of how organizational memory is put into use to generate value for individuals, groups, and the organization itself. The ways in which knowledge can

be applied and used are linked to decision making sequences and individual characteristics.

Wiig also emphasizes the role of knowledge and skill, the business use of that knowledge, constraints that may prevent that knowledge from being fully used, opportunities and alternatives to manage that knowledge, and the expected value added to the organization (Dalkir, 2005). In brief, the strength of the Wiig KMC is that it has a clear description of how organizational memory is put into use to generate value for individuals, groups, and the organization.

Summary

- Business research is the application of the scientific method in searching for truth about business phenomena.
- Applied business research seeks to facilitate managerial decision making. It is directed toward a specific managerial decision in a particular organization.
- Basic or pure research seeks to increase knowledge of theories and concepts.
- Businesses can make more accurate decisions about dealing with problems and/or the opportunities to pursue and how to best pursue them.
- Evaluation research is conducted to inform managers whether planned activities were properly executed and whether they accomplished what they were expected to do.
- Managers determine whether research should be conducted based on time constraints, availability of data, the nature of the decision to be made, and the benefit of the research information versus its cost.
- Business research is the application of the scientific method in searching for the truth about business phenomena.
- The need to make intelligent, informed decisions ultimately motivates an organization to engage in business research.
- A database is a collection of raw data arranged logically and organized in a form that can be stored and processed by a computer.
- Knowledge management systems (KMS) refer to a class of information systems applied to managing organizational knowledge.

- Four modes of knowledge creation have been identified: socialization, externalization, internalization, and combination (Nonaka 1994).
- Wiig (1999a) discussed about two Knowledge Management Cycles: a) Institutional Knowledge Evolution Cycle and b) Personal Knowledge Evolution Cycle.

Review Question

1. Briefly describe decision-making process.
2. State some advantages of internal consultants/researchers.
3. State some disadvantages of external consultants/researchers.
4. When is a business research needed?
5. Write a note on Knowledge Management System.
6. What are the five knowledge transfer elements?
7. Explain the Institutional Knowledge Evolution Cycle.
8. How many stages does the Personal Knowledge Evolution Cycle have? Briefly explain them.
9. How is Organizational memory classified?

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UNIT 2

2

ROLE OF BUSINESS RESEARCH

Unit Structure

2.1 Overview

After studying this chapter, the learner should be able to:

- Know general method of theory building research in applied disciplines.
- Understand multiple purposes of theory building.
- Have in-depth knowledge on research processes.
- Understand the perspective of Organizational Ethics.
- Gain insights about research problems.

2.2 Introduction

Before considering the generic methodological components of theory building, it might be helpful to highlight and discuss considerations general to theory-building research. The first is the notion of the multiple purposes of theory-building research methods. Second is a brief presentation and description of two commonly used strategies in theory building. And finally, consideration is given to the requirement of expertise in both knowledge of and experience with the phenomenon that is the focus of the theory-building endeavor.

Like all abstractions, the word "theory" has been used in many ways, in many different contexts, at times so broadly as to include almost all descriptive statements about a class of phenomena, and at other times so narrowly as to exclude everything but a series of terms and their relationships that satisfies certain logical requirements.

2.3 Theory Building

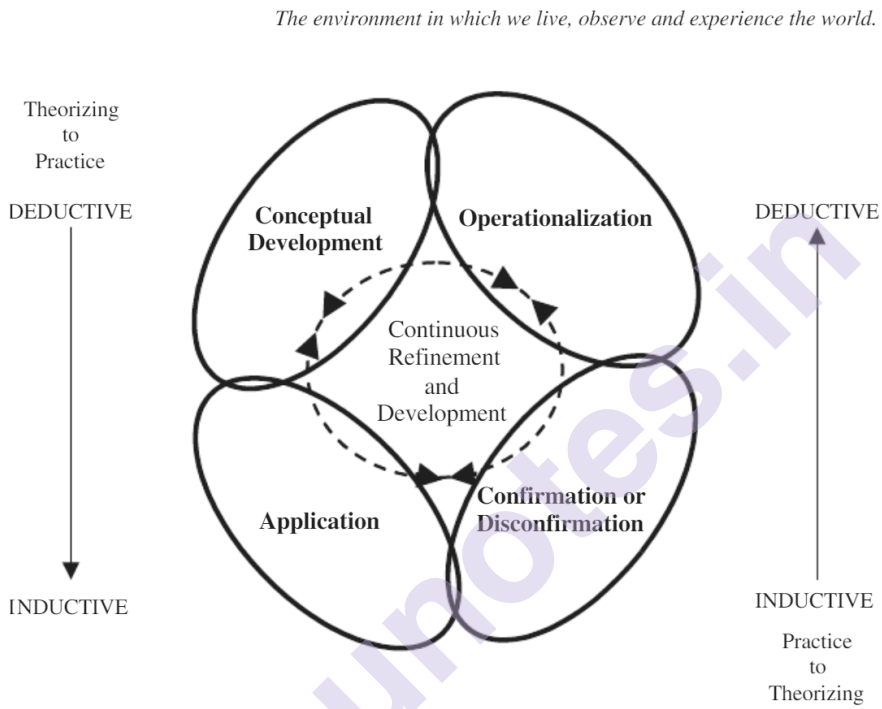

Figure 2.1: The General Method of Theory Building Research in Applied Disciplines

Following concepts provide a brief description of each of the five phases of the general method of applied theory-building research as portrayed in Figure 2.1, referenced from the research paper by Lynham, Susan (2002) – "The General Method of Theory-Building Research in Applied Disciplines.".

Conceptual Development

Concepts serve critical functions in science, through their descriptive powers and as the building-blocks of theory. When concepts are immature, therefore, science suffers. Consequently, concept development ought to be considered a fundamental scientific activity. Knowledge of the different approaches to concept development, however, is relatively limited in the management discipline. Concepts abstract

reality. That is, concepts express in words various events or objects. Concepts, however, may vary in degree of abstraction. For example, the concept of an asset is an abstract term that may, in the concrete world of reality, refer to a wide variety of things, including a specific punch press machine in a production shop.

The different approaches to concept development are known variously as:

- concept analysis (Bohman, 1992; Klausmeier & Goodwin, 1975; Meleis, 1991; Messias, 1996; Rodgers, 1989; Sartori, 1984; Walker & Avant, 1983; Wilson, 1963; Wuest, 1994)
- concept clarification (Berthold, 1964; Meleis, 1991; Morse, 1995; Norris, 1982)
- concept comparison (Morse, 1995)
- concept correction (Morse, 1995)
- concept delineation (Morse, 1995)
- concept derivation (Walker & Avant, 1983)
- concept development (Chinn & Jacobs, 1983; Meleis, 1991; Schwartz-Barcott & Kim, 1986)
- concept exploration (Messias, 1996)
- concept identification (Morse, 1995)
- concept integration (Meleis, 1996)
- concept synthesis (Walker & Avant, 1983)

In the end, researchers are concerned with the observable world, or what we shall loosely term reality. Theorists translate their conceptualization of reality into abstract ideas. Thus, theory deals with abstraction. Things are not the essence of theory; ideas are. Concepts in isolation are not theories.

Operationalization

Operationalization works by identifying specific indicators that will be taken to represent the ideas we are interested in studying. It basically involves spelling out precisely how a concept will be measured. Operational definitions must include the variable, the measure, and how you plan to interpret the measure. Indexes, scales, and typologies are used to measure multi-dimensional concepts. It can be helpful to look at how researchers have measured the concept in previous studies. The purpose of the operationalization phase of theory-building research is essentially an explicit connection between the conceptualization phase and practice.

Operationalization reaches towards an overlap between the theorizing and practice components of the theory-building research process. A primary output of the theorizing component of theory-building research in applied disciplines is therefore an operationalized theoretical framework, that is, an informed theoretical framework that has been converted into components or elements that can be further inquired into and confirmed through rigorous research and relevant application.

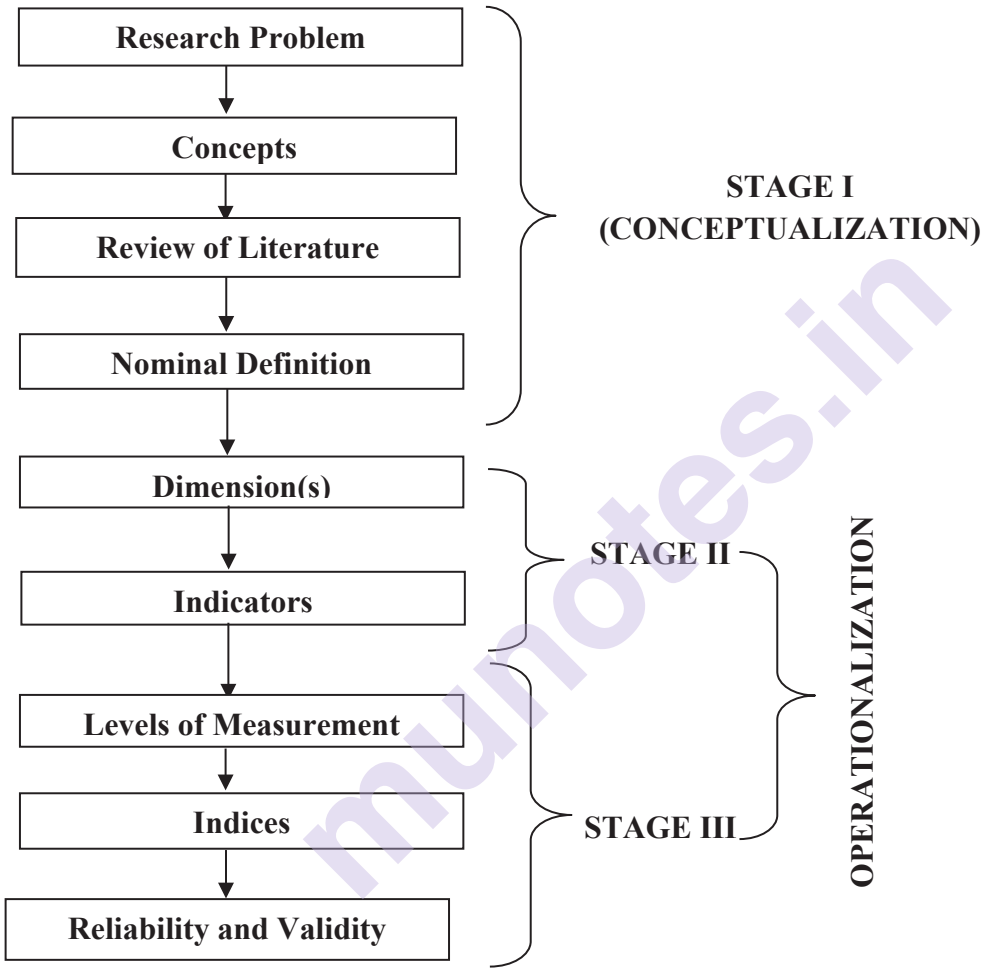

Figure 2.2: Research Process: Conceptualization & Operationalization

Researchers need to be aware of the various dimensions of the concepts that are in vogue and clarify which ones they are interested in the context of a research problem. Dimensions are usually 'concepts' themselves. In practice often the terms: concept and dimension are used interchangeably. In empirical research we are more interested in dimensions rather than in concepts, per se. Concepts having more than one dimension are known as constructs.

Once the researcher finalizes the relevant concepts (constructs), their working definitions and the theoretical framework which links them, the researcher must determine the appropriate scales of measuring the variability in them. That is the researcher now must move to the operationalization or measurement stage of concepts of interest. Here the researcher must specify the operations that will indicate the value of cases on a concept (variable).

Confirmation or Disconfirmation

The confirmation or disconfirmation phase falls within the practice component of applied theory building. This theory-building phase involves the planning, design, implementation, and evaluation of an appropriate research agenda and studies to purposefully inform and intentionally confirm or disconfirm the theoretical framework central to the theory. When adequately addressed, this third phase results in a confirmed and trustworthy theory that can then be used with some confidence to inform better action and practice. This is the process of choosing cases that either serve as supplementary examples that lend further support, richness and depth to patterns emerging from data analysis (confirming cases) or serve as examples that do not fit emergent patterns and allow the research team to evaluate rival explanations (disconfirming cases). This can help the research team understand and define the limitations of research findings.

Application

A theory that has been confirmed in the contextual world to which it applies (i.e., operationalized) and has, at least to some extent, gone through inquiry in the practical world is not enough. A theory must also be threaded through the application phase. The application of the theory to the problem, phenomenon, or issue in the world of practice is in the practice component of the general theory-building research method. Application of the theory enables further study, inquiry, and understanding of the theory in action. An important outcome of this application phase of theory building is therefore that it enables the theorist to use the experience and learning from the real-world application of the theory to further inform, develop, and refine the theory. It is in the application of a theory that practice gets to judge and inform the usefulness and relevance of the theory for improved action and problem solving (Lynham, 2000b). And it is through this application that the practical world becomes an essential source of knowledge and experience for ongoing development of applied theory (Ruona & Lynham, 1999; Swanson, 1997).

Continuous Refinement and Development

Because a theory is never "complete," it is necessary that the theory be continually refined and developed (Cohen, 1991; Root, 1993). This recursive nature of applied theory-building research requires the ongoing study, adaptation, development, and improvement of the theory in action and ensures that the relevance and rigor of the theory are continuously attended to and improved on by theorists through further inquiry and application in the real world. This continuing phase marks a further overlap between the practice and theorizing components of applied theory-building research.

This phase addresses the responsibility of continuous attention to the trustworthiness and substantive quality of the theory that is the burden of the theorist (Dubin, 1978; Van de Ven, 1989). The intentional outcome of this phase is thus to ensure that the theory is kept current and relevant and that it continues to work and have utility in the practical world. It also ensures that when the theory is no longer useful, or is found to be "false," that it is shown to be as such and adapted or discarded accordingly.

At the abstract, conceptual level, a theory may be developed with deductive reasoning by going from a general statement to a specific assertion. Deductive reasoning is the logical process of deriving a conclusion about a specific instance based on a known general premise or something known to be true. At the empirical level, a theory may be developed with inductive reasoning. Inductive reasoning is the logical process of establishing a general proposition based on observation of particular facts. Over the course of time, theory construction is often the result of a combination of deductive and inductive reasoning. Our experiences lead us to draw conclusions that we then try to verify empirically by using the scientific method. The scientific method is a set of prescribed procedures for establishing and connecting theoretical statements about events, for analyzing empirical evidence, and for predicting events yet unknown. It is useful to look at the analytic process of scientific theory building as a series of stages.

2.4 Organizational Ethics and Issues

Ethics are of interest to business scholars because they influence decisions, behaviors, and outcomes. While scholars have increasingly shown interest in business ethics as a research topic, there are a mounting number of studies that examine ethical issues at the organizational level of analysis.

When we talk about organizational ethics, we are referring to the set of values that identify an organization, from within (or, to put another way, how those working in the organization understand it) as well as from without (the perception of the organization by those who have dealings with it). Such a set of values can be considered in a broad sense (that is, the set of values structuring the organization and its practices, be they instrumental or final values, positive or negative) or in a stricter sense (where we shall refer only to those values that express the vision, the raison d'être and the commitments of the organization, and that are linked to their corporate and moral identity).

Generalizing, we could say that in the first case we would find those organizations that ask themselves how to make progress "in search of excellence"; in the second, those organizations that ask themselves "what is necessary for corporate moral excellence?"

This means that when speaking of Organizational Ethics, one can speak from various perspectives:

- One can focus on the practices: from this perspective what is relevant is to identify the values which in fact structure organizational practices. That is, basically to become aware.
- One can focus on formal statements: from this perspective what is relevant is to elaborate the discourse which is proposed as a value reference of the organization. That basically involves formal declarations or statements.
- One can focus on the processes: relevant to Organizational Ethics from this perspective are organizational learning processes which permit continual re-elaboration and reinterpretation of the relationship between statements and practices. That is, basically to narrate and institutionalize.
- One can focus on the project, stressing what, from this perspective, is relevant to innovation and the creation of corporate identity. Both should be an expression of the contribution that an organization makes to society in so far as it is, simultaneously, economic actor and social actor. That is, basically to build and to institutionalize.

We should not understand these four perspectives as being mutually exclusive – quite the opposite. However, we should consider their different 'accents' and that they can form an evolutionary sequence. At any rate, these 'accents' should make us aware of the fact that when we speak of Organizational Ethics, we are not referring to a standardized concept but to an option concerning our very understanding of Organizational Ethics.

In our case, we adopt a perspective that conceives of Organizational Ethics as an opportunity for learning and innovation. This also means that we position ourselves within what we termed earlier a stricter view (which is one that is not merely descriptive or instrumental) and which will lead us on to speak of reflective Organizational Ethics. In other words, it will go beyond Organizational Ethics as a process of awareness to one in which Organizational Ethics is understood as a project.

Business ethics is the application of morals to behavior related to the business environment or context. Generally, good ethics conforms to the notion of "right," and a lack of ethics conforms to the notion of "wrong." Highly ethical behavior can be characterized as being fair, just, and acceptable. Ethical values can be highly influenced by one's moral standards. Moral standards are principles that reflect beliefs about what is ethical and what is unethical. More simply, they can be thought of as rules distinguishing right from wrong. The Golden Rule, "Do unto others as you would have them do unto you," is one such ethical principle.

An ethical dilemma simply refers to a situation in which one chooses from alternative courses of actions, each with different ethical implications. Each individual develops a philosophy or way of thinking that is applied to resolve the dilemmas they face. Many people use moral standards to guide their actions when confronted with an ethical dilemma. Others adapt an ethical orientation that rejects absolute principles. Their ethics are based more on the social or cultural acceptability of behavior. If it conforms to social or cultural norms, then it is ethical. From a moral theory standpoint, idealism is a term that reflects the degree to which one accepts moral standards as a guide for behavior. Relativism is a term that reflects the degree to which one rejects moral standards in favor of the acceptability of some action.

This way of thinking rejects absolute principles in favor of situation-based evaluations. Thus, an action that is judged ethical in one situation can be deemed unethical in another. In contrast, idealism is a term that reflects the degree to which one bases one's morality on moral standards. Someone who is an ethical idealist will try to apply ethical principles like the golden rule in all ethical dilemmas.

Research Problem

A code of ethics is a formal statement of the organization's ethics and values that is designed to guide the employees conduct in a variety of business situations. Business ethics relate to corporate credos like the popular Johnson & Johnson Credo. A corporate credo indicates a company's responsibility to its stakeholders,

such as individuals and groups who have an interest in the performance of the enterprise and how it uses its resources. Gomez-Mejia and Balkin (2002) posit that stakeholders include employees, customers, and shareholders. They state also that a corporate credo focuses on principles and beliefs that can provide direction in a variety of ethically challenging situations. Good corporate credos often emphasize corporate social responsibility (CSR) ethical corporate social responsibility (ECSR) good corporate governance (GCG) as well as the need for business profitability and sustainability. Sustainability is often confused with CSR, but the two are not the same.

The return of interest in business ethics that began in the 1970s was in realization that businesses could be tempted to act immorally and unethically whenever necessary in pursuit of profit. This interest grew rapidly in later years and almost reached a crescendo in the 2000s when it became clearer that many heavy global businesses like Enron collapsed for the most part, due to breaches in GCG and business ethics. It is now believed, more than ever before, that business ethics are also instrumental to the pursuit of long-term profit for the business, as well as prosperity and sustainability for the organization and society.

Organizational sustainability thrives on integrity of the board of directors (BODs). Integrity is an ethical issue and for sound corporate performance, the Organization for Economic Co-operation and Development (OECD) principles of corporate governance state that the BODs should exercise leadership and judgment, with enterprise and integrity, to achieve continuing prosperity for the corporation. The BODs should also act in the best interests of the business enterprise in a manner based on transparency, accountability to shareholders and responsibility to stakeholders. Emphasis is put on integrity as an important ethical factor in enterprise prosperity and continuity (Ezeh, 2019).

Organizations will not adequately meet its goals and ensure sustainability where there are breeches in business ethics and standards. For example, the accounting and auditing scandals that led to the, collapse of Enron, WorldCom and many banks in the 1990s/2000s, and the misfortune of Cadbury Nigeria Plc border on management ineffectiveness, indiscipline and failure to observe the principles of business ethics. Discipline relates to the theory of ethics which Kant (1724 – 1804) thought as what is morally right or wrong in social conduct. Business ethics therefore demands a high dose of discipline among members of the BODs of a company or any other organization to be able to run the organization professionally along ethical lines.

A major challenge of the application of business ethics in many global organizations is the quest for profitability instead of sustainability. Profitability often has a short-term dimension as against sustainability dimension that is future-oriented. The inability of BODs to clearly interpret and understand the Friedmanian theory that while CSR of any business is to increase its profits ethical values drive wealth creation and rooted in the organizational cultures of the wealth-creating opportunities. Although this is frequently forgotten because of the prominence usually given to the value-empty economic theory of profitability. The issue is that the BODs should apply business ethics by responding to public opinion as expressed by customers, by pressure groups or trade unions or by rules, regulations and laws. This will reflect an organization suitably structured to effect GCG, as well as reporting systems structured to provide ethical values, transparency and accountability. This will support the Porterian theory of creating shared value and recognizing that the interest of different stakeholders receives responsible weight (Trevino, 1986; Gellerman, 1989; Van Marrewijk, 2003; Adeyemi and Olamide, 2011; Porter and Kramer, 2011; Okaro and Okafor, 2013). In view of the various organizational problems linked to breaches in business ethics, this researcher believes that the solution lays in continuous search for the right answer. Even though business ethicists propagate that every business should take the ethical path to ensure sustainability the extent to which this can be achieved is yet to be determined.

The research findings by Pflugrath, Martinov-Bennie and Chen state that the code of ethics (namely International Standard on Quality Control 1: ISQC1) has a positive impact on the quality of auditors' judgments. These findings confirm that the code of ethics benefits the organization in terms of ethical performance improvement and corporate ethical reputation. The code of ethics not only encourages employees to perform ethically and professionally, but it also shows a signal to the public that a code of ethics exists within a company. Using the code of ethics is helpful for a company to promote its positive image and reputation. However, the accomplishment of such sustainable development programs as mentioned earlier, requires the support of ethical culture.

A study by Park and Blenkinsopp argues that employees' compliance to the code of ethics is increased when it is supported by ethical culture. Some evidence supports that a strong ethical culture in the organization may provide it with financial benefits. Their reputation for ethical culture is associated with a high level of employee and customer loyalty. Hence, it can be said that doing business ethically can improve financial performance. Many companies realize the significance of ethical culture, but they need to know how to promote ethical

culture in the workplace. The corporate ethical virtues (CEV) model developed by Kaptein is one approach that could be applied to promote the ethical culture of an organization (Figure 2.3).

Figure 2.3 highlights the link between the eight organizational virtues (clarity, congruency of supervisors, congruency of senior management, feasibility, supportability, transparency, discussability, and sanctionability) and ethical culture. The presence of these organizational virtues could be helpful to develop organizational ethical culture. These organizational virtues are discussed as follows.

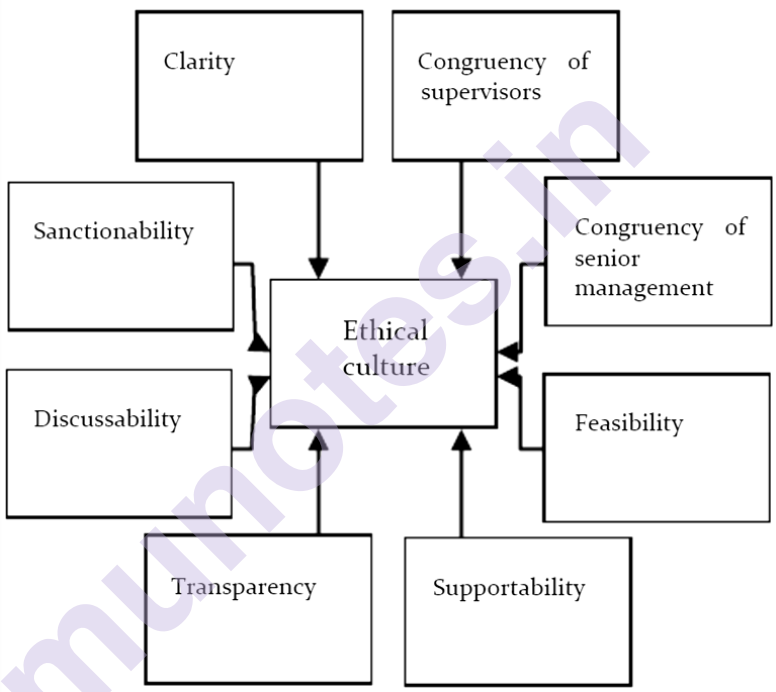

Figure 2.3 The CEV model

- First, an organization with the clarity of normative expectations regarding ethical conduct assists its employees to distinguish between ethical and unethical conduct.
- Second, congruency of supervisors and third, congruency of senior management, with these normative expectations, encourage employees to behave ethically. If supervisors and senior management show an example of ethical behavior, employees will be motivated to do the same.
- Fourth, feasibility refers to the extent to which an organization sets the conditions which enable employees to act in accordance with the normative

expectations. Unethical behavior of employees might occur when they lack the conditions or resources (such as time, budgets, information, etc.) provided by an organization to fulfill their responsibilities.

- Fifth, supportability refers to the extent to which an organization supports its employees to meet normative expectations. The organization should be able to motivate its members to comply with ethical standards.
- Sixth, transparency or visibility in the organization is important to the encouragement of ethical decision-making and behavior among employees. It is defined as "the degree to which employee conduct and its consequences are perceptible to those who can act upon it".
- Seventh, discussability is the opportunities to discuss ethical issues in a company. A high level of discussability helps employees to realize their ethical/unethical behavior to make them feel they are ready to improve their conduct.
- Eighth, sanctionability refers to the extent to which the organization reinforces ethical behavior in the workplace by rewarding ethical behavior and punishing unethical behavior. The organizational virtue of sanctionability reflects that the organization values ethical behavior.

The CEV model provides an understanding of the determinants of ethical culture. Organizations with the capability to create ethical virtues can gain success in developing an ethical culture in the workplace. However, the CEV model should be investigated further, particularly in different areas or regions where people hold different cultural values. The CEV model may need to be adapted to a specific area to effectively produce an ethical culture in various types of organizations as well as in various countries.

Summary

- Concepts serve critical functions in science, through their descriptive powers and as the building-blocks of theory
- Operationalization reaches towards an overlap between the theorizing and practice components of the theory-building research process
- The confirmation or disconfirmation phase falls within the practice component of applied theory building.
- At the abstract, conceptual level, a theory may be developed with deductive reasoning by going from a general statement to a specific assertion.

- One can focus on the practices: from this perspective what is relevant is to identify the values which in fact structure organizational practices. That is, basically to become aware.
- One can focus on formal statements: from this perspective what is relevant is to elaborate the discourse which is proposed as a value reference of the organization. That basically involves formal declarations or statements.
- One can focus on the processes: relevant to Organizational Ethics from this perspective are organizational learning processes which permit continual re-elaboration and reinterpretation of the relationship between statements and practices. That is, basically to narrate and institutionalize.
- One can focus on the project, stressing what, from this perspective, is relevant to innovation and the creation of corporate identity. Both should be an expression of the contribution that an organization makes to society in so far as it is, simultaneously, economic actor and social actor. That is, basically to build and to institutionalize.
- Business ethics is the application of morals to behavior related to the business environment or context.
- A code of ethics is a formal statement of the organization's ethics and values that is designed to guide the employees conduct in a variety of business situations.
- As per a research, there are eight organizational virtues.
- First, an organization with the clarity of normative expectations regarding ethical conduct assists its employees to distinguish between ethical and unethical conduct.
- Second, congruency of supervisors and third, congruency of senior management, with these normative expectations, encourage employees to behave ethically. If supervisors and senior management show an example of ethical behavior, employees will be motivated to do the same.
- Fourth, feasibility refers to the extent to which an organization sets the conditions which enable employees to act in accordance with the normative expectations. Unethical behavior of employees might occur when they lack the conditions or resources (such as time, budgets, information, etc.) provided by an organization to fulfill their responsibilities.

- Fifth, supportability refers to the extent to which an organization supports its employees to meet normative expectations. The organization should be able to motivate its members to comply with ethical standards.
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- Eighth, sanctionability refers to the extent to which the organization reinforces ethical behavior in the workplace by rewarding ethical behavior and punishing unethical behavior. The organizational virtue of sanctionability reflects that the organization values ethical behavior.

Review Question

1. Explain the general method of theory building research.
2. What is operationalization?
3. What is the role of Continuous Refinement and Development in Business Research?
4. Write a note on Organizational Ethics.
5. Briefly explain corporate ethical virtues model.

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UNIT 2

3

PROBLEM DEFINITION: THE FOUNDATION OF BUSINESS RESEARCH

Unit Structure

3.0 Objective

- Importance of research
- Understanding the different phases of research
- Beginning with research process

3.1 Importance of Starting with a Good Problem Definition

When the client fails to understand their situation or insists on studying an irrelevant problem, the research is very likely to fail, even if it is done perfectly. Translating a business situation into something that can be researched is somewhat like translating one language into another. It begins by coming to a consensus on a decision statement or question. A **decision statement** is a written expression of the key question(s) that a research user wishes to answer. It is the reason that research is being considered. It must be well stated and relevant. The researcher translates this into research terms by rephrasing the decision statement into one or more research objectives. These are expressed as deliverables in the research proposal. The researcher then further expresses these in precise and scientific research terminology by creating research hypotheses from the research objectives.

For simplicity, the term **problem definition** is adapted here to refer to the process of defining and developing a decision statement and the steps involved in translating it into more precise research terminology, including a set of research objectives. If this process breaks down at any point, the research will almost certainly be useless or even harmful. It will be useless if it presents results that simply are deemed irrelevant and do not assist in decision making. It can be harmful both because of the wasted resources and because it may misdirect the company in a poor direction. Ultimately, it is difficult to say that any one step in the research process is most important. However, formally defining the problem to be attacked by developing decision statements and translating them into actionable research objectives must be done well or the rest of the research process is misdirected. Even a good road map is useless unless you know just where you are going. All of the roads can be correctly drawn, but they still don't get you where you want to be. Similarly, even the best research procedures will not overcome poor problem definition.

3.2 Problem Complexity

Ultimately, the quality of business research in improving business decisions is limited by the quality of the problem definition stage. This is far from the easiest stage of the research process. Indeed, it can be the most complex. Figure below helps to illustrate factors that influence how complex the process can be.

1. Situation Frequency

Many business situations are cyclical. Cyclical business situations lead to recurring business problems. These problems can even become routine. In these cases, it is easy to define problems and identify the types of research that are needed. In some cases, problems are so routine that they can be solved without any additional research. Recurring problems can even be automated through a company's DSS.

For example, pricing problems often occur routinely. Just think about how the price of gas fluctuates when several stations are located within sight of each other. One station's prices definitely affect the sales of the other stations as well as of the station itself. Similarly, automobile companies, airline companies, and computer companies, to name just a few, face recurring pricing issues. Because these situations recur so frequently, addressing them becomes routine. Decision makers know how to communicate them to researchers and researchers know what data are needed.

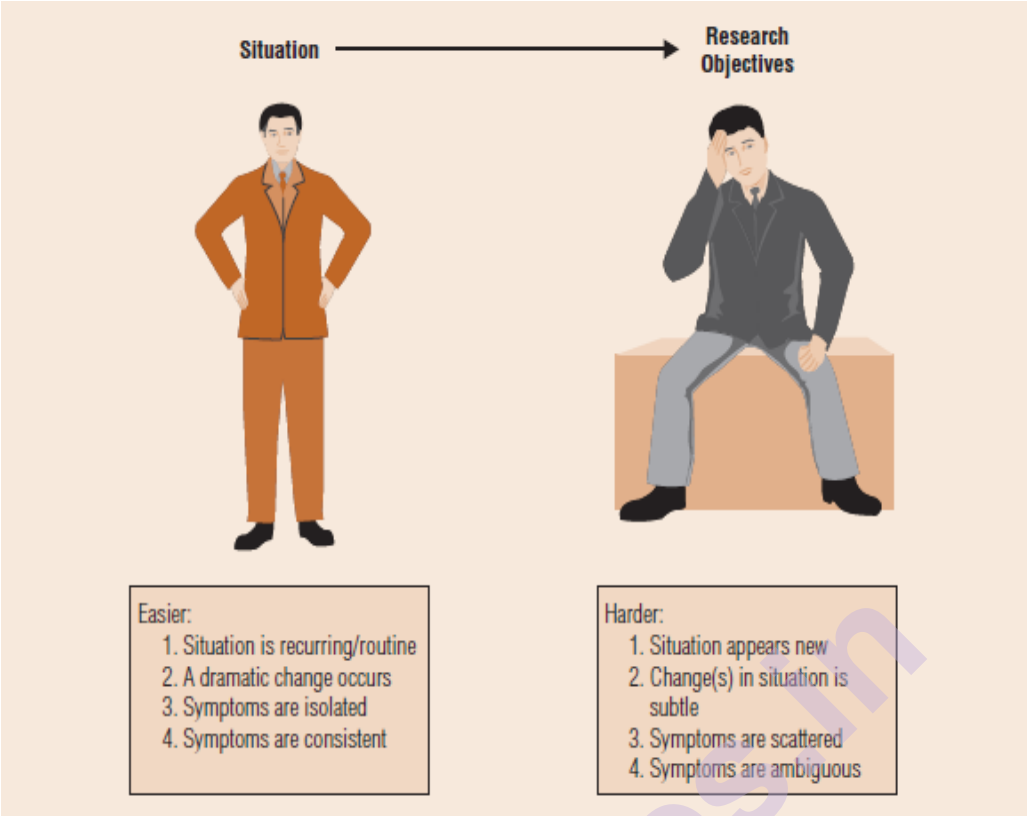

Figure a: how to define research objectives?

2. Dramatic Changes

When a sudden change in the business situation takes place, it can be easier to define the problem. For example, if Deland's business had increased sharply at the beginning of the year, the key factors to study could be isolated by identifying other factors that have changed in that same time period. It could be that a very large trucking contract had been obtained, or that a current customer dramatically increased their distribution needs, which Deland is benefiting from. In contrast, when changes are very subtle and take effect over a long period of time, it can be more difficult to define the actual decision and research problems. Detecting trends that would permanently affect the recruitment challenges that Deland faces can be difficult. It may be difficult to detect the beginning of such a trend and even more difficult to know whether such a trend is relatively permanent or simply a temporary occurrence.

3. How Widespread are The Symptoms?

The more scattered any symptoms are, the more difficult it is to put them together into some coherent problem statement. In contrast, firms may sometimes face situations in which multiple symptoms exist, but they are all

pointing to some specific business area. For instance, an automobile manufacturing company may exhibit symptoms such as increased complaints about a car's handling, increased warranty costs due to repairs, higher labor costs due to inefficiency, and lower performance ratings by consumer advocates such as Consumer Reports. All of these symptoms point to production as a likely problem area. This may lead to research questions that deal with supplier-manufacturer relationships, job performance, job satisfaction, supervisory support, and performance. Although having a lot of problems in one area may not sound very positive, it can be very helpful in pointing out the direction that is most in need of attention and improvement. In contrast, when the problems are more widespread, it can be very difficult to develop useful research questions. If consumer complaints dealt with the handling and the appearance of the car, and these were accompanied by symptoms including consumer beliefs that gas mileage could be better and that dealerships did not have a pleasant environment, it may be more difficult to put these scattered symptoms together into one or a few related research questions. Later in the chapter, we'll discuss some tools for trying to analyze symptoms in an effort to find some potential common cause.

4. Symptom Ambiguity

Ambiguity is almost always unpleasant. People simply are uncomfortable with the uncertainty that comes with ambiguity. Similarly, an environmental scan of a business situation may lead to many symptoms, none of which seem to point in a clear and logical direction. In this case, the problem area remains vague and the alternative directions are difficult to ascertain. A retail store may face a situation in which sales and traffic are up, but margins are down. They may have decreased employee turnover, but lower job satisfaction. In addition, there may be several issues that arise with their suppliers, none of which is clearly positive or negative. In this case, it may be very difficult to sort through the evidence and reach a definitive decision statement or list of research objectives.

3.3 The Problem-Definition Process

3.3.1 Problems Mean Gaps

A **problem** occurs when there is a difference between the current conditions and a more preferable set of conditions. In other words, a gap exists between the way things are now and a way that things could be better. The gap can come about in a number of ways:

1. Business performance is worse than expected business performance. For instance, sales, profits, and margins could be below targets set by management. This is a very typical type of problem analysis. Think of all the new products that fail to meet their targeted goals. Trend analysis would also be included in this type of problem. Management is constantly monitoring key performance variables. Previous performance usually provides a benchmark forming expectations. Sales, for example, are generally expected to increase a certain percentage each year. When sales fall below this expectation, or particularly when they fall below the previous year's sales, management usually recognizes that they have a potential problem on their hands. The Research Snapshot on the next page illustrates this point.

2. Actual business performance is less than possible business performance. Realization of this gap first requires that management have some idea of what is possible. This may form a research problem in and of itself. Opportunity-seeking often falls into this type of problem-definition process. Many American and European Union companies have redefined what possible sales levels are based upon the expansion of free markets around the world. China's Civil Aviation Administration has relaxed requirements opening the Chinese air travel market to private airlines. Suddenly, the possible market size for air travel has increased significantly, creating opportunities for growth.

3. Expected business performance is greater than possible business performance. Sometimes, management has unrealistic views of possible performance levels—either too high or too low. One key problem with new product introductions involves identifying realistic possibilities for sales. While you may have heard the old adage that 90 percent of all new products fail, how many of the failures had a realistic sales ceiling? In other words, did the company know the possible size of the market? In this case, the problem is not with the product but with the plan. Some product "failures" may actually have been successful if management had a more accurate idea of the total market potential. Management can close this gap through decision making. Researchers help managers make decisions by providing relevant input.

3.4 The Problem-Definition Process Steps

The problem-definition process involves several interrelated steps. Sometimes, the boundaries between each step aren't exactly clear. But generally, completing one step leads to the other and by the time the problem is defined, each of these steps has been addressed in some way. The steps are

1. Understand the business situation—identify key symptoms
2. Identify key problem(s) from symptoms
3. Write managerial decision statement and corresponding research objectives
4. Determine the unit of analysis
5. Determine the relevant variables
6. Write research questions and/or research hypotheses

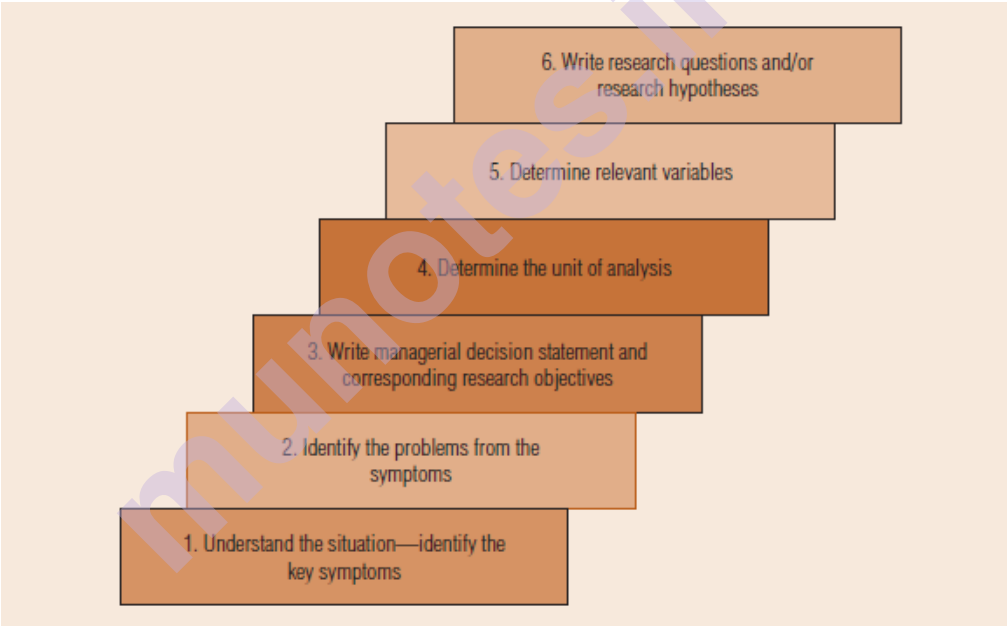

Fig b: The Problem-Definition Process

1-Understand the Business Decision

A **situation analysis** involves the gathering of background information to familiarize researchers and managers with the decision-making environment. The situation analysis can be written up as a way of documenting the problem-definition process. Gaining an awareness of marketplace conditions and an appreciation of the situation often requires exploratory research. Researchers sometimes apply qualitative research with the objective of better problem definition. The situation analysis begins with an interview between the researcher and management.

Interview Process

The researcher must enter a dialogue with the key decision makers in an effort to fully understand the situation that has motivated a research effort. This process is critical and the researcher should be granted access to all individuals who have specific knowledge of or insight into this situation. Researchers working with managers who want the information "yesterday" often get little assistance when they ask, "What are your objectives for this study?" Nevertheless, even decision makers who have only a gut feeling that the research might be a good idea benefit greatly if they work with the researcher to articulate precise research objectives.

Researchers may often be tempted to accept the first plausible problem statement offered by management. For instance, in the opening vignette, it is clear that David believes there is a recruitment problem. However, it is very important that the researcher not blindly accept a convenient problem definition for expediency's sake. In fact, research demonstrates that people who are better problem solvers generally reject problem definitions as given to them. Rather, they take information provided by others and re-associate it with other information in a creative way. This allows them to develop more innovative and more effective decision statements. There are many ways to discover problems and spot opportunities.

There is certainly much art involved in translating scattered pieces of evidence about some business situation into relevant problem statements and then relevant research objectives. While there are other sources that address creative thinking in detail, some helpful hints that can be useful in the interview process include:

i. Develop many alternative problem statements. These can emerge from the interview material or from simply rephrasing decision statements and problem statements.

ii. Think about potential solutions to the problem. Ultimately, for the research to be actionable, some plausible solution must exist. After pairing decision statements with research objectives, think about the solutions that might result. This can help make sure any research that results is useful.

iii. Make lists. Use free-association techniques to generate lists of ideas. The more ideas, the better. Use interrogative techniques to generate lists of potential questions that can be used in the interview process. **Interrogative techniques** simply involve asking multiple what, where, who, when, why, and how questions. They can also be used to provoke introspection, which can assist with problem definition.

iv. Be open-minded. It is very important to consider all ideas as plausible in the beginning stages of problem solving. One sure way to stifle progress is to think only like those intimately involved in the business situation or only like those in other industries. Analogies can be useful in thinking more creatively.

Identifying Symptoms

Interviews with key decision makers also can be one of the best ways to identify key problem symptoms. Recall that all problems have symptoms just as human disease is diagnosed through symptoms. Once symptoms are identified, then the researcher must probe to identify possible causes of these changes. **Probing** is an interview technique that tries to draw deeper and more elaborate explanations from the discussion. This discussion may involve potential problem causes. This probing process will likely be very helpful in identifying key variables that are prime candidates for study.

One of the most important questions the researcher can ask during these interviews is, "what has changed?" Then, the researcher should probe to identify potential causes of the change. At the risk of seeming repetitive, it is important that the researcher repeat this process to make sure that some important change has not been left out. In addition, the researcher should look for changes in company documents, including financial statements and operating reports. Changes may also be identified by tracking down news about competitors and customers.

2-Identifying the Relevant Issues from the Symptoms

Anticipating the many influences and dimensions of a problem is impossible for any researcher or executive. The preceding interview is extremely useful in translating the decision situation into a working problem definition by focusing on symptoms. However, the researcher needs to be doubly certain that the research attacks real problems and not superficial symptoms. For instance, when a firm has a problem with advertising effectiveness, the possible causes of this problem may be low brand awareness, the wrong brand image, use of the wrong media, or perhaps too small a budget. Certain occurrences that appear to be the problem may be only symptoms of a deeper problem.

3-Writing Managerial Decision Statements and Corresponding Research Objectives

The situation analysis ends once researchers have a clear idea of the managerial objectives from the research effort. Decision statements capture these objectives in a way that invites multiple solutions. Multiple solutions are encouraged by using

plural nouns to describe solutions. In other words, a decision statement that says in what "ways" a problem can be solved is better than one that says in what "way" a problem can be solved. Ultimately, research may provide evidence showing results of several ways a problem can be attacked.

Decision statements must be translated into research objectives. At this point, the researcher is starting to visualize what will need to be measured and what type of study will be needed.

What information or data will be needed to help answer this question? Obviously, we'll need to study the driver census and the number of hires needed to fill open positions. James needs to find out what might cause employee dissatisfaction and cause turnover to increase. Thinking back to the interview, James knows that there have been several changes in the company itself, many related to saving costs. Saving costs sounds like a good idea; however, if it harms driver loyalty Even slightly, it probably isn't worthwhile. Thus, the corresponding research objectives are stated as follows:

- Determine what key variables relate to driver loyalty within the company, meaning (1) how does the lower level of pay impact driver retention and (2) what does the increase in long-haul trucking do to Deland Trucking's ability to increase retention?
- Assess the impact of different intervention strategies on driver satisfaction These research objectives are the deliverables of the research project. A research study will be conducted that (1) shows how much each of several key variables relates to loyalty and retention and (2) provides a description of likelihood of different intervention strategies on driver satisfaction.
- The researcher should reach a consensus agreement with the decision maker regarding the overall decision statement(s) and research objectives. If the decision maker agrees that the statement captures the situation well and understands how the research objectives, if accomplished, will help address the situation, then the researcher can proceed. The researcher should make every effort to ensure that the decision maker understands what a research project can deliver. If there is no agreement on the decision statement or research objectives, more dialogue between decision makers and researchers is needed.

4-Determine the Unit ofAnalysis

The **unit of analysis** for a study indicates what or who should provide the data and at what level of aggregation. Researchers specify whether an investigation will collect data about individuals (such as customers, employees, and owners),

households (families, extended families, and so forth), organizations (businesses and business units), departments (sales, finance, and so forth), geographical areas, or objects (products, advertisements, and so forth). In studies of home buying, for example, the husband/wife dyad typically is the unit of analysis rather than the individual because many purchase decisions are made jointly by husband and wife.

Researchers who think carefully and creatively about situations often discover that a problem can be investigated at more than one level of analysis. For example, a lack of worker productivity could be due to problems that face individual employees or it could reflect problems that are present in entire business units. Determining the unit of analysis should not be overlooked during the problem-definition stage of the research.

5-Determine Relevant Variables

What is a Variable?

What things should be studied to address a decision statement? Researchers answer this question by identifying key variables. A **variable** is anything that varies or changes from one instance to another. Variables can exhibit differences in value, usually in magnitude or strength, or in direction. In research, a variable is either observed or manipulated, in which case it is an experimental variable.

The converse of a variable is a **constant**. A constant is something that does not change. Constants are not useful in addressing research questions. Since constants don't change, management isn't very interested in hearing the key to the problem is something that won't or can't be changed. In causal research, it can be important to make sure that some potential variable is actually held constant while studying the cause and effect between two other variables. In this way, a spurious relationship can be ruled out. At this point however, the notion of a constant is more important in helping to understand how it differs from a variable.

Types of Variables

There are several key terms that help describe types of variables. The *variance* in *variables* is captured either with numerical differences or by an identified category membership. In addition, different terms describe whether a variable is a potential cause or an effect.

A **continuous variable** is one that can take on a range of values that correspond to some quantitative amount. Consumer attitude toward different airlines is a variable that would generally be captured by numbers, with higher numbers indicating a more positive attitude than lower numbers. Each attribute of airlines' services, such

as safety, seat comfort, and baggage handling can be numerically scored in this way. Sales volume, profits, and margin are common business metrics that represent continuous variables.

A **categorical variable** is one that indicates membership in some group. The term **classificatory variable** is sometimes also used and is generally interchangeable with *categorical variable*. Categorical variables sometimes represent quantities that take on only a small number of values (one, two, or three). However, categorical variables more often simply identify membership.

For example, people can be categorized as either male or female. A variable representing biological sex describes this important difference. The variable values can be an "M" for membership in the male category and an "F" for membership in the female category. Alternatively, the researcher could assign a "0" for men and a "1" for women. In either case, the same information is represented.

A common categorical variable in consumer research is adoption, meaning the consumer either did or did not purchase a new product. Thus, the two groups, purchase or not purchase, comprise the variable. Similarly, turnover, or whether an employee has quit or not, is a common organizational variable.

In descriptive and causal research, the terms *dependent variable* and *independent variable* describe different variable types. This distinction becomes very important in understanding how business processes can be modeled by a researcher. The distinction must be clear before one can correctly apply certain statistical procedures like multiple regression analysis. In some cases, however, such as when only one variable is involved in a hypothesis, the researcher need not make this distinction.

A **dependent variable** is a process outcome or a variable that is predicted and/or explained by other variables. An **independent variable** is a variable that is expected to influence the dependent variable in some way. Such variables are independent in the sense that they are determined outside of the process being studied. That is another way of saying that dependent variables do not change independent variables.

For example, average customer loyalty may be a dependent variable that is influenced or predicted by an independent variable such as perceptions of restaurant food quality, service quality, and customer satisfaction. Thus, a process is described by which several variables together help create and explain how much customer loyalty exists. In other words, if we know how a customer rates the food

quality, service quality, and satisfaction with a restaurant, then we can predict that customer's loyalty toward that restaurant. Note that this does not mean that we can predict food quality or service quality with customer loyalty.

Dependent variables are conventionally represented by the letter Y. Independent variables are conventionally represented by the letter X. If research involves two dependent variables and two or more independent variables, subscripts may also be used to indicate Y1, Y2 and X1, X2, and so on.

Ultimately, theory is critical in building processes that include both independent and dependent variables. Managers and researchers must be careful to identify relevant and actionable variables. *Relevant* means that a change in the variable matters and *actionable* means that a variable can be controlled by managerial action. Superfluous variables are those that are neither relevant nor actionable and should not be included in a study. Theory should help distinguish relevant from superfluous variables. The process of identifying the relevant variables overlaps with the process of determining the research objectives. Typically, each research objective will mention a variable or variables to be measured or analyzed. As the translation process proceeds through research objectives, research questions, and research hypotheses, it is usually possible to emphasize the variables that should be included in a study.

6-Write Research Objectives and Questions

Both managers and researchers expect problem-definition efforts to result in statements of research questions and research objectives. At the end of the problem-definition stage, the researcher should prepare a written statement that clarifies any ambiguity about what the research hopes to accomplish. This completes the translation process.

Research questions express the research objectives in terms of questions that can be addressed by research. For example, one of the key research questions involved in the opening vignette is "Are wages and long-haul distance related to driver loyalty and retention?" Hypotheses are more specific than research questions. One key distinction between research questions and hypotheses is that hypotheses can generally specify the direction of a relationship. In other words, when an independent variable goes up, we have sufficient knowledge to predict that the dependent variable should also go up (or down as the case may be). One key research hypothesis for Deland Trucking is:

Higher cents per mile are related positively to *driver loyalty.*

At times, a researcher may suspect that two variables are related but have insufficient theoretical rationale to support the relationship as positive or negative. In this case, hypotheses cannot be offered. At times in research, particularly in exploratory research, a proposal can only offer research questions. Research hypotheses are much more specific and therefore require considerably more theoretical support. In addition, research questions are interrogative, whereas research hypotheses are declarative.

3.5 Clarity in Research Questions and Hypotheses

Research questions make it easier to understand what is perplexing managers and to indicate what issues have to be resolved. A research question is the researcher's translation of the marketing problem into a specific inquiry.

A research question can be too vague and general, such as "Is advertising copy 1 better than advertising copy 2?" Advertising effectiveness can be variously measured by sales, recall of sales message, brand awareness, intention to buy, recognition, or knowledge, to name a few possibilities. Asking a more specific research question (such as, "Which advertisement has a higher day after recall score?") helps the researcher design a study that will produce useful results, as seen in the Research Snapshot above. Research question answers should provide input that can be used as a standard for selecting from among alternative solutions. Problem definition seeks to state research questions clearly and to develop well-formulated, specific hypotheses.

A sales manager may hypothesize that salespeople who show the highest job satisfaction will be the most productive. An advertising manager may believe that if consumers' attitudes toward a product are changed in a positive direction, consumption of the product also will increase.

Hypotheses are statements that can be empirically tested. A formal hypothesis has considerable practical value in planning and designing research. It forces researchers to be clear about what they expect to find through the study, and it raises crucial questions about data required. When evaluating a hypothesis, researchers should ensure that the information collected will be useful in decision making. Notice how the following hypotheses express expected relationships between variables:

- There is a positive relationship between *buying on the Internet* and the presence of *younger children* in the home.

- *Sales* are lower for salespeople in regions that receive less *advertising support*.
- Consumers will experience *cognitive dissonance* after the decision to *adopt* a TiVo personal video recorder.
- *Opinion leaders* are more affected by mass media communication *sources* than are non-leaders.
- Among non-exporters, the degree of perceived importance of overcoming barriers to exporting is related positively to general interest in exporting (export intentions).

  Management is often faced with a "go/no go" decision. In such cases, a research question or hypothesis may be expressed in terms of a meaningful barrier that represents the turning point in such a decision. In this case, the research involves a **managerial action standard** that specifies a specific performance criterion upon which a decision can be based.

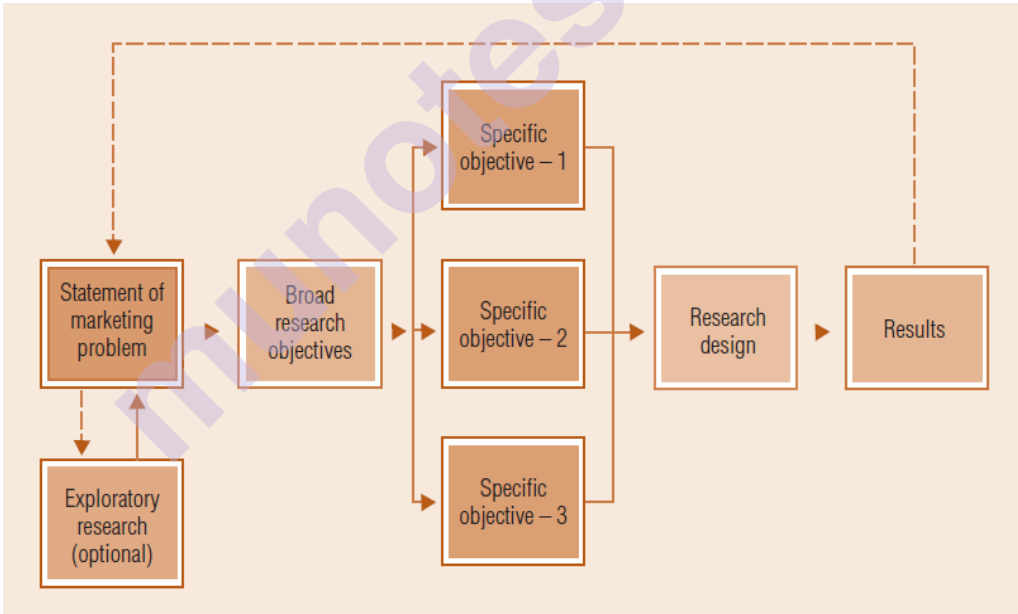

Figure c : Influence of Decision Statement of Marketing Problem on Research Objectives and Research Designs

3.5.1 HowMuchTime Should BeSpenton Problem Definition?

Budget constraints usually influence how much effort is spent on problem definition. Business situations can be complex and numerous variables may be relevant. Searching for every conceivable cause and minor influence is impractical.

The more important the decision faced by management, the more resources should be allocated toward problem definition. While not a guarantee, allowing more time and spending more money will help make sure the research objectives that result are relevant and can demonstrate which influences management should focus on.

Managers, being responsible for decision making, may wish the problem-definition process to proceed quickly. Researchers who take a long time to produce a set of research objectives can frustrate managers. However, the time taken to identify the correct problem is usually time well spent.

3.6 The Research Proposal

The **research proposal** is a written statement of the research design. It always includes a statement explaining the purpose of the study (in the form of research objectives or deliverables) and a definition of the problem, often in the form of a decision statement. A good proposal systematically outlines the particular research methodology and details procedures that will be used during each stage of the research process. Normally a schedule of costs and deadlines is included in the research proposal. The research proposal becomes the primary communication document between the researcher and the research user.

The Proposal as a Planning Tool

Preparation of a research proposal forces the researcher to think critically about each stage of the research process. Vague plans, abstract ideas, and sweeping generalizations about problems or procedures must become concrete and precise statements about specific events. Data requirements and research procedures must be specified clearly so others may understand their exact implications. All ambiguities about why and how the research will be conducted must be clarified before the proposal is complete.

The researcher submits the proposal to management for acceptance, modification, or rejection. Research clients (management) evaluate the proposed study with particular emphasis on whether or not it will provide useful information, and whether it will do so within a reasonable resource budget. Initial proposals are almost always revised after the first review.

The proposal helps managers decide if the proper information will be obtained and if the proposed research will accomplish what is desired. If the problem has not been adequately translated into a set of specific research objectives and a research

design, the client's assessment of the proposal will help ensure that the researchers revise it to meet the client's information needs.

An effective proposal communicates exactly what information will be obtained, where it will be obtained, and how it will be obtained. For this reason, it must be explicit about sample selection, measurement, fieldwork, and data analysis. For instance, most proposals involving descriptive research include a proposed questionnaire (or at least some sample questions).

The Proposal as a Contract

When the research will be conducted by a consultant or an outside research supplier, the written proposal serves as that person's bid to offer a specific service. Typically, a client solicits several competitive proposals, and these written offers help management judge the relative quality of alternative research suppliers.

A wise researcher will not agree to do a research job for which no written proposal exists. The proposal also serves as a contract that describes the product the research user will buy. In fact, the proposal is in many ways the same as the final research report without the actual results. Misstatements and faulty communication may occur if the parties rely only on each individual's memory of what occurred at a planning meeting. The proposal creates a record, which greatly reduces conflicts that might arise after the research has been conducted. Both the researcher and the research client should sign the proposal indicating agreement on what will be done.

The proposal then functions as a formal, written statement of agreement between marketing executives and researchers. As such, it protects the researcher from criticisms such as, "Shouldn't we have had a larger sample?" or "Why didn't you use a focus group approach?" As a record of the researcher's obligation, the proposal also provides a standard for determining whether the actual research was conducted as originally planned. Suppose in our Deland Trucking case, following the research, David is unhappy with the nature of the results because they indicate that higher cents per mile do, in fact, impact driver loyalty.

Funded business research generally refers to basic research usually performed by academic researchers and supported by some public or private institution. Most commonly, researchers pursue federal government grants. A very detailed proposal is usually needed for federal grants, and the agreement for funding is predicated on the research actually delivering the results described in the proposal. One important comment needs to be made about the nature of research proposals. Not all proposals follow the same format. A researcher can adapt his or her

Decisions to Make	Basic Questions
Problem definition	What is the purpose of the study? How much is already known? Is additional background information necessary? What is to be measured? How? Can the data be made available? Should research be conducted? Can a hypothesis be formulated?
Selection of basic research design	What types of questions need to be answered? Are descriptive or causal findings required? What is the source of the data? Can objective answers be obtained by asking people? How quickly is the information needed? How should survey questions be worded? How should experimental manipulations be made?
Selection of sample	Who or what is the source of the data? Can the target population be identified? Is a sample necessary? How accurate must the sample be? Is a probability sample necessary? Is a national sample necessary? How large a sample is necessary? How will the sample be selected?
Data gathering	Who will gather the data? How long will data gathering take? How much supervision is needed? What procedures will data collectors need to follow?
Data analysis and evaluation	Will standardized editing and coding procedures be used? How will the data be categorized? Will computer or hand tabulation be used? What is the nature of the data? What questions need to be answered? How many variables are to be investigated simultaneously? What are the criteria for evaluation of performance? What statistical tools are appropriate?
Type of report	Who will read the report? Are managerial recommendations requested? How many presentations are required? What will be the format of the written report?
Overall evaluation	How much will the study cost? Is the time frame acceptable? Is outside help needed? Will this research design attain the stated research objectives? When should the research begin?

Figure d: Basic Points Addressed by Research Proposals

proposal to the target audience or situation. An extremely brief proposal submitted by an organization's internal research department to its own executives bears little resemblance to a complex proposal submitted by a university professor to a federal government agency to research a basic consumer issue.

3.7 Anticipating Outcomes

As mentioned above, the proposal and the final research report will contain much of the same information. The proposal describes the data collection, measurement, data analysis, and so forth, in future tense. In the report, the actual results are presented. In this sense, the proposal anticipates the research outcome. Experienced researchers know that research fails more often because the problem-definition process breaks down or because the research client never truly understood what a research project could or couldn't do. While it probably seems as though the proposal should make this clear, any shortcoming in the proposal can contribute to a communication failure. Thus, any tool that helps communication become as clear as can be is valued very highly.

Dummy Tables

One such tool that is perhaps the best way to let management know exactly what kind of results will be produced by research is the *dummy table.* **Dummy tables** are placed in research proposals and are exact representations of the actual tables that will show results in the final report with one exception: The results are hypothetical. They get the name because the researcher fills in, or "dummies up," the tables with likely but fictitious data. Dummy tables include the tables that will present hypothesis test results. In this way, they are linked directly to research objectives

A research analyst can present dummy tables to the decision maker and ask, "Given findings like these, will you be able to make a decision?" If the decision maker says yes, the proposal may be accepted. However, if the decision maker cannot see how results like those in the dummy tables will help make the needed decision(s), it may be back to the drawing board. In other words, the client and researcher need to rethink what research results are necessary to solve the problem. Sometimes, examining the dummy tables may reveal that a key variable is missing or that some dependent variable is really not relevant. In other words, the problem is clarified by deciding on action standards or performance criteria and recognizing the types of research findings necessary to make specific decisions.

Summary

The chapter explains the importance of research along the process of research. It also discuss about Cyclical business situations lead to recurring business problems. The problem definition process identifies the problem gaps and also includes various steps such as writing the decision statement, determining the unit

of analysis and relevant variables. A good proposal systematically outlines the particular research methodology and details procedures that will be used during each stage of the research process. A research analyst can present dummy tables to the decision maker and ask, "Given findings like these, will you be able to make a decision?" If the decision maker says yes, the proposal may be accepted research findings necessary to make specific decisions.

Questions

1. Explain the process of research with suitable example.
2. Explain how research objectives are defined.
3. List the activities use for defining and identifying the research problem.
4. What is variable? Explain the types of variables used.
5. Explain the importance of survey and interview with respect to research problem.
6. What is the influence of decision statement of marketing problem on research objectives and research designs?
7. Discuss the relation of hypothesis with respect to research.
8. Write a note on Dummy table.

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UNIT 2

4

QUALITATIVE RESEARCH TOOLS

4.0 Objectives

- Understanding types of research
- Process of qualitative research
- Process of quantitative research
- Exploratory research

4.1 Introduction:

Chemists sometimes use the term *qualitative analysis* to mean research that determines what some compound is made of. In other words, the focus is on the inner meaning of the chemical— its *qualities*. As the word implies, qualitative research is interested more in *qualities* than quantities. Therefore, qualitative research is not about applying specific numbers to measure variables or using statistical procedures to numerically specify a relationship's strength.

4.2 What Is Qualitative Research?

Qualitative business research is research that addresses business objectives through techniques that allow the researcher to provide elaborate interpretations of market phenomena without depending on numerical measurement. Its focus is on discovering true inner meanings and new insights. Qualitative research is very widely applied in practice. There are many research firms that specialize in qualitative research.

Qualitative research is less structured than most quantitative approaches. It does not rely on self- response questionnaires containing structured response formats. Instead, it is more **researcher-dependent** in that the researcher must extract meaning from unstructured responses, such as text from a recorded interview or a collage representing the meaning of some experience, such as skateboarding. The researcher interprets the data to extract its meaning and converts it to information.

4.3 Uses of Qualitative Research

The researcher has many tools available and the research design should try to match the best tool to the research objective. Not every researcher has expertise with tools that would comprise qualitative research. Generally, the less specific the research objective, the more likely that qualitative research tools will be appropriate. Also,

when the emphasis is on a deeper understanding of motivations or on developing novel concepts, qualitative research is very appropriate. The following list represents common situations that often call for qualitative research:

When it is difficult to develop specific and actionable problem statements or research objectives. For instance, if after several interviews with the research client the researcher still can't determine exactly what needs to be measured, then qualitative research approaches may help with problem definition. Qualitative research is often useful to gain further insight and crystallize the research problem.

When the research objective is to develop an understanding of some phenomena in great detail and in much depth. Qualitative research tools are aimed at discovering the primary themes indicating human motivations and the documentation of activities is usually very complete. Often qualitative research provides richer information than quantitative approaches.

When the research objective is to learn how a phenomena occurs in its natural setting or to learn how to express some concept in colloquial terms. For example, how do consumers actually use a product? Or, exactly how does the accounting department process invoices? While a survey can probably ask many useful questions, observing a product in use or watching the invoice process will usually be more insightful. Qualitative research produces many product and process improvement ideas.

When some behavior the researcher is studying is particularly context dependent—meaning the reasons something is liked or some behavior is performed depend very much on the particular situation surrounding the event. Understanding why Vans are liked is probably difficult to determine correctly outside the skating environment.

When a fresh approach to studying some problem is needed. This is particularly the case when quantitative research has yielded less than satisfying results. Qualitative tools can yield unique insights, many of which may lead the organization in new directions.

4.4 Qualitative "versus" QuantitativeResearch

In social science, one can find many debates about the superiority of qualitative research over quantitative research or vice versa. We'll begin by saying that this is largely a superfluous argument in either direction. The truth is that qualitative research can accomplish research objectives that quantitative research cannot. Similarly, truthful, but no more so, quantitative research can accomplish objectives that qualitative research cannot. The key to successfully using either is to match the

right approach to the right research context.

Many good research projects combine both qualitative and quantitative research. For instance, developing valid survey measures requires first a deep understanding of the concept to be measured and a description of the way these ideas are expressed in everyday language. Both of these are tasks best suited for qualitative research. However, validating the measure formally to make sure it can reliably capture the intended concept will likely require quantitative research. Also, qualitative research may be needed to separate symptoms from problems and then quantitative research can follow up to test relationships among relevant variables.

Quantitative business research can be defined as business research that addresses research objectives through empirical assessments that involve numerical measurement and analysis approaches. Qualitative research is more apt to stand on its own in the sense that it requires less interpretation. For example, quantitative research is quite appropriate when a research objective involves a managerial action standard. For example, a salad dressing company considered changing its recipe. The new recipe was tested with a sample of consumers. Each consumer rated the product using numeric scales. Management established a rule that a majority of consumers rating the new product higher than the old product would have to be established with 90 percent confidence before replacing the old formula. A project like this can involve both quantitative measurement in the form of numeric rating scales and quantitative analysis in the form of applied statistical procedures.

4.5 Contrasting Qualitative and Quantitative Methods

Quantitative researchers direct a considerable amount of activity toward measuring concepts with scales that either directly or indirectly provide numeric values. The numeric values can then be used in statistical computations and hypothesis testing. In contrast, qualitative researchers are more interested in observing, listening, and interpreting. As such, the researcher is intimately involved in the research process and in constructing the results. For these reasons, qualitative research is said to be more **subjective**, meaning that the results are researcher-dependent. Different researchers may reach different conclusions based on the same interview. In that respect, qualitative research lacks **intersubjective certifiability**, the ability of different individuals following the same procedures to produce the same results or come to the same conclusion. This should not necessarily be considered a weakness of qualitative research; rather it is simply a characteristic that yields differing insights. In contrast, when a survey respondent provides a commitment score on a

quantitative scale, it is thought to be more objective because the number will be the same no matter what researcher is involved in the analysis.

Exhibit below on the next page illustrates some differences between qualitative and quantitative research. Certainly, these are generalities and exceptions may apply. However, it covers some of the key distinctions.

Qualitative research seldom involves samples with hundreds of respondents. Instead, a handful of people are usually the source of qualitative data. This is perfectly acceptable in discovery-oriented research. All ideas would still have to be tested before adopted. Does a smaller sample mean that qualitative research is cheaper than qualitative? Perhaps not. Although fewer respondents must be interviewed, the greater researcher involvement in both the data collection and analysis can drive up the costs of qualitative research.

Given the close relationship between qualitative research and exploratory designs, it should not be surprising that qualitative research is most often used in exploratory designs. Small samples, interpretive procedures that require subjective judgments, and the unstructured interview format all make traditional hypotheses testing difficult with qualitative research. Thus, these procedures are not best suited for drawing definitive conclusions, as would be expected from causal designs involving experiments. These disadvantages for drawing inferences, however, become advantages when the goal is to draw out potential explanations because the researcher spends more time with each respondent and is able to explore much more ground due to the flexibility of the procedures.

Qualitative Research	Research Aspect	Quantitative Research
Discover Ideas, Used in Exploratory Research with General Research Objects	Common Purpose	Test Hypotheses or Specific Research Questions
Observe and Interpret	Approach	Measure and Test
Unstructured, Free-Form	Data Collection Approach	Structured Response Categories Provided
Researcher Is Intimately Involved. Results Are Subjective.	Researcher Independence	Researcher Uninvolved Observer. Results Are Objective.
Small Samples—Often in Natural Settings	Samples	Large Samples to Produce Generalizable Results (Results That Apply to Other Situations)
Exploratory Research Designs	Most Often Used	Descriptive and Causal Research Designs

Figure a: Comparing Qualitative and Quantitative Research

4.6 Contrasting Exploratory and Confirmatory Research

Philosophically, research can be considered as either exploratory or confirmatory. Most exploratory research designs produce **qualitative data**. Exploratory designs do not usually produce **quantitative data**, which represent phenomena by assigning numbers in an ordered and meaningful way. Rather than numbers, the focus of qualitative research is on stories, visual portrayals, meaningful characterizations, interpretations, and other expressive descriptions. Often, exploratory research may be needed to develop the ideas that lead to research hypotheses. In other words, in some situations the outcome of exploratory research is a testable research hypothesis. Confirmatory research then tests these hypotheses with quantitative data. The results of these tests help decision making by suggesting a specific course of action. For example, an exploratory researcher is more likely to adopt a qualitative approach that might involve trying to develop a deeper understanding of how families are impacted by changing economic conditions, investigating how people suffering economically spend scarce resources. This may lead to the development of a hypothesis that during challenging economic times consumers seek low-cost entertainment such as movie rentals, but would not test this hypothesis. In contrast, a quantitative researcher may search for numbers that indicate economic trends. This may lead to hypothesis tests concerning how much the economy influences rental movie consumption.

Some types of qualitative studies can be conducted very quickly. Others take a very long time. For example, a single focus group analysis involving a large bottling company's sales force can likely be conducted and interpreted in a matter of days. This would provide faster results than most descriptive or causal designs. However, other types of qualitative research, such as a participant- observer study aimed at understanding skateboarding, could take months to complete. A qualitative approach can, but does not necessarily, save time.

In summary, when researchers have limited experience or knowledge about a research issue, exploratory research is a useful step. Exploratory research, which often involves qualitative methods, can be an essential first step to a more conclusive, confirmatory study by reducing the chance of beginning with an inadequate, incorrect, or misleading set of research objectives.

4.7 Orientations to QualitativeResearch

Qualitative research can be performed in many ways using many techniques. Orientations to qualitative research are very much influenced by the different fields

of study involved in research. These orientations are each associated with a category of qualitative research. The major categories of qualitative research include

1. Phenomenology—originating in philosophy and psychology
2. Ethnography—originating in anthropology
3. Grounded theory—originating in sociology
4. Case studies—originating in psychology and in business research

Precise lines between these approaches are difficult to draw and there are clearly links among these orientations. In addition, a particular qualitative research study may involve elements of two or more approaches. However, each category does reflect a somewhat unique approach to human inquiry and approaches to discovering knowledge. Each will be described briefly below.

4.8 Phenomenology

What Is A Phenomenological Approach To Research?

Phenomenology represents a philosophical approach to studying human experiences based on the idea that human experience itself is inherently subjective and determined by the context in which people live.10 The phenomenological researcher focuses on how a person's behavior is shaped by the relationship he or she has with the physical environment, objects, people, and situations. Phenomenological inquiry seeks to describe, reflect upon, and interpret experiences.

Researchers with a phenomenological orientation rely largely on conversational interview tools. When conversational interviews are face to face, they are recorded either with video or audiotape and then interpreted by the researcher. The phenomenological interviewer is careful to avoid asking direct questions when at all possible. Instead, the research respondent is asked to tell a story about some experience. In addition, the researcher must do everything possible to make sure a respondent is comfortable telling his or her story. One way to accomplish this is to become a member of the group. Another way may be to avoid having the person use his or her real name. This might be particularly necessary in studying potentially sensitive topics such as smoking, drug usage, shoplifting, or employee theft.

Therefore, a phenomenological approach to studying the meaning of Vans may require considerable time. The researcher may first spend weeks or months fitting in with the person or group of interest to establish a comfort level. During this time, careful notes of conversations are made. If an interview is sought, the researcher would likely not begin by asking a skateboarder to describe his or her shoes. Rather, asking for favorite skateboard incidents or talking about what makes a skateboarder unique may generate productive conversation. Generally, the approach is very unstructured as a way of avoiding leading questions and to provide every opportunity for new insights.

4.9 What Is Hermeneutics?

The term hermeneutics is important in phenomenology. **Hermeneutics** is an approach to understanding phenomenology that relies on analysis of texts in which a person tells a story about him or herself.12 Meaning is then drawn by connecting text passages to one another or to themes expressed outside the story. These connections are usually facilitated by coding the key meanings expressed in the story. While a full understanding of hermeneutics is beyond the scope of this text, some of the terminology is used when applying qualitative tools. For instance, a **hermeneutic unit** refers to a text passage from a respondent's story that is linked with a key theme from within this story or provided by the researcher. These passages are an important way in which data are interpreted.

Computerized software exists to assist in coding and interpreting texts and images. ATLAS.ti is one such software package that adopts the term hermeneutic unit in referring to groups of phrases that are linked with meaning. Hermeneutic units and computerized software are also very appropriate in grounded theory approaches. One useful component of computerized approaches is a word counter. The word counter will return counts of how many times words were used in a story. Often, frequently occurring words suggest a key theme. The Research Snapshot above demonstrates the use of hermeneutics in interpreting a story about a consumer shopping for a car

4.10 Ethnography

What Is Ethnography?

Ethnography represents ways of studying cultures through methods that involve becoming highly active within that culture. **Participant-observation** typifies an

ethnographic research approach. Participantobservation means the researcher becomes immersed within the culture that he or she is studying and draws data from his or her observations. A *culture* can be either a broad culture, like American culture, or a narrow culture, like urban gangs, Harley-Davidson owners, or skateboarding enthusiasts.

Organizational culture would also be relevant for ethnographic study.15 At times, researchers have actually become employees of an organization for an extended period of time. In doing so, they become part of the culture and over time other employees come to act quite naturally around the researcher. The researcher may observe behaviors that the employee would never reveal otherwise. For instance, a researcher investigating the ethical behavior of salespeople may have difficulty getting a car salesperson to reveal any potentially deceptive sales tactics in a traditional interview. However, ethnographic techniques may result in the salesperson letting down his or her guard, resulting in more valid discoveries about the car selling culture.

4.11 Observation in Ethnography

Observation plays a key role in ethnography. Researchers today sometimes ask households for permission to place video cameras in their home. In doing so, the ethnographer can study the consumer in a "natural habitat" and use the observations to test new products, develop new product ideas, and develop strategies in general.

Ethnographic study can be particularly useful when a certain culture is comprised of individuals who cannot or will not verbalize their thoughts and feelings. For instance, ethnography has advantages for discovering insights among children since it does not rely largely on their answers to questions. Instead, the researcher can simply become part of the environment, allow the children to do what they do naturally, and record their behavior.17 The opening vignette describing a participant-observer approach to learning about skateboarding culture represents an ethnographic approach. Here, the researcher would draw insight from observations and personal experiences with the culture.

4.12 Grounded Theory

What Is Grounded Theory?

Grounded theory is probably applied less often in business research than is either phenomenology or ethnography.

Grounded theory represents an inductive investigation in which the researcher poses questions about information provided by respondents or taken from historical records. The researcher asks the questions to him or herself and repeatedly questions the responses to derive deeper explanations. Grounded theory is particularly applicable in highly dynamic situations involving rapid and significant change. Two key questions asked by the grounded theory researcher are "What is happening here?" and "How is it different?"19 The distinguishing characteristic of grounded theory is that it does not begin with a theory but instead extracts one from whatever emerges from an area of inquiry.

4.13 How Is Grounded Theory Used?

Consider a company that approaches a researcher to study whether or not its sales force is as effective as it has been over the past five years. The researcher uses grounded theory to discover a potential explanation. A theory is inductively developed based on text analysis of dozens of sales meetings that had been recorded over the previous five years. By questioning the events discussed in the sales interviews and analyzing differences in the situations that may have led to the discussion, the researcher is able to develop a theory. The theory suggests that with an increasing reliance on e-mail and other technological devices for communication, the salespeople do not communicate with each other informally as much as they did five years previously. As a result, the salespeople had failed to bond into a close-knit "community."

Computerized software also can be useful in developing grounded theory. In our Vans example, the researcher may interpret skateboarders' stories of good and bad skating experiences by questioning the events and changes described. These may yield theories about the role that certain brands play in shaping a good or bad experience. Alternatively, grounded theorists often rely on visual representations. Thus, the skateboarder could develop collages representing good and bad experiences. Just as with the text, questions can be applied to the visuals in an effort to develop theory.

4.14 Case Studies

What Are Case Studies?

Case studies simply refer to the documented history of a particular person, group, organization, or event. Typically, a case study may describe the events of a specific company as it faces an important decision or situation, such as introducing a new

product or dealing with some management crisis. Textbook cases typify this kind of case study. Clinical interviews of managers, employees, or customers can represent a case study.

The case studies can then be analyzed for important themes. **Themes** are identified by the frequency with which the same term (or a synonym) arises in the narrative description. The themes may be useful in discovering variables that are relevant to potential explanations.

4.15 HOW ARE CASE STUDIES USED?

Case studies are commonly applied in business. For instance, case studies of brands that sell "luxury" products helped provide insight into what makes up a prestigious brand. A business researcher carefully conducted case (no pun intended) studies of higher end wine labels (such as Penfold's Grange) including the methods of production and distribution. This analysis suggested that a key ingredient to a prestige brand may well be authenticity. When consumers know something is authentic, they attach more esteem to that product or brand.

Case studies often overlap with one of the other categories of qualitative research. The Research Snapshot on the next page illustrates how observation was useful in discovering insights leading to important business changes.

A primary advantage of the case study is that an entire organization or entity can be investigated in depth with meticulous attention to detail. This highly focused attention enables the researcher to carefully study the order of events as they occur or to concentrate on identifying the relationships among functions, individuals, or entities. Conducting a case study often requires the cooperation of the party whose history is being studied. This freedom to search for whatever data an investigator deems important makes the success of any case study highly dependent on the alertness, creativity, intelligence, and motivation of the individual performing the case analysis.

4.16 Common Techniques Used in Qualitative Research

Qualitative researchers apply a nearly endless number of techniques. These techniques overlap more than one of the orientations previously discussed, although each category may display a preference for certain techniques.

1- Focus Group Interview

What Is a Focus Group Interview?

The focus group interview is so widely used that many advertising and research agencies do nothing but focus group interviews. In that sense, it is wrongly

synonymous with qualitative research. Nonetheless, focus groups are a very important qualitative research technique and deserve considerable discussion.

A **focus group interview** is an unstructured, free-flowing interview with a small group of people, usually between six and ten. Focus groups are led by a trained moderator who follows a flexible format encouraging dialogue among respondents. Common focus group topics include employee programs, employee satisfaction, brand meanings, problems with products, advertising themes, or new-product concepts.

The group meets at a central location at a designated time. Participants may range from consumers talking about hair coloring, petroleum engineers talking about problems in the "oil patch," children talking about toys, or employees talking about their jobs. A moderator begins by providing some opening statement to broadly steer discussion in the intended direction. Ideally, discussion topics emerge at the group's initiative, not the moderator's. Consistent with phenomenological approaches, moderators should avoid direct questioning unless absolutely necessary.

2. Advantages Of Focus Group Interviews

Focus groups allow people to discuss their true feelings, anxieties, and frustrations, as well as the depth of their convictions, in their own words. While other approaches may also do much the same, focus groups offer several advantages:

1. Relatively fast
2. Easy to execute
3. Allow respondents to piggyback off each other's ideas
4. Provide multiple perspectives
5. Flexibility to allow more detailed descriptions
6. High degree of scrutiny

Speed and Ease

In an emergency situation, three or four group sessions can be conducted, analyzed, and reported in a week or so. The large number of research firms that conduct focus group interviews makes it easy to find someone to host and conduct the research. Practically every state in the United States contains multiple research firms that have their own focus group facilities. Companies with large research departments likely have at least one qualified focus group moderator so that they need not outsource the focus group.

Piggybacking and MultiplePerspectives

Furthermore, the group approach may produce thoughts that would not be produced otherwise. The interplay between respondents allows them to **piggyback** off of each other's ideas. In other words, one respondent stimulates thought among the others and, as this process continues, increasingly creative insights are possible. A comment by one individual often triggers a chain of responses from the other participants. The social nature of the focus group also helps bring out multiple views as each person shares a particular perspective.

Flexibility

The flexibility of focus group interviews is advantageous, especially when compared with the more structured and rigid survey format. Numerous topics can be discussed and many insights can be gained, particularly with regard to the variations in consumer behavior in different situations.

Scrutiny

A focus group interview allows closer scrutiny in several ways. First, the session can be observed by several people, as it is usually conducted in a room containing a two-way mirror. The respondents and moderator are on one side, and an invited audience that may include both researchers and decision makers is on the other. If the decision makers are located in another city or country, the session may be shown via a live video hookup. Either through live video or a two-way mirror, some check on the eventual interpretations is provided through the ability to actually watch the research being conducted. If the observers have questions that are not being asked or want the moderator to probe on an issue, they can send a quick text message with instructions to the moderator.

4.17 Focus Group Illustration

Focus groups often are used for concept screening and concept refinement. The concept may be continually modified, refined, and retested until management believes it is acceptable. While RJR's initial attempts at smokeless cigarettes failed in the United States, Philip Morris is developing a smokeless cigarette for the U.K. market. Focus groups are being used to help understand how the product will be received and how it might be improved. The voluntary focus group respondents are presented with samples of the product and then they discuss it among themselves. The interview results suggest that the key product features that must be conveyed are the fact that it produces no ashes, no side smoke, and very little odor. These beliefs are expected to lead to a positive attitude. Focus group respondents show

little concern about how the cigarette actually functioned. Smokers believe they will use the product if nonsmokers are not irritated by being near someone using the "electronic cigarette." Thus, the focus groups are useful in refining the product and developing a theory of how it should be marketed.

Group Composition

The ideal size of the focus group is six to ten people. If the group is too small, one or two members may intimidate the others. Groups that are too large may not allow for adequate participation by each group member. Homogeneous groups seem to work best because they allow researchers to concentrate on consumers with similar lifestyles, experiences, and communication skills. The session does not become rife with too many arguments and different viewpoints stemming from diverse backgrounds. Also, from an ethnographic perspective, the respondents should all be members of a unique and identifiable culture. Vans may benefit from a focus group interview comprised only of skateboard enthusiasts. Perhaps participants can be recruited from a local skate park. However, additional group(s) of participants that are not boarders might be useful in gaining a different perspective.

4.18 Environmental Conditions

A focus group session may typically take place at the research agency in a room specifically designed for this purpose. Research suppliers that specialize in conducting focus groups operate from commercial facilities that have videotape cameras in observation rooms behind two-way mirrors and microphone systems connected to tape recorders and speakers to allow greater scrutiny as discussed above. Refreshments are provided to help create a more relaxed atmosphere conducive to a free exchange of ideas. More open and intimate reports of personal experiences and sentiments can be obtained under these conditions.

4.19 The Focus Group Moderator

The **moderator** essentially runs the focus group and plays a critical role in its success. There are several qualities that a good moderator must possess:

1. The moderator must be able to develop rapport with the group to promote interaction among all participants. The moderator should be someone who is really interested in people, who listens carefully to what others have to say, and who can readily establish rapport, gain people's confidence, and make them feel relaxed and eager to talk.

2. The moderator must be a good listener. Careful listening is especially important because the group interview's purpose is to stimulate spontaneous responses. Without good listening skills, the moderator may direct the group in an unproductive direction.

3. The moderator must try not to interject his or her own opinions. Good moderators usually say less rather than more. They can stimulate productive discussion with generalized follow-ups such as, "Tell us more about that incident," or "How are your experiences similar or different from the one you just heard?" The moderator must be particularly careful not to ask leading questions such as "You are happy to work at Acme, aren't you?"

4. The moderator must be able to control discussion without being overbearing. The moderator's role is also to focus the discussion on the areas of concern. When a topic is no longer generating fresh ideas, the effective moderator changes the flow of discussion. The moderator does not give the group total control of the discussion, but he or she normally has prepared questions on topics that concern management. However, the timing of these questions in the discussion and the manner in which they are raised are left to the moderator's discretion. The term *focus group* thus stems from the moderator's task. He or she starts out by asking for a general discussion but usually *focuses* in on specific topics during the session.

4.20 Planning the Focus Group Outline

Focus group researchers use a discussion guide to help control the interview and guide the discussion into product areas. A **discussion guide** includes written introductory comments informing the group about the focus group purpose and rules and then outlines topics or questions to be addressed in the group session. Thus, the discussion guide serves as the focus group outline. Some discussion guides will have only a few phrases in the entire document. Others may be more detailed. The amount of content depends on the nature and experience of the researcher and the complexity of the topic. A cancer center that wanted to warn the public about the effects of the sun used the discussion guide in Exhibit below. The business researchers had several objectives for this question guide:

The first question was very general, asking that respondents describe their feelings about being out in the sun. This opening question aimed to elicit the full range of views within the group. Some individuals might view being out in the sun as a healthful practice, whereas others view the sun as deadly. The hope is that by

exposing the full range of opinions, respondents would be motivated to fully explain their own position. This was the only question asked specifically of every respondent. Each respondent had to give an answer before free discussion began. In this way, individuals experience a nonthreatening environment encouraging their free and full opinion. A general question seeking a reaction serves as an effective icebreaker.

The second question asks whether participants could think of any reason they should be warned about sunlight exposure. This question was simply designed to introduce the idea of a warning label.

Subsequent questions were asked and became increasingly specific. They were first asked about possible warning formats that might be effective. Respondents are allowed to react to any formats suggested by any other respondent. After this discussion, the moderator will introduce some specific formats the cancer center personnel have in mind.

Finally, the "bottom-line" question is asked: "What format would be most likely to induce people to take protective measures?" There would be probing follow-ups of each opinion so that a respondent couldn't simply say something like "The second one." All focus groups finish up with a catchall question asking for any comments including any thoughts they wanted passed along to the sponsor (which in this case was only then revealed as the Houston-based cancer center).

In general, the following steps should be used to conduct an effective focus group discussion guide:

Welcome and introductions should take place first.

Begin the interview with a broad icebreaker that does not reveal too many specifics about the interview. Sometimes, this may even involve respondents providing some written story or their reaction to some stimulus like a photograph, film, product, or advertisement.

Questions become increasingly more specific as the interview proceeds. However, the Moderator will notice that a good interview will cover the specific question topics before they

Have to be asked. This is preferable as respondents are clearly not forced to react to the specific issue; it just emerges naturally.

If there is a very specific objective to be accomplished, such as explaining why a respondent would either buy or not buy a product, that question should probably be saved for last.

A debriefing statement should provide respondents with the actual focus group objectives and answering any questions they may have. This is also a final shot to gain some insight from the group.

4.21 Focus Groups as Diagnostic Tools

Focus groups are perhaps the predominant means by which business researchers implement exploratory research designs. Focus groups also can be helpful in later stages of a research project, particularly when the findings from surveys or other quantitative techniques raise more questions than they answer. Managers who are puzzled about the meaning of survey research results may use focus groups to better understand what survey results indicate. In such a situation, the focus group supplies diagnostic help after quantitative research has been conducted.

Focus groups are also excellent diagnostic tools for spotting problems with ideas. For instance, idea screening is often done with focus groups. An initial concept is presented to the group and then they are allowed to comment on it in detail. This usually leads to lengthy lists of potential product problems and some ideas for overcoming them. Mature products can also be "focusgrouped" in this manner.

4.22 Video Conferencing and Focus Groups

With the widespread utilization of videoconferencing, the number of companies using these systems to conduct focus groups has increased. With videoconference focus groups, managers can stay home and watch on television rather than having to take a trip to a focus group facility.

FocusVision (**http://www.focusvision.com/**) is a business research company that provides videoconferencing equipment and services. The FocusVision system is modular, allowing for easy movement and an ability to capture each group member close up. The system operates via a remote keypad that allows observers in a far-off location to pan the focus group room or zoom in on a particular participant. Managers viewing at remote locations can send the moderator messages during the interview.

4.23 Interactive Media and Online Focus Groups

Internet applications of qualitative exploratory research are growing rapidly and involve both formal and informal applications. Formally, the term **online focus group** refers to a qualitative research effort in which a group of individuals provides unstructured comments by entering their remarks into an electronic Internet display board of some type, such as a chat-room session or in the form of a blog. Because respondents enter their comments into the computer, transcripts of verbatim responses are available immediately after the group session. Online groups can be quick and cost efficient. However, because there is less personal interaction between participants, group synergy and snowballing of ideas may be diminished.

Several companies have established a form of informal, "continuous" focus group by establishing an Internet blog for that purpose. We might call this technique a **focus blog** when the intention is to mine the site for business research purposes.

4.24 Online versus Face-To-Face Focus Group Techniques

A research company can facilitate a formal online focus group by setting up a private chat room for that purpose. Participants in formal and informal online focus groups feel that their anonymity is very secure. Often respondents will say things in this environment that they would never say otherwise. For example, a lingerie company was able to get insights into how it could design sexy products for larger women. Online, these women freely discussed what it would take "to feel better about being naked."26 One can hardly imagine how difficult such a discussion might be face to face. Increased anonymity can be a major advantage for a company investigating sensitive or embarrassing issues.

Disadvantages Of Focus Groups

Focus groups offer many advantages as a form of qualitative research. Like practically every other research technique, the focus group has some limitations and disadvantages as well. Problems with focus groups include those discussed below.

First, focus groups require objective, sensitive, and effective moderators. It is very difficult for a moderator to remain completely objective about most topics. In large research firms, the moderator may be provided only enough information to effectively conduct the interview, no more. The focus group interview obviously shouldn't reduce to, or even be influenced by, the moderator's opinion. Also, without a good moderator, one or two participants may dominate a session, yielding

results that are really the opinion of one or two people, not the group. The moderator has to try very hard to make sure that all respondents feel comfortable giving their opinions and even a timid respondent's opinion is given due consideration. While many people, even some with little or no background to do so, conduct focus groups, good moderators become effective through a combination of naturally good people skills, training (in qualitative research), and experience.

Second, some unique sampling problems arise with focus groups. Researchers often select focus group participants because they have similar backgrounds and experiences or because screening indicates that the participants are more articulate or gregarious than the typical consumer. Such participants may not be representative of the entire target market. Thus, focus group results are not intended to be representative of a larger population.

Third, although not so much an issue with online formats where respondents can remain anonymous, traditional face-to-face focus groups may not be useful for discussing sensitive topics. A focus group is a social setting and usually involves people with little to no familiarity with each other. Therefore, issues that people normally do not like to discuss in public may also prove difficult to discuss in a focus group. Fourth, focus groups do cost a considerable amount of money, particularly when they are not conducted by someone employed by the company desiring the focus group. As research projects go, there are many more expensive approaches, including a full-blown mail survey using a national random sample. This may cost thousands of dollars to conduct and thousands of dollars to analyze and disseminate.

2-Depth Interviews

An alternative to a focus group is a depth interview. A **depth interview** is a one-on-one interview between a professional researcher and a research respondent. Depth interviews are much the same as a psychological, clinical interview, but with a different purpose. The researcher asks many questions and follows up each answer with probes for additional elaboration.

Like focus group moderators, the interviewer's role is critical in a depth interview. He or she must be a highly skilled individual who can encourage the respondent to talk freely without influencing the direction of the conversation. Probing questions are critical. **Laddering** is a term used for a particular approach to probing, asking respondents to compare differences between brands at different levels. What usually results is that the first distinctions are attribute-level distinctions, the second are benefit-level distinctions, and the third are at the value or motivation level.

Laddering can then distinguish two brands of skateboarding shoes based on a) the materials they are made of, b) the comfort they provide, and c) the excitement they create.

Each depth interview may last more than an hour. Thus, it is a time-consuming process if multiple interviews are conducted. Not only does the interview have to be conducted, but each interview produces about the same amount of text as does a focus group interview. This has to be analyzed and interpreted by the researcher. A third major issue stems from the necessity of recording both surface reactions and subconscious motivations of the respondent. Analysis and interpretation of such data are highly subjective, and it is difficult to settle on a true interpretation.

Depth interviews provide more insight into a particular individual than do focus groups. In addition, since the setting isn't really social, respondents are more likely to discuss sensitive topics than are those in a focus group. Depth interviews are particularly advantageous when some unique or unusual behavior is being studied. For instance, depth interviews have been usefully applied to reveal characteristics of adolescent behavior, ranging from the ways they get what they want from their parents to shopping, smoking, and shoplifting.

Depth interviews are similar to focus groups in many ways. The costs are similar if only a few interviews are conducted. However, if a dozen or more interviews are included in a report, the costs are higher than focus group interviews due to the increased interviewing and analysis time.

3-Conversations

Holding **conversations** in qualitative research is an informal data-gathering approach in which the researcher engages a respondent in a discussion of the relevant subject matter. This approach is almost completely unstructured and the researcher enters the conversation with few expectations. The goal is to have the respondent produce a dialogue about his or her lived experiences. Meaning will be extracted from the resulting dialogue. A conversational approach to qualitative research is particularly appropriate in phenomenological research and for developing grounded theory. In our Vans experience, the researcher may simply tape-record a conversation about becoming a "skater." The resulting dialogue can then be analyzed for themes and plots. The result may be some interesting and novel insight into the consumption patterns of skaters, for example, if the respondent said,

"I knew I was a real skater when I just had to have Vans, not just for boarding, but for wearing."

This theme may connect to a right-of-passage plot and show how Vans play a role in this process. Technology is also influencing conversational research. Online communications such as the reviews posted about book purchases at **http://www.barnesandnoble.com** can be treated as a conversation. Companies may discover product problems and ideas for overcoming them by analyzing these computer-based consumer dialogues. A conversational approach is advantageous because each interview is usually inexpensive to conduct. Respondents often need not be paid. They are relatively effective at getting at sensitive issues once the researcher establishes a rapport with them. Conversational approaches, however, are prone to produce little relevant information since little effort is made to steer the conversation. Additionally, the data analysis is very much researcher-dependent.

4-Semi-Structured Interviews

Semi-structured interviews usually come in written form and ask respondents for short essay responses to specific open-ended questions. Respondents are free to write as much or as little as they want. The questions would be divided into sections, typically, and within each section, the opening question would be followed by some probing questions. When these are performed face to face, there is room for less structured follow-ups. The advantages to this approach include an ability to address more specific issues. Responses are usually easier to interpret than other qualitative approaches. Since the researcher can simply prepare the questions in writing ahead of time, and if in writing, the questions are administered without the presence of an interviewer, semi-structured interviews can be relatively costeffective. Some researchers interested in studying car salesperson stereotypes used qualitative semistructured interviews to map consumers' cognitions (memory). The semi-structured interview began with a free-association task:

List the first five things that come into your mind when you think of a "car salesman."

This was followed up with a probing question:

Describe the way a typical "car salesman" looks.

This was followed with questions about how the car salesperson acts and how the respondent feels in the presence of a car salesperson. The results led to research showing how the information that consumers process differs in the presence of a typical car salesperson, as opposed to a less typical car salesperson

5-Social Networking

Social networking is one of the most impactful trends in recent times. For many consumers, particularly younger generations, social networking sites like MySpace, Second Life, Zebo, and others have become the primary tool for communicating with friends both far and near and known and unknown. Social networking has replaced large volumes of e-mail and, many would say, face– to-face communications as well. While the impact that social networking will eventually have on society is an interesting question, what is most relevant to marketing research is the large portion of this information that discusses marketing and consumer related information. Companies can assign research assistants to monitor these sites for information related to their particular brands. The information can be coded as either positive or negative. When too much negative information is being spread, the company can try to react to change the opinions. In addition, many companies like P&G and Ford maintain their own social networking sites for the purpose of gathering research data. In a way, these social networking sites are a way that companies can eavesdrop on consumer conversations and discover key information about their products. The textual data that consumers willingly put up becomes like a conversation. When researchers get the opportunity to react with consumers or employees through a social network site, they can function much like an online focus group or interview.

6-Free-Association/Sentence Completion Method

Free-association techniques simply record a respondent's first cognitive reactions (top-of- mind) to some stimulus. The Rorschach or inkblot test typifies the free-association method. Respondents view an ambiguous figure and are asked to say the first thing that comes to their mind. Free-association techniques allow researchers to map a respondent's thoughts or memory.

The sentence completion method is based on free-association principles. Respondents simply are required to complete a few partial sentences with the first word or phrase that comes to mind. For example:

People who drink beer are_____.

A man who drinks a dark beer is____. Imported beer is most liked by_____.

The woman drinking beer in the commercial_____.

Answers to sentence-completion questions tend to be more extensive than responses to word association tests. Although the responses lack the ability to probe for meaning as in other qualitative techniques, they are very effective in finding out what is on a respondent's mind. They can also do so in a quick and very cost-effective manner. Free-association and sentence- completion tasks are sometimes

used in conjunction with other approaches. For instance, they can sometimes be used as effective icebreakers in focus group interviews.

7-Observation

Observation can be a very important qualitative tool. The participant-observer approach typifies how observation can be used to explore various issues. Meaning is extracted from field notes. **Field notes** are the researchers' descriptions of what actually happens in the field. These notes then become the text from which meaning is extracted.

Observation may also take place in visual form. Researchers may observe employees in their workplace, consumers in their home, or try to gain knowledge from photographic records of one type or another. Observation can either be very inexpensive, such as when a research associate sits and simply observes behavior, or it can be very expensive, as in most participant-observer studies.

8-Collages

Business researchers sometimes have respondents prepare a collage to represent their experiences. The collages are then analyzed for meaning much in the same manner as text dialogues are analyzed. Computer software can even be applied to help develop potential grounded theories from the visual representations.

Like sentence completion and word association, collages are often used within some other approach, such as a focus group or a depth interview. Collages offer the advantage of flexibility but are also very much subject to the researcher's interpretations.

4.25 Projective Research Techniques

A **projective technique** is an indirect means of questioning enabling respondents to project beliefs and feelings onto a third party, an inanimate object, or a task situation. Projective techniques usually encourage respondents to describe a situation in their own words with little prompting by the interviewer. Individuals are expected to interpret the situation within the context of their own experiences, attitudes, and personalities and to express opinions and emotions that may be hidden from others and possibly themselves. Projective techniques are particularly useful in studying sensitive issues.

10-Thematic Apperception Test (TAT)

A **thematic apperception test (TAT)**, sometimes called the *picture interpretation*

technique, presents subjects with an ambiguous picture(s) and asks the subject to tell what is happening in the picture(s) now and what might happen next. Hence, themes (*thematic*) are elicited on the basis of the perceptual-interpretive (*apperception*) use of the pictures. The researcher then analyzes the contents of the stories that the subjects relate. A TAT represents a projective research technique.

Frequently, the TAT consists of a series of pictures with some continuity so that stories may be constructed in a variety of settings. The first picture might portray a person working at their desk; in the second picture, a person that could be a supervisor is talking to the worker; the final picture might show the original employee and another having a discussion at the water cooler. A Vans TAT might include several ambiguous pictures of a skateboarder and then show him or her heading to the store. This might reveal ideas about the brands and products that fit the role of skateboarder.

The picture or cartoon stimulus must be sufficiently interesting to encourage discussion but ambiguous enough not to disclose the nature of the research project. Clues should not be given to the character's positive or negative predisposition. A pretest of a TAT investigating why men might purchase chainsaws used a picture of a man looking at a very large tree. The research respondents were homeowners and weekend woodcutters. They almost unanimously said that they would get professional help from a tree surgeon to deal with this situation. Thus, early in pretesting, the researchers found out that the picture was not sufficiently ambiguous. The tree was too large and did not allow respondents to identify with the tree-cutting task. If subjects are to project their own views into the situation, the environmental setting should be a well-defined, familiar problem, but the solution should be ambiguous.

4.26 Exploratory Research in Science and in Practice

Misuses of Exploratory and Qualitative Research

Any research tool can be misapplied. Exploratory research cannot take the place of conclusive, confirmatory research. Thus, since many qualitative tools are best applied in exploratory design, they are likewise limited in the ability to draw conclusive inferences—test hypotheses. One of the biggest drawbacks is the subjectivity that comes along with "interpretation." In fact, sometimes the term *interpretive* research is used synonymously with qualitative research. When only one researcher interprets the meaning of what a single person said in a depth interview or similar technique, one should be very cautious before major business decisions are made based on these results. Is the result replicable? **Replication** means that the same results and conclusions will be drawn if the study is repeated by different researchers with different respondents following the same methods. In

other words, would the same conclusion be reached based on another researcher's interpretation?

Indeed, some qualitative research methodologies were generally frowned upon for years based on a few early and public misapplications during what became known as the "motivational research" era. While many of the ideas produced during this time had some merit, as can sometimes be the case, too few researchers did too much interpretation of too few respondents. Compounding this, managers were quick to act on the results, believing that the results peaked inside one's subliminal consciousness and therefore held some type of extra power. Thus, often the research was flawed based on poor interpretation, and the decision process was flawed because the deciders acted prematurely.

4.27 Scientific Decision Processes

Objectivity and replicability are two characteristics of scientific inquiry. Are focus groups objective and replicable? Would three different researchers all interpret focus group data identically? How should a facial expression or nod of the head be interpreted? Have subjects fully grasped the idea or concept behind a nonexistent product? Have respondents overstated their satisfaction because they think their supervisor will read the report and recognize them from their comments? Many of these questions are reduced to a matter of opinion that may vary from researcher to researcher and from one respondent group to another. Therefore, a focus group, or a depth interview, or TAT alone does not best represent a complete scientific inquiry.

However, if the thoughts discovered through these techniques survive preliminary evaluations and are developed into research hypotheses, they can be further tested. These tests may involve survey research or an experiment testing an idea very specifically (for example, if a certain advertising slogan is more effective than another). Thus, exploratory research approaches using qualitative research tools are very much a *part* of scientific inquiry. However, before making a *scientific* decision, a research project should include a confirmatory study using objective tools and an adequate sample in terms of both size and how well it represents a population.

But is a *scientific* decision approach always used or needed? In practice, many business decisions are based solely on the results of focus group interviews or some other exploratory result. The primary reasons for this are

(1) Time,

(2) Money,

(3) Emotion.

1) Time

Sometimes, researchers simply are not given enough time to follow up on exploratory research results. Companies feel an increasingly urgent need to get new products to the market faster. Thus, a seemingly good idea generated in a focus group (like Clear, Vanilla, or Cherry Dr Pepper) is simply not tested with a more conclusive study. The risk of delaying a decision may be seen as greater than the risk of proceeding without completing the scientific process. Thus, although the researcher may warn against it, there may be logical reasons for such action. The decision makers should be aware, though, that the conclusions drawn from exploratory research designs are just that — exploratory. Thus, there is less likelihood of good results from the decision than if the research process had involved further testing.

2) Money

Similarly, researchers sometimes do not follow up on exploratory research results because they believe the cost is too high. Realize that tens of thousands of dollars may have already been spent on qualitative research. Managers who are unfamiliar with research will be very tempted to wonder, "Why do I need yet another study?" and "What did I spend all that money for?" Thus, they choose to proceed based only on exploratory results. Again, the researcher has fulfilled the professional obligation as long as the tentative nature of any ideas derived from exploratory research has been relayed through the research report.

3) Emotion

Time, money, and emotion are all related. Decision makers sometimes become so anxious to have something resolved, or they get so excited about some novel discovery resulting from a focus group interview, that they may act rashly. Perhaps some of the ideas produced during the motivational research era sounded so enticing that decision makers got caught up in the emotion of the moment and proceeded without the proper amount of testing. Thus, as in life, when we fall in love with something, we are prone to act irrationally. The chances of emotion interfering in this way are lessened, but not reduced, by making sure multiple decision makers are involved in the decision process.

Summary

Qualitative business research is research that addresses business objectives through techniques that allow the researcher to provide elaborate interpretations of market phenomena without depending on numerical measurement. Quantitative

researchers direct a considerable amount of activity toward measuring concepts with scales that either directly or indirectly provide numeric values. Qualitative research seldom involves samples with hundreds of respondents. Instead, a handful of people are usually the source of qualitative data. Ethnography represents ways of studying cultures through methods that involve becoming highly active within that culture. Grounded theory is particularly applicable in highly dynamic situations involving rapid and significant change. Focus groups are led by a trained moderator who follows a flexible format encouraging dialogue among respondents. exploratory research approaches using qualitative research tools are very much a part of scientific inquiry.

Questions

1. What is quantitative research?
2. What is qualitative research?
3. Give comparison between quantitative and qualitative research.
4. What is a phenomenological approach to research?
5. What are hermeneutics?
6. What is ethnography?
7. Explain in brief about exploratory research.
8. Explain the scientific decision process with suitable example.

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UNIT 2

5

SECONDARY DATA RESEARCH IN A DIGITAL AGE

Unit Structure

5.0 Objectives

- Understanding about the use of secondary data
- Single-Source Data-Integrated Information
- Use of social networking and other resources in the research

5.1 Introduction

Research projects often begin with **secondary data**, which are gathered and recorded by someone else prior to (and for purposes other than) the current project. Secondary data usually are historical and already assembled. They require no access to respondents or subjects.

5.2 Secondary Data

Secondary data is the data that has already been collected through primary sources and made readily available for researchers to use for their own research. It is a type of data that has already been collected in the past.

A researcher may have collected the data for a particular project, then made it available to be used by another researcher. The data may also have been collected for general use with no specific research purpose like in the case of the national census.

A data classified as secondary for a particular research may be said to be primary for another research. This is the case when a data is being reused, making it a primary data for the first research and secondary data for the second research it is being used for.

5.3 Sources of Secondary Data

Sources of secondary data includes books, personal sources, journal, newspaper, website, government record etc. Secondary data are known to be readily available compared to that of primary data. It requires very little research and need for manpower to use these sources.

With the advent of electronic media and the internet, secondary data sources have become more easily accessible. Some of these sources are highlighted below.

Books

Books are one of the most traditional ways of collecting data. Today, there are books available for all topics you can think of. When carrying out research, all you have to do is look for a book on the topic being researched on, then select from the available repository of books in that area. Books, when carefully chosen are an authentic source of authentic data and can be useful in preparing a literature review.

Published Sources

There are a variety of published sources available for different research topics. The authenticity of the data generated from these sources depends majorly on the writer and publishing company.

Published sources may be printed or electronic as the case may be. They may be paid or free depending on the writer and publishing company's decision.

Unpublished Personal Sources

This may not be readily available and easily accessible compared to the published sources. They only become accessible if the researcher shares with another researcher who is not allowed to share it with a third party.

For example, the product management team of an organization may need data on customer feedback to assess what customers think about their product and improvement suggestions. They will need to collect the data from the customer service department, which primarily collected the data to improve customer service.

Journal

Journals are gradually becoming more important than books these days when data collection is concerned. This is because journals are updated regularly with new publications on a periodic basis, therefore giving to date information.

Also, journals are usually more specific when it comes to research. For example, we can have a journal on, "Secondary data collection for quantitative data" while a book will simply be titled, "Secondary data collection".

Newspapers

In most cases, the information passed through a newspaper is usually very reliable. Hence, making it one of the most authentic sources of collecting secondary data.

The kind of data commonly shared in newspapers is usually more political, economic, and educational than scientific. Therefore, newspapers may not be the best source for scientific data collection.

Websites

The information shared on websites are mostly not regulated and as such may not be trusted compared to other sources. However, there are some regulated websites that only share authentic data and can be trusted by researchers.

Most of these websites are usually government websites or private organizations that are paid, data collectors.

Blogs

Blogs are one of the most common online sources for data and may even be less authentic than websites. These days, practically everyone owns a blog and a lot of people use these blogs to drive traffic to their website or make money through paid ads.

Therefore, they cannot always be trusted. For example, a blogger may write good things about a product because he or she was paid to do so by the manufacturer even though these things are not true.

Diaries

They are personal records and as such rarely used for data collection by researchers. Also, diaries are usually personal, except for these days when people now share public diaries containing specific events in their life.

A common example of this is Anne Frank's diary which contained an accurate record of the Nazi wars.

Government Records

Government records are a very important and authentic source of secondary data. They contain information useful in marketing, management, humanities, and social science research.

Some of these records include; census data, health records, education institute records, etc. They are usually collected to aid proper planning, allocation of funds, and prioritizing of projects.

Podcasts

Podcasts are gradually becoming very common these days, and a lot of people listen to them as an alternative to radio. They are more or less like online radio stations and are generating increasing popularity.

Information is usually shared during podcasts, and listeners can use it as a source of data collection.

Advantages of Secondary Data

The primary advantage of secondary data is their availability. Obtaining secondary data is almost always faster and less expensive than acquiring primary data. This is particularly true when researchers use electronic retrieval to access data stored digitally. In many situations, collecting secondary data is instantaneous. Consider the money and time saved by researchers who obtained updated population estimates for a town during the interim between the 2000 and 2010 censuses. Instead of doing the fieldwork themselves, researchers could acquire estimates from a firm dealing in demographic information or from sources such as Claritas or PCensus. As in this example, the use of secondary data eliminates many of the activities normally associated with primary data collection, such as sampling and data processing. Secondary data are essential in instances when data cannot be obtained using primary data collection procedures. For example, a manufacturer of

farm implements could not duplicate the information in the *Census of Agriculture* because much of the information there (for example, amount of taxes paid) might not be accessible to a private firm.

Disadvantages of Secondary Data

An inherent disadvantage of secondary data is that they were not designed specifically to meet the researchers' needs. Thus, researchers must ask how pertinent the data are to their particular project. To evaluate secondary data, researchers should ask questions such as these:

- Is the subject matter consistent with our problem definition?
- Do the data apply to the population of interest?
- Do the data apply to the time period of interest?
- Do the secondary data appear in the correct units of measurement?
- Do the data cover the subject of interest in adequate detail?

Even when secondary information is available, it can be inadequate. Consider the following typical situations:

- A researcher interested in forklift trucks finds that the secondary data on the subject are included in a broader, less pertinent category encompassing all industrial trucks and tractors. Furthermore, the data were collected five years earlier.
- An investigator who wishes to study individuals earning more than $100,000 per year finds the top category in a secondary study reported at $75,000 or more per year.
- A brewery that wishes to compare its per-barrel advertising expenditures with those of competitors finds that the units of measurement differ because some report point-of-purchase expenditures with advertising and others do not.
- Data from a previous warranty card study show where consumers prefer to purchase the product but provide no reasons why. The most common reasons why secondary data do not adequately satisfy research needs are (1) outdated information, (2) variation in definition of terms, (3) different units of measurement, and (4) lack of information to verify the data's accuracy. Furthermore, in our rapidly changing environment, information quickly becomes outdated. Because the purpose of most studies is to predict the future, secondary data must be timely to be useful. Every primary researcher has the right to define the terms or concepts under investigation to satisfy the purpose of his or her primary investigation. This practice provides little solace,

5.4 Typical Objectives for Secondary-Data Research Designs

It would be impossible to identify all the purposes of research using secondary data. However, some common business and marketing problems that can be addressed with secondary research designs are useful. Exhibit below shows three general categories of research objectives: fact finding, model building, and database marketing.

Figure a: Common Research Objectives for Secondary- Data Studies

Broad Objective	Specific Research Example
Fact-finding	Identifying consumption patterns Tracking trends
Model building	Estimating market potential Forecasting sales Selecting trade areas and sites
Database marketing	Enhancing customer databases Developing prospect lists

Fact-Finding

The simplest form of secondary-data research is fact-finding. A restaurant serving breakfast might be interested in knowing what new products are likely to entice consumers. Secondary data available from National Eating Trends, a service of the NPD Group, show that the most potential may be in menu items customers can eat on the go. According to data from the survey of eating trends, take-out breakfasts have doubled over the past few years, and they have continued to surpass dine-in breakfast sales for over a decade. These trends make smoothies and breakfast sandwiches sound like a good bet for a breakfast menu. Also, NPD found that 41 percent of breakfast sandwiches are consumed by people in their cars and 24 percent of people polled take them to work. These findings suggest that the sandwiches should be easy to handle.

But what to put on the biscuit or bun? Another research firm, Market Facts, says almost half of consumers say they would pay extra for cheese. These simple facts would interest a researcher who was investigating the market for take-out breakfasts. Fact-finding can serve more complex purposes as well. In the digital age we live in, the use of music as a means to notify users of a call is commonplace. The Research Snapshot on the next page gives some of the amazing growth facts predicted in this industry.

5.5 Identification of Consumer Behavior for a Product Category

A typical objective for a secondary research study might be to uncover all available information about consumption patterns for a particular product category or to identify demographic trends that affect an industry. For example, a company called Servigistics offers software that will scan a company's own parts inventory data and compare it with marketing objectives and competitors' prices to evaluate whether the company should adjust prices for its parts. Kia Motors tried using this service in place of the usual method of marking up cost by a set fraction. By considering secondary data including internal inventory data and external data about competitors' prices, it was able to make service parts a more profitable segment of its business.3 This example illustrates the wealth of factual information about consumption and behavior patterns that can be obtained by carefully collecting and analyzing secondary data.

5.6 Trend Analysis

Business researchers are challenged to constantly watch for trends in the marketplace and the environment. **Market tracking** is the observation and analysis of trends in industry volume and brand share over time. Scanner research services and other organizations provide facts about sales volume to support this work. Almost every large consumer goods company routinely investigates brand and product category sales volume using secondary data. This type of analysis typically involves comparisons with competitors' sales or with the company's own sales in comparable time periods. It also involves industry comparisons among different geographic areas. Exhibit below on the next page shows the trend in cola market share relative to the total carbonated soft-drink industry.

1. Model Building

The second general objective for secondary research, model building, is more complicated than simple fact-finding. **Model building** involves specifying relationships between two or more variables, perhaps extending to the development of descriptive or predictive equations, a technique that is used by the Nielsen Claritas Company routinely to add value to their secondary data. Models need not include complicated mathematics, though. In fact, decision makers often prefer simple models that everyone can readily understand over complex models that are difficult to comprehend. For example, market share is company sales divided by industry sales. Although some may not think of this simple calculation as a model, it represents a mathematical model of a basic relationship. We will illustrate model building by discussing three common objectives that can be satisfied with secondary research: estimating market potential, forecasting sales, and selecting potential facility or expansion sites.

2. Estimating Market Potential for Geographic Areas

Business researchers often estimate their company's market potential using secondary data. In many cases exact figures may be published by a trade association or another source. However, when the desired information is unavailable, the researcher may estimate market potential by transforming secondary data from two or more sources. For example, managers may find secondary data about market potential for a country or other large geographic area, but this information may not be broken down into smaller geographical areas, such as by metropolitan area, or in terms unique to the company, such as sales territory. In this type of situation, researchers often need to make projections for the geographic area of interest.

3. Forecasting Sales

For any project, such as forecasting sales, you need information about the future. You will need to know what company sales will be next year and in future time periods. Sales forecasting is the process of predicting sales totals over a specific time period. Accurate sales forecasts, especially for products in mature, stable markets, frequently come from secondary-data research that identifies trends and extrapolates past performance into the future. Researchers often use internal company sales records to project sales. A rudimentary model would multiply past sales volume by an expected growth rate. A researcher might investigate a secondary source and find that industry sales are expected to grow by 10 percent; multiplying company sales volume by 10 percent would give a basic sales forecast.

5.7 Analysis of Trade Areas And Sites

Managers routinely examine trade areas and use **site analysis techniques** to select the best locations for retail or wholesale operations. Secondary-data research helps managers make these site selection decisions. Some organizations, especially franchisers, have developed special computer software based on analytical models to select sites for retail outlets. The researcher must obtain the appropriate secondary data for analysis with the computer software. The **index of retail saturation** offers one way to investigate retail sites and to describe the relationship between retail demand and supply.7 It is easy to calculate once the appropriate secondary data are obtained:

$$\textit{Index of retail saturation} = \frac{\textit{local market potentia(demand)}}{\textit{local market retailing space}}$$

Data Mining

Large corporations' decision support systems often contain millions or even hundreds of millions of records of data. These complex data volumes are too large to be understood by managers. Two points about data volume are important to keep in mind. First, relevant data are often in independent and unrelated files. Second, the number of distinct pieces of information each data record contains is often large. When the number of distinct pieces of information contained in each data record and data volume grows too large, end users don't have the capacity to make sense of it all. Data mining helps clarify the underlying meaning of the data.

The term **data mining** refers to the use of powerful computers to dig through volumes of data to discover patterns about an organization's customers and products. As seen in the Research Snapshot on the next page, this can even apply to Internet content from blogs. It is a broad term that applies to many different forms of analysis. For example, **neural networks** are a form of artificial intelligence in which a computer is programmed to mimic the way that human brains process information.

Market-basket analysis is a form of data mining that analyzes anonymous point-of-sale transaction databases to identify coinciding purchases or relationships between products purchased and other retail shopping information.10 Consider this example about patterns in customer purchases: Osco Drugs mined its databases provided by checkout scanners and found that when men go to its drugstores to buy diapers in the evening between 6:00 p.m. and 8:00 p.m., they sometimes walk out with a six-pack of beer as well. Knowing this behavioral pattern, supermarket managers may consider laying out their stores so that these items are closer together

A data-mining application of interest to some researchers is known as **customer discovery**, which involves mining data to look for patterns identifying who is likely to be a valuable customer. For example, a larger provider of business services wanted to sell a new product to its existing customers, but it knew that only some of them would be interested. The company had to adapt each product offering to each customer's individual needs, so it wanted to save money by identifying the best prospects. It contracted with a research provider called DataMind to mine its data on sales, responses to marketing, and customer service to look for the customers most likely to be interested in the new product. DataMind assigned each of the company's customers an index number indicating their expected interest level, and the selling effort was much more efficient as a result.

When a company knows the identity of the customer who makes repeated purchases from the same organization, an analysis can be made of sequences of purchases. The use of data mining to detect sequence patterns is a popular application among direct marketers, such as catalog retailers. A catalog merchant has information for each customer, revealing the sets of products that the customer buys in every purchase order. A sequence detection function can then be used to discover the set of purchases that frequently precedes the purchase of, say, a microwave oven. As another example, a sequence of insurance claims could lead to the identification of frequently occurring medical procedures performed on patients, which in turn could be used to detect cases of medical fraud.

Data mining requires sophisticated computer resources, and it is expensive. That's why companies like DataMind, IBM, Oracle, Information Builders, and Acxiom Corporation offer data-mining services. Customers send the databases they want analyzed and let the data-mining company do the "number crunching."

Database Marketing and Customer Relationship Management

CRM (customer relationship management) systems are a decision support system that manage the interactions between an organization and its customers. A CRM maintains customer databases containing customers' names, addresses, phone numbers, past purchases, responses to past promotional offers, and other relevant data such as demographic and financial data. **Database marketing** is the practice of using CRM databases to develop one-to-one relationships and precisely targeted promotional efforts with individual customers. For example, a fruit catalog company CRM contains a database of previous customers, including what purchases they made during the Christmas holidays. Each year the company sends last year's gift list to customers to help them send the same gifts to their friends and relatives.

Because database marketing requires vast amounts of CRM data compiled from numerous sources, secondary data are often acquired for the exclusive purpose of developing or enhancing databases. The transaction record, which often lists the item purchased, its value, customer name, address, and zip code, is the building block for many databases. This may be supplemented with data customers provide directly, such as data on a warranty card, and by secondary data purchased from third parties. For example, credit services may sell databases about applications for loans, credit card payment history, and other financial data. Several companies, such as Donnelley Marketing (with its BusinessContentFile and ConsumerContentFile services) and Claritas (with PRIZM), collect primary data and then sell demographic data that can be related to small geographic areas, such as those with a certain zip code. (Remember that when the vendor collects the data,

they are primary data, but when the database marketer incorporates the data into his or her database, they are secondary data.) Now that some of the purposes of secondary-data analysis have been addressed, we turn to a discussion of the sources of secondary data.

Other Sources to obtain SecondaryData

Secondary data can be classified as either internal to the organization or external. Modern information technology makes this distinction seem somewhat simplistic. Some accounting documents are indisputably internal records of the organization. Researchers in another organization cannot have access to them. Clearly, a book published by the federal government and located at a public library is external to the company. However, in today's world of electronic data interchange, the data that appear in a book published by the federal government may also be purchased from an online information vendor for instantaneous access and subsequently stored in a company's decision support system. Internal data should be defined as data that originated in the organization, or data created, recorded, or generated by the organization. **Internal and proprietary data** is perhaps a more descriptive term.

Sources of Internal and Proprietary Data

Most organizations routinely gather, record, and store internal data to help them solve future problems. An organization's accounting system can usually provide a wealth of information. Routine documents such as sales invoices allow external financial reporting, which in turn can be a source of data for further analysis. If the data are properly coded into a modular database in the accounting system, the researcher may be able to conduct more detailed analysis using the decision support system. Sales information can be broken down by account or by product and region; information related to orders received, back orders, and unfilled orders can be identified; sales can be forecast on the basis of past data. Other useful sources of internal data include salespeople's call reports, customer complaints, service records, warranty card returns, and other records. Researchers frequently aggregate or disaggregate internal data. For example, a computer service firm used internal secondary data to analyze sales over the previous three years, categorizing business by industry, product, purchase level, and so on. The company discovered that 60 percent of its customers represented only 2 percent of its business and that nearly all of these customers came through telephone directory advertising. This simple investigation of internal records showed that, in effect, the firm was paying to attract customers it did not want. Internet technology is making it easier to research internal and proprietary data. Often companies set up intranets so that employees can use Web tools to store and share data within the organization. And just as Google's search software lets people search the entire World Wide Web, Google is

offering the enterprise search, which is essentially the same technology in a version that searches a corporate intranet. The enterprise search considers not only how often a particular document has been viewed but also the history of the user's past search patterns, such as how that user has looked at particular documents and for how long. In addition, other companies have purchased specialized software, such as Autonomy, which searches internal sources plus such external sources as news government Web sites

5.8 External Data: The Distribution System

External data are generated or recorded by an entity other than the researcher's organization. The government, newspapers and journals, trade associations, and other organizations create or produce information. Traditionally, this information has been in published form, perhaps available from a public library, trade association, or government agency. Today, however, computerized data archives and electronic data interchange make external data as accessible as internal data. Exhibit below illustrates some traditional and some modern ways of distributing information.

5.9 Information as a Product and Its Distribution Channels

Because secondary data have value, they can be bought and sold like other products. And just as bottles of perfume or plumbers' wrenches may be distributed in many ways, secondary data also flow through various channels of distribution. Many users, such as the Fortune 500 corporations, purchase documents and computerized census data directly from the government. However, many small companies get census data from a library or another intermediary or vendor of secondary information.

Libraries

Traditionally, libraries' vast storehouses of information have served as a bridge between users and producers of secondary data. The library staff deals directly with the creators of information, such as the federal government, and intermediate distributors of information, such as abstracting and indexing services. The user need only locate the appropriate secondary data on the library shelves. Libraries provide collections of books, journals, newspapers, and so on for reading and reference. They also stock many bibliographies, abstracts, guides, directories, and indexes, as well as offer access to basic databases.

The Internet

Today, of course, much secondary data is conveniently available over the Internet. Its creation has added an international dimension to the acquisition of secondary data. For example, Library Spot, at **http://www.libraryspot.com**, provides links to online libraries, including law libraries, medical libraries, and music libraries. Its reference desk features links to calendars, dictionaries, encyclopedias, maps, and other sources typically found at a traditional library's reference desk.

Vendors

The information age offers many channels besides libraries through which to access data. Many external producers make secondary data available directly from the organizations that produce the data or through intermediaries, which are often called *vendors.* Vendors such as Factiva now allow managers to access thousands of external databases via desktop computers and telecommunications systems. Hoovers (**http://www.hoovers.com**) specializes in providing information about thousands of companies' financial situations and operations.

Producers

Classifying external secondary data by the nature of the producer of information yields five basic sources: publishers of books and periodicals, government sources, media sources, trade association sources, and commercial sources. The following section discusses each type of secondary data source.

1) Books and Periodicals

Some researchers consider books and periodicals found in a library to be the quintessential secondary data source. A researcher who finds books on a topic of interest obviously is off to a good start. Professional journals, such as the *Journal of Marketing, Journal of Management, Journal of the Academy of Marketing Science, The Journal of Business Research, Journal of Advertising Research, American Demographics,* and *The Public Opinion Quarterly,* as well as commercial business periodicals such as the *Wall Street Journal, Fortune,* and *BusinessWeek,* contain much useful material.

2) Government Sources

Government agencies produce data prolifically. Most of the data published by the federal government can be counted on for accuracy and quality of investigation. Most students are familiar with the U.S. *Census of Population,* which provides a wealth of data.

3) Media Sources

Information on a broad range of subjects is available from broadcast and print media. *CNN Financial News* and *BusinessWeek* are valuable sources for

information on the economy and many industries. Media frequently commission research studies about various aspects of Americans' lives, such as financial affairs, and make reports of survey findings available to potential advertisers free of charge. Data about the readers of magazines and the audiences for broadcast media typically are profiled in media kits and advertisements.

4) Trade Association Sources

Trade associations, such as the Food Marketing Institute or the American Petroleum Institute, serve the information needs of a particular industry. The trade association collects data on a number of topics of specific interest to firms, especially data on market size and market trends. Association members have a source of information that is particularly germane to their industry questions.

5) Commercial Sources

Numerous firms specialize in selling and/or publishing information. For example, the Polk Company publishes information on the automotive field, such as average car values and new-car purchase rates by zip code. Many of these organizations offer information in published formats and as CD-ROM or Internet databases.

Market-Share Data. A number of syndicated services supply either wholesale or retail sales volume data based on product movement. Information Resources, Inc., collects market-share data using Universal Product Codes (UPC) and optical scanning at retail store checkouts.

Demographic and Census Updates. A number of firms, such as CACI Marketing Systems and Urban Information Systems, offer computerized U.S. census files and updates of these data broken down by small geographic areas, such as zip codes. Many of these research suppliers provide indepth information on minority customers and other market segments.

Consumer Attitude and Public Opinion Research. Many research firms offer specialized syndicated services that report findings from attitude research and opinion polls. For example, Yankelovich provides custom research, tailored for specific projects, and several syndicated services.

Consumption and Purchase Behavior Data. NPD's *National Eating Trends* (NET) is the most detailed database available on consumption patterns and trends for more than 4,000 food and beverage products. This is a syndicated source of data about the types of meals people eat and when and how they eat them. The data, called *diary panel data,* are based on records of meals and diaries kept by a group of households that have agreed to record their consumption behavior over an extended period of time.

Advertising Research. Advertisers can purchase readership and audience data from a number of firms. W. R. Simmons and Associates measures magazine audiences; Arbitron measures radio audiences; ACNielsen Media Measurement estimates television audience ratings. By specializing in collecting and selling audience information on a continuing basis, these commercial sources provide a valuable service to their subscribers.

5.10 Single-Source Data-Integrated Information

ACNielsen Company offers data from both its television meters and scanner operations. The integration

of these two types of data helps marketers investigate the impact of television advertising on retail sales. In other ways as well, users of data find that merging two or more diverse types of data into a single database offers many advantages. The data and information industry uses the term **single-source data** for diverse types of data offered by a single company.

Sources for GlobalResearch

As business has become more global, so has the secondary data industry. The Japan Management Association Research Institute, Japan's largest provider of secondary research data to government and industry, maintains an office in San Diego. The Institute's goal is to help U.S. firms access its enormous store of data about Japan to develop and plan their business there. The office in San Diego provides translators and acts as an intermediary between Japanese researchers and U.S. clients.

Secondary data compiled outside the United States have the same limitations as domestic secondary data. However, international researchers should watch for certain pitfalls that frequently are associated with foreign data and cross-cultural research. First, data may simply be unavailable in certain countries. Second, the accuracy of some data may be called into question. This is especially likely with official statistics that may be adjusted for the political purposes of foreign governments. Finally, although economic terminology may be standardized, various countries use different definitions and accounting and recording practices for many economic concepts. For example, different countries may measure disposable personal income in radically different ways. International researchers should take extra care to investigate the comparability of data among countries.

The U.S. government and other organizations compile databases that may aid international secondary data needs. For example, *The European Union in the U.S.* (**http://www.eurunion.org**) reports on historical and current activity in the European Union providing a comprehensive reference guide to information about laws and regulations. The *European Union in the U.S.* profiles in detail each European Union member state, investment opportunities, sources of grants and other funding, and other information about business resources.

Summary

A researcher may have collected the data for a particular project, then made it available to be used by another researcher. Secondary data are known to be readily available compared to that of primary data. It requires very little research and need for manpower to use these sources. Secondary data are known to be readily available compared to that of primary data. It requires very little research and need for manpower to use these sources. Modern information technology makes this distinction seem somewhat simplistic. Most organizations routinely gather, record, and store internal data to help them solve future problems. Secondary data compiled outside the United States have the same limitations as domestic secondary data. International researchers should take extra care to investigate the comparability of data among countries.

Questions

1. What is secondary data? Explain its need in research.
2. Discuss any 4 sources of secondary data.
3. Discuss advantages and dis-advantages of secondary data.
4. Explain brief about data mining with reference to analysis.
5. Discuss the main objectives of secondary research.
6. Explain in brief about the sources of global research.
7. Write a note on trend analysis.

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UNIT 3

6

OBSERVATION METHODS AND EXPERIMENTAL RESEARCH

Unit Structure

6.0 Objectives

1. Discuss the role of observation as a business research method
2. Describe the use of direct observation and contrived observation
3. Identify ethical issues in observation studies
4. Explain the observation of physical objects and message content

6.1 Introduction

While survey data can provide some insight into future or past behavior, one can hardly argue with the power of data representing actual behavior.

6.2 Observation in Business Research

The systematic process of recording the behavioral patterns of people, objects, and occurrences as they are witnessed is called observation.

Observation becomes a tool for scientific inquiry when it meets several conditions:

- The observation serves a formulated research purpose.
- The observation is planned systematically.
- The observation is recorded systematically and related to general propositions, rather than simply reflecting a set of interesting curiosities.
- The observation is subjected to checks or controls on validity and reliability.

6.3 The Nature of Observation Studies

Business researchers can observe people, objects, events, or other phenomena using either human observers or machines designed for specific observation tasks. Human observation best suits a situation or behavior that is not easily predictable in advance of the research. Mechanical observation, as performed by supermarket scanners or traffic counters, can very accurately record situations or types of behavior that are routine, repetitive, or programmatic.

A situation in which an observer's presence is known to the subject involves **visible observation**.

A situation in which a subject is unaware that observation is taking place is **hidden observation**.

Hidden, unobtrusive observation minimizes respondent error. Asking subjects to participate in the research is not required when they are unaware that they are being observed.

6.4 Direct Observation

Direct observation can produce detailed records of what people actually do during an event. The observer plays a passive role, making no attempt to control or manipulate a situation, instead merely recording what occurs.

Errors Associated with Direct Observation

A distortion of measurement resulting from the cognitive behavior or actions of the witnessing observer is called **observer bias.** Interpretation of observation data is another potential source of error. Facial expressions and other nonverbal communication may have several meanings

Scientifically Contrived Observation

Most observation takes place in a natural setting, but sometimes the investigator intervenes to create an artificial environment in order to test a hypothesis. This approach is called contrived observation. Contrived observation can increase the frequency of occurrence of certain behavior patterns, such as employee responses to complaints.

6.5 Observation of Physical Objects

Physical phenomena may be the subject of observation study. Physical-trace evidence is a visible mark of some past event or occurrence. For example, the wear on library books indirectly indicates which books are actually read (handled most) when checked out.

An observer can record physical-trace data to discover information a respondent could not recall accurately. For example, measuring the number of ounces of a liquid bleach used during a test provides precise physical-trace evidence without relying on the respondent's memory. The accuracy of respondents' memories is not a problem for the firm that conducts a pantry audit. The pantry audit requires an inventory of the brands, quantities, and package sizes in a consumer's home rather than responses from individuals. The problem of untruthfulness or some other form of response bias is avoided. For example, the pantry audit prevents the possible problem of respondents erroneously claiming to have purchased prestige brands.

6.6 Content Analysis

Content analysis, which obtains data by observing and analyzing the contents or messages of advertisements, newspaper articles, television programs, letters, and the like. This method involves systematic analysis as well as observation to identify the specific information content and other characteristics of the messages.

Content analysis studies the message itself and involves the design of a systematic observation and recording procedure for quantitative description of the manifest content of communication.

Content analysis might be used to investigate questions such as whether some advertisers use certain themes, appeals, claims, or deceptive practices more than others or whether recent consumer-oriented actions by the Federal Trade Commission have influenced the contents of advertising.

6.7 Mechanical Observation

In many situations, the primary—and sometimes the only—means of observation is mechanical rather than human. Video cameras, traffic counters, and other machines help observe and record behavior. Some unusual observation studies have used motion-picture cameras and time-lapse photography. An early application of this observation technique photographed train passengers and determined their levels of comfort by observing how they sat and moved in their seats.

6.7.1 Television Monitoring

Computerized mechanical observation used to obtain television ratings. The Nielsen People Meter gathers data on what each television in a household is playing and who is watching it at the time. Researchers attach electronic boxes to television sets and remote controls to capture information on program choices and the length of viewing time. Nielsen matches the signals captured through these devices with its database of network broadcast and cable program schedules so that it can identify the specific programs being viewed.

6.7.2 Monitoring Web Site Traffic

Computer technology makes gathering detailed data about online behavior easy and inexpensive. The greater challenges are to identify which measures are meaningful and to interpret the data correctly. For instance, most organizations

record the number of hits at their Web sites—mouse clicks on a single page of a Web site.

A click-through rate (CTR) is the percentage of people who are exposed to an advertisement who actually click on the corresponding hyperlink which takes them to the company's Web site.

A more refined count is the number of unique visitors to a Web site. This measurement counts the initial access to the site but not multiple hits on the site by the same visitor during the same day or week. Operators of Web sites can collect the data by attaching small files, called cookies, to the computers of visitors to their sites and then tracking those cookies to see whether the same visitors return.

6.7.3 Scanner-Based Research

It is a type of consumer panel in which participants' purchasing habits are recorded with a laser scanner rather than a purchase diary.

Data from scanner research parallel data provided by a standard mail diary panel, with some important improvements:

1. The data measure observed (actual) purchase behavior rather than reported behavior (recorded later in a diary).
2. Substituting mechanical for human record-keeping improves accuracy.
3. Measures are unobtrusive, eliminating interviewing and the possibility of social desirability or other bias on the part of respondents.
4. More extensive purchase data can be collected, because all UPC categories are measured. In a mail diary, respondents could not possibly reliably record all items they purchased. Because all UPC-coded items are measured in the panel, users can investigate many product categories to determine loyalty, switching rates, and so on for their own brands as well as for other companies' products and locate product categories for possible market entry.
5. The data collected from computerized checkout scanners can be combined with data about the timing of advertising, price changes, displays, and special sales promotions. Researchers can scrutinize them with powerful analytical software provided by the scanner data providers.

6.7.4 Measuring Physiological Reactions

Researchers have used a number of mechanical devices to evaluate physical and physiological reactions to advertising copy, packaging, and other stimuli.

Researchers use such means when they believe consumers are unaware of their own reactions to stimuli such as advertising or that consumers will not provide honest responses. Recent research approaches use devices to monitor and measure brain activity as described in the Research Snapshot above. Four major categories of mechanical devices are used to measure physiological reactions:

(1) eye-tracking monitors: A mechanical device used to observe eye movements; some eye monitors use infrared light beams to measure unconscious eye movements.

(2) pupilometers: A mechanical device used to observe and record changes in the diameter of a subject's pupils.

(3) psychogalvanometers: A device that measures galvanic skin response, a measure of involuntary changes in the electrical resistance of the skin.

(4) voice-pitch analyzers: A physiological measurement technique that records abnormal frequencies in the voice that are supposed to reflect emotional reactions to various stimuli.

6.8 Experimental Research

The term experiment typically conjures up an image of a chemist surrounded by bubbling test tubes and Bunsen burners. Behavioral and physical scientists have used experimentation far longer than have business researchers. Nevertheless, both social scientists and physical scientists use experiments for much the same purpose—to assess cause and effect relationships.

6.9 Creating an Experiment

Experimental research allows a researcher to control the research situation so that causal relationships among variables may be evaluated. The experimenter manipulates one or more independent variables and holds constant all other possible independent variables while observing effects on dependent variable(s). Events may be controlled in an experiment to a degree that is simply not possible in a survey.

Experimental design is a major research topic. In fact, there are courses and books devoted only to that topic.3 Here, an introduction into experimental design is provided. A student should be able to design and implement basic experimental

designs with this introduction. Fortunately, most experimental designs for business research are relatively simple.

Experimental designs involve no less than four important design elements. These issues include

(1) Manipulation of the independent variable(s)

(2) Selection and measurement of the dependent variable(s)

(3) Selection and assignment of experimental subjects

(4) Control over extraneous variables.

6.10 Manipulation of the Independent Variable

The thing that makes independent variables special in experimentation is that the researcher actually creates his or her values. This is how the researcher manipulates, and therefore controls, independent variables.

An experimental treatment is the term referring to the way an experimental variable is manipulated.

6.10.1 Experimental and Control Groups

In perhaps the simplest experiment, an independent variable is manipulated over two treatment levels resulting in two groups, an experimental group and a control group. An experimental group is one in which an experimental treatment is administered. A control group is one in which no experimental treatment is administered.

6.10.2 Several Experimental Treatment Levels

An experiment with one experimental and one control group may not tell a manager everything he or she wishes to know. By analyzing more groups each with a different treatment level, a more precise result may be obtained than in a simple experimental group–control group experiment. This design, only manipulating the level of advertising, can produce only a main effect.

6.10.3 More Than One Independent Variable

An experiment can also be made more complicated by including the effect of another experimental variable. Our extended example of the self-efficacy experiment would typify a still relatively simple two-variable experiment. Since there are two variables, each with two different levels, four experimental groups

are obtained. Often, the term cell is used to refer to a treatment combination within an experiment.

6.10.4 Repeated Measures

Experiments in which an individual subject is exposed to more than one level of an experimental treatment are referred to as repeated measures designs. Although this approach has advantages, including being more economical since the same subject provides more data than otherwise, it has several drawbacks that can limit its usefulness.

6.11 Selection and Assignment of Test Units

Test units are the subjects or entities whose responses to the experimental treatment are measured or observed. Individual consumers, employees, organizational units, sales territories, market segments, or other entities may be the test units. People, whether as customers or employees, are the most common test units in most organizational behavior, human resources, and marketing experiments.

6.11.1 Sample selection and random sampling errors

Systematic or nonsampling error may occur if the sampling units in an experimental cell are somehow different than the units in another cell, and this difference affects the dependent variable.

6.11.2 Randomization

The random assignment of subject and treatments to groups—is one device for equally distributing the effects of extraneous variables to all conditions. These nuisance variables, items that may affect the dependent measure but are not of primary interest, often cannot be eliminated.

6.11.3 Matching

Random assignment of subjects to the various experimental groups is the most common technique used to prevent test units from differing from each other on key variables; it assumes that all characteristics of the subjects have been likewise randomized. Matching the respondents on the basis of pertinent background information is another technique for controlling systematic error by assigning subjects in a way that their characteristics are the same in each group. This is best thought of in terms of demographic characteristics. If a subject's sex is expected to influence dependent variable responses, as in a taste test, then the researcher may make sure that there are equal numbers of men and women in each experimental

cell. In general, if a researcher believes that certain extraneous variables may affect the dependent variable, he or she can make sure that the subjects in each group are the same on these characteristics.

6.11.4 Control over extraneous variables

The fourth decision about the basic elements of an experiment concerns control over extraneous variables. This is related to the various types of experimental error. In an earlier chapter, we classified total survey error into two basic categories: random sampling error and systematic error. The same dichotomy applies to all research designs, but the terms random (sampling) error and systematic error are more frequently used when discussing experiments.

6.11.5 Experimental confounds

A confound means that there is an alternative explanation beyond the experimental variables for any observed differences in the dependent variable. Once a potential confound is identified, the validity of the experiment is severely questioned. In a simple experimental group–control group experiment, if subjects in the experimental group are always administered treatment in the morning and subjects in the control group always receive the treatment in the afternoon, a systematic error occurs.

6.11.5.1 Extraneous variables

Most business students realize that the marketing mix variables—price, product, promotion, and distribution—interact with uncontrollable forces in the market, such as economic variables, competitor activities, and consumer trends. Thus, many marketing experiments are subject to the effect of extraneous variables. Since extraneous variables can produce confounded results, they must be identified before the experiment if at all possible.

6.12 Demand Characteristics

6.12.1 What Are Demand Characteristics?

The term demand characteristic refers to an experimental design element that unintentionally provides subjects with hints about the research hypothesis. Researchers cannot reveal the research hypotheses to subjects before the experiment or else they can create a confounding effect. Think about the self-efficacy experiment. If the subjects learned that they were being intentionally given positive feedback to enhance their confidence and attitudes toward their job, the researcher would never be sure if their responses to the dependent variable were

really due to the differences in the experimental stimuli or due to the fact that the subjects were trying to provide a "correct" response.

Once subjects know the hypotheses, there is little hope that they will respond naturally. A confound may be created by knowledge of the experimental hypothesis. This particular type of confound is known as a demand effect. Demand characteristics make demand effects very likely.

6.12.2 Experimenter Bias and Demand Effects

Demand characteristics are aspects of an experiment that demand (encourage) that the subjects respond in a particular way. Hence, they are a source of systematic error. If participants recognize the experimenter's expectation or demand, they are likely to act in a manner consistent with the experimental treatment. Even slight nonverbal cues may influence their reactions. Prominent demand characteristics are often presented by the person administering experimental procedures. If an experimenter's presence, actions, or comments influence the subjects' behavior or sway the subjects to slant their answers to cooperate with the experimenter, the experiment has introduced experimenter bias.

6.12.3 Hawthorne Effect

A famous management experiment illustrates a common demand characteristic. Researchers were attempting to study the effects on productivity of various working conditions, such as hours of work, rest periods, lighting, and methods of pay, at the Western Electric Hawthorne plant in Cicero, Illinois. The researchers found that workers' productivity increased whether the work hours were lengthened or shortened, whether lighting was very bright or very dim, and so on.

The surprised investigators realized that the workers' morale was higher because they were aware of being part of a special experimental group. This totally unintended effect is now known as the Hawthorne effect because researchers realize that people will perform differently when they know they are experimental subjects.

6.12.4 Reducing Demand Characteristics

Although it is practically impossible to eliminate demand characteristics from experiments, there are steps that can be taken to reduce them. Many of these steps make it difficult for subjects to know what the researcher is trying to find out. Some or all of these may be appropriate in a given experiment.

1. Use an experimental disguise.
2. Isolate experimental subjects.

3. Use a "blind" experimental administrator.
4. Administer only one experimental treatment level to each subject.

Experimental disguise

A placebo is an experimental deception involving a false treatment. A placebo effect refers to the corresponding effect in a dependent variable that is due to the psychological impact that goes along with knowledge of the treatment.

Isolate experimental subjects

Researchers should minimize the extent to which subjects are able to talk about the experimental procedures with each other. Although it may be unintentional, discussion among subjects may lead them to guess the experimental hypotheses.

Use a "blind" experimental administrator

When possible, the people actually administering the experiment may not be told the experimental hypotheses. The advantage is that if they do not know what exactly is being studied, then they are less likely to give off clues that result in demand effects.

Administer only one experimental condition per subject

When subjects know more than one experimental treatment condition, they are much more likely to guess the experimental hypothesis. So, even though there are cost advantages to administering multiple treatment levels to the same subject, it should be avoided when possible.

6.13 Establishing Control

When extraneous variables cannot be eliminated, experimenters may strive for constancy of conditions. This means that subjects in all experimental groups are exposed to identical conditions except for the differing experimental treatments. Random assignment and the principle of matching discussed earlier help make sure that constancy is achieved.

If an experimental method requires that the same subjects be exposed to two or more experimental treatments, an error may occur due to the order of presentation. For instance, if subjects are examining the effects of different levels of graphical interface on video game enjoyment, and they are asked to view each of four different levels, the order in which they are presented may influence enjoyment. Subjects might prefer one level simply because it follows a very poor level.

Counterbalancing attempts to eliminate the confounding effects of order of presentation by requiring that one-fourth of the subjects be exposed to treatment A first, one-fourth to treatment B first, one-fourth to treatment C first, and finally one-fourth to treatment D first. Likewise, the other levels are counterbalanced so that the order of presentation is rotated among subjects. It is easy to see where counterbalancing is particularly important for experiments such as taste tests, where the order of presentation may have significant effects on consumer preference.

6.14 Practical Experimental Design Issues

6.14.1 Basic versus Factorial Experimental Designs

In basic experimental designs a single independent variable is manipulated to observe its effect on a single dependent variable. The simultaneous change in independent variables such as price and advertising may have a greater influence on sales than if either variable is changed alone. In job satisfaction studies, we know that no one thing totally determines job satisfaction.

6.14.2 Laboratory Experiments

In a laboratory experiment the researcher has more complete control over the research setting and extraneous variables. Our example of the financial protocol experiment illustrates the benefits of a laboratory setting. The researchers were able to control for many factors, such as the size of the data file, the models of the computers, the Internet line, and so forth. This enhanced their confidence in establishing that the differences noted in speed were due to the different protocols.

However, the researchers were not able to determine how the protocols compared when used in the field, on various computers, with a variety of file sizes, and under differing “real-world” circumstances.

6.14.3 Field Experiments

Field experiments are research projects involving experimental manipulations that are implemented in a natural environment. They can be useful in fine-tuning managerial strategies and tactical decisions. Experiments vary in their degree of artificiality and control. In field experiments, a researcher manipulates experimental variables but cannot possibly control all the extraneous variables.

6.14.4 Within-Subjects and Between-Subjects Designs

Field experiments involving new products or promotions are often conducted in a retail store. These are known as controlled store tests. The products are put into

stores in a number of small cities or into selected supermarket chains. Product deliveries are made not through the traditional warehouse but by the research agency, so product information remains confidential.

6.15 Issues of Experimental Validity

An experiment's quality is judged by two types of validity. These are known as internal and external validity. Internal validity exists to the extent that an experimental variable is truly responsible for any variance in the dependent variable. In other words, does the experimental manipulation truly cause changes in the specific outcome of interest? If the observed results were influenced or confounded by extraneous factors, the researcher will have problems making valid conclusions about the relationship between the experimental treatment and the dependent variable.

6.15.1 Internal Validity

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Manipulation checks:

The validity of manipulations can often be determined with a manipulation check. If a drug is administered in different dosages that should affect blood sugar levels, the researcher could actually measure blood sugar level after administering the drug to make sure that the dosages were different enough to produce a change in blood sugar. In business research, the manipulation check is often conducted by asking a survey question or two. Extraneous variables can jeopardize internal validity. The six major ones are history, maturation, testing, instrumentation, selection, and mortality.

History:

Occurs when some change other than the experimental treatment occurs during the course of an experiment that affects the dependent variable. A special case of the history effect is the cohort effect, which refers to a change in the dependent variable that occurs because members of one experimental group experienced different historical situations than members of other experimental groups.

Maturation

Maturation effects are effects that are a function of time and the naturally occurring events that coincide with growth and experience. Experiments taking place over longer time spans may see lower internal validity as subjects simply grow older or more experienced.

Testing

Testing effects are also called pretesting effects because the initial measurement or test alerts or primes subjects in a way that affects their response to the experimental treatments. Testing effects only occur in a before-and-after study. A before-and-after study is one requiring an initial baseline measure be taken before an experimental treatment is administered. So, before and- after experiments are a special case of a repeated measures design. For example, students taking standardized achievement and intelligence tests for the second time usually do better than those taking the tests for the first time.

Instrumentation

A change in the wording of questions, a change in interviewers, or a change in other procedures used to measure the dependent variable causes an instrumentation effect, which may jeopardize internal validity. Sometimes instrumentation effects are difficult to control.

Selection

The selection effect is a sample bias that results from differential selection of respondents for the comparison groups, or sample selection error, discussed earlier. Researchers must make sure the characteristics of the research subjects accurately reflect the population of relevance.

Mortality

If an experiment is conducted over a period of a few weeks or more, some sample bias may occur due to the mortality effect (sample attrition). Sample attrition occurs when some subjects withdraw from the experiment before it is completed. Mortality effects may occur if subjects drop from one experimental treatment group disproportionately than from other groups.

6.15.2 External Validity

External validity is the accuracy with which experimental results can be generalized beyond the experimental subjects. External validity is increased when the subjects comprising the sample truly represent the population of interest and when the results extend to other market segments or groups of people. The higher the external validity, the more researchers and managers can count on the fact that any results observed in an experiment will also be seen in the "real world" (financial market, workplace, sales floor, and so on).

6.16 Classification of Experimental Designs

An experimental design may be compared to an architect's plans for a building. The basic requirements for the structure are given to the architect by the prospective owner. Several different plans may be drawn up as options for meeting the basic requirements. Some may be more costly than others. One may offer potential advantages that another does not. There are various types of experimental designs. If only one variable is manipulated, the experiment has a basic experimental design. If the experimenter wishes to investigate several levels of the independent variable (for example, four different employee salary levels) or to investigate the interaction effects of two or more independent variables (salary level and retirement package), the experiment requires a complex, or statistical, experimental design.

Symbolism for Diagramming Experimental Designs

The work of Campbell and Stanley has helped many students master the subject of basic experimental designs.

The following symbols will be used in describing the various experimental designs:

X = exposure of a group to an experimental treatment

O = observation or measurement of the dependent variable; if more than one observation or measurement is taken, subscripts (that is, O1, O2, etc.) indicate temporal order

R = random assignment of test units; R symbolizes that individuals selected as subjects for the experiment are randomly assigned to the experimental groups

The diagrams of experimental designs that follow assume a time flow from left to right. Our first example will make this clearer.

6.17 Time Series Designs

Many experiments may be conducted in a short period of time (a few hours, a week, or a month). However, a business experiment investigating long-term strategic and/or structural changes may require a time series design. Time series designs are quasi-experimental because they generally do not allow the researcher full control over the treatment exposure or influence of extraneous variables. When experiments are conducted over long periods of time, they are most vulnerable to history effects due to changes in population, attitudes, economic patterns, and the like. Although seasonal patterns and other exogenous influences may be noted, the experimenter can do little about them when time is a major factor in the design.

6.17.1 Complex Experimental Designs

The previous discussion focused on simple experimental designs—experiments manipulating a single variable. Here, the focus shifts to more complex experimental designs involving multiple experimental variables. Complex experimental designs are statistical designs that isolate the effects of confounding extraneous variables or allow for manipulation of more than one independent variable in the experiment. Completely randomized designs, randomized block designs, and factorial designs are covered in the following section.

6.17.2 Completely Randomized Design

A completely randomized design is an experimental design that uses a random process to assign subjects to treatment levels of an experimental variable. Randomization of experimental units is the researcher's attempt to control extraneous variables while manipulating potential causes. A one-variable experimental design can be completely randomized, so long as subjects are assigned in a random way to a particular experimental treatment level.

6.17.3 Randomized-block Design

The randomized-block design is an extension of the completely randomized design. A form of randomization is used to control for most extraneous variation; however, the researcher has identified a single extraneous variable that might affect subjects' responses systematically. The researcher will attempt to isolate the effects of this single variable by blocking out its effects. The term randomized block originated in agricultural research that applied several levels of a treatment variable to each of several blocks of land. Systematic differences in agricultural yields due to the quality of the blocks of land may be controlled in the randomized-block design.

6.17.4 Factorial Designs

A factorial design allows for the testing of the effects of two or more treatments (factors) at various levels.

Summary

1. Discuss the role of observation as a business research method. Observation is a powerful tool for the business researcher. Scientific observation is the systematic process of recording the behavioral patterns of people, objects, and occurrences as they are witnessed. Questioning or otherwise communicating with subjects does not occur. A wide variety of information about the behavior of people and objects can be observed. Seven kinds of phenomena are observable: physical actions, verbal behavior, expressive behavior, spatial relations and locations, temporal patterns, physical objects, and verbal and pictorial records. Thus, both verbal and nonverbal behavior may be observed.

2. Describe the use of direct observation and contrived observation. Human observation, whether direct or contrived, is commonly used when the situation or behavior to be recorded is not easily predictable in advance of the research. It may be unobtrusive, and many types of data can be obtained more accurately through direct observation than by questioning respondents. Direct observation involves watching and recording what naturally occurs, without creating an artificial situation. For some data, observation is the most direct or the only method of collection. For example, researchers can measure response latency, the time it takes individuals to choose between alternatives. Observation can also be contrived by creating the situations to be observed, such as with a mystery shopper or a research laboratory. This can reduce the time and expense of obtaining reactions to certain circumstances.

3. Identify ethical issues in observation studies. Contrived observation, hidden observation, and other observation research designs have the potential to involve deception. For this reason, these methods often raise ethical concerns about subjects' right to privacy and right to be informed. We mentioned three questions to help determine the ethicality of observation: (1) is the behavior being observed commonly performed in public where others can observe it, (2) is anonymity of the subject assured, and (3) has the subject agreed to be observed? If the answers to 1 and 2 are "yes," or if the answer to 3 is "yes,' the observation is likely ethical.

4. Explain the observation of physical objects and message content. Physical-trace evidence serves as a visible record of past events. Researchers may examine whatever evidence provides such a record, including inventory levels, the contents of garbage cans, or the items in a consumer's pantry. Content analysis obtains data by observing and analyzing the contents of the messages in written or spoken communications.

5. Describe major types of mechanical observation. Mechanical observation uses a variety of devices to record behavior directly. It may be an efficient and accurate choice when the situation or behavior to be recorded is routine, repetitive, or programmatic. National television audience ratings are based on mechanical observation (for example, Nielsen's People Meters) and computerized data collection. Web site traffic may be measured electronically. Scanner-based research provides product category sales data recorded by laser scanners in retail stores. Many syndicated services offer secondary data collected through scanner systems.

6. Summarize techniques for measuring physiological reactions. Physiological reactions, such as arousal or eye movement patterns, may be observed using a number of mechanical devices. Eye-tracking monitors identify the direction of a person's gaze, and a pupilometer observes and records changes in the diameter of the pupils of subjects' eyes, based on the assumption that a larger pupil signifies a positive attitude. A psychogalvanometer measures galvanic skin response as a signal of a person's emotional reactions. Voice-pitch analysis measures changes in a person's voice and associates the changes with emotional response.

Questions

1. What are the advantages and disadvantages of observation studies relative to surveys?

2. Under what conditions are observation studies most appropriate?

3. What is a scanner-based consumer panel?

4. What are the major types of mechanical observation?

5. What is a psychogalvanometer?

6. Define experimental condition, experimental treatment, and experimental group. How are these related to the implementation of a valid manipulation?

7. What is the difference between a main effect and an interaction in an experiment?

8. In what ways might the design in question 2 yield systematic or non sampling error?

9. What purpose does the random assignment of subjects serve?

10. Why is an experimental confound so damaging to the conclusions drawn from an experiment?

11. What are demand characteristics? How can they be minimized?

12. What is a manipulation check? How does it relate to internal validity?

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Unit 3

7

SURVEY RESEARCH

Unit Structure

7.0 Objectives

1. Define surveys and explain their advantages
2. Describe the type of information that may be gathered in a survey
3. Identify sources of error in survey research
4. Distinguish among the various categories of surveys
5. Discuss the importance of survey research to total quality management programs
6. Summarize ways researchers gather information through interviews
7. Discuss the importance of pretesting questionnaires
8. Describe ethical issues that arise in survey research

7.1 Introduction

Often research entails asking people—called respondents—to provide answers to written or spoken questions. These interviews or questionnaires collect data through the mail, on the telephone, online, or face-to-face. Thus, a survey is defined as a method of collecting primary data based on communication with a representative sample of individuals. Surveys provide a snapshot at a given point in time. The more formal term, sample survey, emphasizes that the purpose of contacting respondents is to obtain a representative sample, or subset, of the target population.

7.2 Using Surveys

Surveys attempt to describe what is happening or to learn the reasons for a particular business activity. The term survey is most often associated with quantitative findings. Although most surveys are conducted to quantify certain factual information, some aspects of surveys may also be qualitative.

7.3 Advantages and disadvantages of Surveys

Surveys provide a quick, inexpensive, efficient, and accurate means of assessing information about a population. When properly conducted, surveys offer managers many advantages. However, they can also be used poorly when researchers do not follow research principles, such as careful survey and sample design. Sometimes even a welldesigned and carefully executed survey is not helpful because the results are delivered too late to inform decisions.

7.4 Errors in Survey Research

7.4.1 Random sampling error:

A statistical fluctuation that occurs because of chance variation in the elements selected for a sample

7.4.2 Systematic error:

Error resulting from some imperfect aspect of the research design that causes respondent error or from a mistake in the execution of the research.

7.4.3 Sample bias:

A persistent tendency for the results of a sample to deviate in one direction from the true value of the population parameter.

7.4.4 Respondent error:

A category of sample bias resulting from some respondent action or inaction such as nonresponse or response bias.

Nonresponse error: The statistical differences between a survey that includes only those who responded and a perfect survey that would also include those who failed to respond.

Nonrespondents: People who are not contacted or who refuse to cooperate in the research.

No contacts: People who are not at home or who are otherwise inaccessible on the first and second contact.

Refusals: People who are unwilling to participate in a research project.

7.4.5 Self-selection bias:

A bias that occurs because people who feel strongly about a subject are more likely to respond to survey questions than people who feel indifferent about it.

7.4.6 Response bias:

A bias that occurs when respondents either consciously or unconsciously tend to answer questions with a certain slant that misrepresents the truth.

7.4.7 Deliberate Falsification

Occasionally people deliberately give false answers. It is difficult to assess why people knowingly misrepresent answers. A response bias may occur when people misrepresent answers to appear intelligent, conceal personal information, avoid embarrassment, and so on.

7.4.8 Unconscious Misrepresentation

Even when a respondent is consciously trying to be truthful and cooperative, response bias can arise from the question format, the question content, or some other stimulus.

7.5 Types of Response Bias

7.5.1 Acquiescence Bias

Some respondents are very agreeable. They seem to agree to practically every statement they are asked about. A tendency to agree (or disagree) with all or most questions is known as acquiescence bias.

7.5.2 Extremity Bias

Some individuals tend to use extremes when responding to questions. For example, they may choose only “1” or “10” on a ten-point scale. Others consistently refuse to use extreme positions and tend to respond more neutrally—“I never give a 10 because nothing is really perfect.” Response styles vary from person to person, and extreme responses may cause an extremity bias in the data.

7.5.3 Interviewer Bias

Response bias may arise from the interplay between interviewer and respondent. If the interviewer’s presence influences respondents to give untrue or modified answers, the survey will be marred by interviewer bias.

7.5.4 Social Desirability Bias

Social desirability bias may occur either consciously or unconsciously because the respondent wishes to create a favorable impression or save face in the presence of an interviewer.

7.6 Administrative Error

The result of improper administration or execution of the research task is called an administrative error.

Administrative errors are caused by carelessness, confusion, neglect, omission, or some other blunder.

Four types of administrative error are :

7.6.1 Data-processing error

A category of administrative error that occurs because of incorrect data entry, incorrect computer programming, or other procedural errors during data analysis.

7.6.2 Sample selection error

An administrative error caused by improper sample design or sampling procedure execution.

7.6.3 Interviewer error

Mistakes made by interviewers failing to record survey responses correctly.

7.6.4 Interviewer cheating

The practice of filling in fake answers or falsifying questionnaires while working as an interviewer.

7.7 Classifying Survey Research Methods

Surveys may be classified based on the method of communication, the degrees of structure and disguise in the questionnaire,method of communicating with the respondent and the time frame in which the data are gathered (temporal classification).

7.7.1 Structured/Unstructured and Disguised/ Undisguised Questionnaires

In designing a questionnaire (or an interview schedule), the researcher must decide how much structure or standardization is needed.11 A structured question limits the number of allowable responses.

An unstructured question does not restrict the respondent's answers. An open-ended, unstructured question such as "Why do you shop at Wal-Mart?" allows the respondent considerable freedom in answering.

The researcher must also decide whether to use undisguised questions or disguised questions. A straightforward, or undisguised, question such as "Do you have dandruff problems?" assumes that the respondent is willing to reveal the information. However, researchers know that some questions are threatening to a person's ego, prestige, or self-concept. So, they have designed a number of indirect techniques of questioning to disguise the purpose of the study.

7.7.2 Temporal Classification

Although most surveys are for individual research projects conducted only once over a short time period, other projects require multiple surveys over a long period. Thus, surveys can be classified on a temporal basis

- **Cross-sectional study**

  A study in which various segments of a population are sampled and data are collected at a single moment in time.

- **Longitudinal study**

  A survey of respondents at different times, thus allowing analysis of response continuity and changes over time.

- **Tracking study**

  A type of longitudinal study thatuses successive samples to compare trends and identify changes in variables such as consumer satisfaction, brand image, or advertising awareness.

- **Consumer panel**

  A longitudinal survey of the same sample of individuals or households to record their attitudes, behavior, or purchasing habits over time.

7.7.3 Interviews as Interactive Communication

When two people engage in a conversation, human interaction takes place. Human interactive media are a personal form of communication. One human being directs a message to and interacts with another individual (or a small group). When most people think of interviewing, they envision two people engaged in a face-to-face dialogue or a conversation on the telephone.

Noninteractive Media

The traditional questionnaire received by mail and completed by the respondent does not allow a dialogue or an exchange of information providing immediate feedback. So, from our perspective, self-administered questionnaires printed on paper are noninteractive. This fact does not mean that they are without merit, just that this type of survey is less flexible than surveys using interactive communication media.

7.8 Personal Interviews

Personal interview is a form of direct communication in which an interviewer asks respondents questions face-to-face. This versatile and flexible method is a two-way conversation between interviewer and respondent.

Advantages of Personal Interviews

Business researchers find that personal interviews offer many unique advantages. One of the most important is the opportunity for detailed feedback.

- **Opportunity for Feedback:**

  Personal interviews, similar to those mentioned in the Research Snapshot on the next page, provide the opportunity for feedback and clarification.

- **Probing Complex Answers:**

  Another important characteristic of personal interviews is the opportunity to follow up by probing. If a respondent's answer is too brief or unclear, the researcher may request a more comprehensive or clearer explanation.

- **Length of Interview:**

  If the research objective requires an extremely lengthy questionnaire, personal interviews may be the only option. A general rule of thumb on mail surveys is that they should not exceed six pages, and telephone interviews typically last less than ten minutes. In contrast, a personal interview can be much longer, perhaps an hour and a half

- **Completeness of Questionnaire:**

  The social interaction between a well-trained interviewer and a respondent in a personal interview increases the likelihood that the respondent will answer all the items on the questionnaire.

  Item nonresponse—failure to provide an answer to a question—is least likely to occur when an experienced interviewer asks questions directly.

- **Props and Visual Aids:**

  Interviewing respondents face-to-face allows the investigator to show them new product samples, sketches of proposed advertising, or other visual aids. Research that uses visual aids has become increasingly popular with researchers who investigate film concepts, advertising problems, and moviegoers' awareness of performers.

- **High Participation:**

  Although some people are reluctant to participate in a survey, the presence of an interviewer generally increases the percentage of people willing to complete the interview.

Disadvantages of Personal Interviews

Personal interviews also have some disadvantages. Respondents are not anonymous and as a result may be reluctant to provide confidential information to another person

- **Interviewer Influence**:

  Some evidence suggests that demographic characteristics of the interviewer influence respondents' answers.

- **Lack of Anonymity of Respondent:**

  Because a respondent in a personal interview is not anonymous and may be reluctant to provide confidential information to another person, researchers often spend considerable time and effort to phrase sensitive questions to avoid social desirability bias

- **Cost:**

  Personal interviews are expensive, generally substantially more costly than mail, Internet, or telephone surveys. The geographic proximity of respondents, the length and complexity of the questionnaire, and the number of people who are nonrespondents because they could not be contacted (not-at-homes) will all influence the cost of the personal interview

7.9 Door-to-Door Interviews and Shopping Mall Intercepts

Personal interviews may be conducted at the respondents' homes or offices or in many other places. Increasingly, personal interviews are being conducted in shopping malls. Mall intercept interviews allow many interviews to be conducted

quickly. Often, respondents are intercepted in public areas of shopping malls and then asked to come to a permanent research facility to taste new food items or to view advertisements.

Door to Door Interviews

The presence of an interviewer at the door generally increases the likelihood that a person will be willing to complete an interview. Because door-to-door interviews increase the participation rate, they provide a more representative sample of the population than mail questionnaires.

Callbacks

When a person selected to be in the sample cannot be contacted on the first visit, a systematic procedure is normally initiated to call back at another time. Callbacks, or attempts to recontact individuals selected for the sample, are the major means of reducing nonresponse error. Calling back a sampling unit is more expensive than interviewing the person the first time around, because subjects who initially were not at home generally are more widely dispersed geographically than the original sample units.

Mall Intercept Interviews

Personal interviews conducted in shopping malls are referred to as mall intercept interviews, or shopping center sampling. Interviewers typically intercept shoppers at a central point within the mall or at an entrance. The main reason mall intercept interviews are conducted is because their costs are lower. No travel is required to the respondent's home; instead, the respondent comes to the interviewer, and many interviews can be conducted quickly in this way.

7.10 Telephone Interviews

For several decades, landline telephone interviews have been the mainstay of commercial survey research. The quality of data obtained by telephone is potentially comparable to the quality of data collected face-to-face. Respondents are more willing to provide detailed and reliable information on a variety of personal topics over the phone while in the privacy of their own homes than when answering questions face-to-face.

Mobile Phone Interviews

Mobile phone interviews differ from landline phones most obviously because they are directed toward a mobile (i.e., cell) phone number.

Phone Interview Characteristics

Phone interviews in general have several distinctive characteristics that set them apart from other survey techniques. These characteristics present significant advantages and disadvantages for the researcher.

- **Speed:**

  One advantage of telephone interviewing is the speed of data collection. While data collection with mail or personal interviews can take several weeks, hundreds of telephone interviews can be conducted literally overnight. When the interviewer enters the respondents' answers directly into a computerized system, the data processing speeds up even more.

- **Cost**:

  As the cost of personal interviews continues to increase, telephone interviews are becoming relatively inexpensive. The cost of telephone interviews is estimated to be less than 23.2 percent of the cost of door-to-door personal interviews. Travel time and costs are eliminated. However, the typical Internet survey is less expensive than a telephone survey.

- **Absence of Face to Face Contact:**

  Telephone interviews are more impersonal than face-to-face interviews. Respondents may answer embarrassing or confidential questions more willingly in a telephone interview than in a personal interview.

- **Cooperation:**

  One trend is very clear. In the last few decades, telephone response rates have fallen. One way researchers can try to improve response rates is to leave a message on the household'stelephone answering machine or voice mail. However, many people will not return a call to help someone conduct a survey.

- **Incentives to Repond:**

  Respondents should receive some incentive to respond. Research addresses different types of incentives. For telephone interviews, test-marketing involving different types of survey introductions suggests that not all introductions are equally effective.

- **Representative Samples:**

  Practical difficulties complicate obtaining representative samples based on listings in the telephone book. The problem of unlisted phone numbers can be partially resolved through the use of random digit dialing. Random digit dialing eliminates the counting of names in a list (for example, calling every fiftieth name in a column) and subjectively determining whether a directory listing is a business, institution, or legitimate household. In the simplest form of random digit dialing, telephone exchanges (prefixes) for the geographic areas in the sample are obtained. Using a table of random numbers, the last four digits of the telephone number are selected.

- **Callbacks**:

  An unanswered call, a busy signal, or a respondent who is not at home requires a callback. Telephone callbacks are much easier to make than callbacks in personal interviews. However, as mentioned, the ownership of telephone answering machines is growing, and their effects on callbacks need to be studied.

- **Limited Duration:**

  Respondents who run out of patience with the interview can merely hang up. To encourage participation, interviews should be relatively short. The length of the telephone interview is definitely limited.

- **Lack of Visual Medium:**

  Because visual aids cannot be used in telephone interviews, this method is not appropriate for packaging research, copy testing of television and print advertising, and concept tests that require visual materials.

7.11 Self-Administered Questionnaires

Surveys in which the respondent takes the responsibility for reading and answering the questions is called self-administered questionnaires.Self-administered questionnaires present a challenge to the researcher because they rely on the clarity of the written word rather than on the skills of the interviewer. The nature of self administered questionnaires is best illustrated by explaining mail questionnaires.

Mail Questionnaires

A mail survey is a self-administered questionnaire sent to respondents through the mail. This paper-and-pencil method has several advantages and disadvantages

- **Geographic Flexibility:**

  Mail questionnaires can reach a geographically dispersed sample simultaneously because interviewers are not required.

- **Cost:**

  Mail questionnaires are relatively inexpensive compared with personal interviews, though they are not cheap.

- **Respondent Convenience:**

  Mail surveys and other self-administered questionnaires can be filled out when the respondents have time, so respondents are more likely to take time to think about their replies. Many hardto-reach respondents place a high value on convenience and thus are best contacted by mail.

- **Anonymity of Respondent:**

  In the cover letter that accompanies a mail or self-administered questionnaire, researchers almost always state that the respondents' answers will be confidential. Respondents are more likely to provide sensitive or embarrassing information when they can remain anonymous

- **Absence of Interviewer:**

  Although the absence of an interviewer can induce respondents to reveal sensitive or socially undesirable information, this lack of personal contact can also be a disadvantage. Once the respondent receives the questionnaire, the questioning process is beyond the researcher's control.

- **Standardized Questions:**

  Mail questionnaires typically are highly standardized, and the questions are quite structured. Questions and instructions must be clear-cut and straightforward.

- **Time is Money:**

  If time is a factor in management's interest in the research results, or if attitudes are rapidly changing (for example, toward a political event), mail surveys may not be the best communication medium. A minimum of two or three weeks is necessary for receiving the majority of the responses.

- **Length Of Mail Questionnaire:**

  Mail questionnaires vary considerably in length, ranging from extremely short postcard questionnaires to multipage booklets that require respondents to fill in thousands of answers. A general rule of thumb is that a mail questionnaire should not exceed six pages in length.

Response rate

The number of questionnaires returned or completed divided by the number of eligible people who were asked to participate in the survey.

Increasing Response Rates for Mail Surveys

Nonresponse error is always a potential problem with mail surveys. Individuals who are interested in the general subject of the survey are more likely to respond than those with less interest or little experience.

7.12 Self-Administered Questionnaires Using Other Forms of Distribution

Drop-off method:

A survey method that requires the interviewer to travel to the respondent's location to drop off questionnaires that will be picked up later.

Fax survey:

A survey that uses fax machines as a way for respondents to receive and return questionnaires.

E-Mail Surveys:

Questionnaires can be distributed via e-mail, but researchers must remember that some individuals cannot be reached this way. Certain projects do lend themselves to e-mail surveys, such as internal surveys of employees or satisfaction surveys of retail buyers who regularly deal with an organization via e-mail. The benefits of incorporating a questionnaire in an e-mail include the speed of distribution, lower distribution and processing costs, faster turnaround time, more flexibility, and less handling of paper questionnaires. The speed of e-mail distribution and the quick response time can be major advantages for surveys dealing with time-sensitive issues.

Internet Surveys:

An Internet survey is a self-administered questionnaire posted on a Web site. Respondents provide answers to questions displayed onscreen by highlighting a phrase, clicking an icon, or keying in an answer.

Kiosk Interactive Surveys

A computer with a touch screen may be installed in a kiosk at a trade show, at a professional conference, in an airport, or in any other high-traffic location to administer an interactive survey.

7.13 Pretesting

Pretesting involves a trial run with a group of respondents to iron out fundamental problems in the instructions or design of a questionnaire. The researcher looks for such obstacles as the point at which respondent fatigue sets in and whether there are any particular places in the questionnaire where respondents tend to terminate. Unfortunately, this stage of research is sometimes eliminated because of costs or time pressures.

Broadly speaking, three basic ways to pretest exist. The first two involve screening the questionnaire with other research professionals, and the third—the one most often called pretesting— is a trial run with a group of respondents. When screening the questionnaire with other research professionals, the investigator asks them to look for such problems as difficulties with question wording, leading questions, and bias due to question order. An alternative type of screening might involve a client or the research manager who ordered the research. Often, managers ask researchers to collect information, but when they see the questionnaire, they find that it does not really meet their needs. Only by checking with the individual who has requested the questionnaire does the researcher know for sure that the information needed will be provided.

Once the researcher has decided on the final questionnaire, data should be collected with a small number of respondents (perhaps 100) to determine whether the questionnaire needs refinement.

Summary

1. Define surveys and explain their advantages. The survey is a common tool for asking respondents questions. Surveys can provide quick, inexpensive, and accurate information for a variety of objectives. The term sample survey is often used because a survey is expected to obtain a representative sample of the target population.

2. Describe the type of information that may be gathered in a survey. The typical survey is a descriptive research study with the objective of measuring awareness, knowledge, behavior, opinions and attitudes, both inside and outside of the organization. Common survey populations including customers, employees, suppliers and distributors.

3. Identify sources of error in survey research. Two major forms of error are common in survey research. The first, random sampling error, is caused by chance variation and results in a sample that is not absolutely representative of the target population. Such errors are inevitable, but they can be predicted using the statistical methods discussed in later chapters on sampling. The second major category of error, systematic error, takes several forms. Nonresponse error is caused by subjects' failing to respond to a survey. This type of error can be identified by comparing the demographics of the sample population with those of the target population and reduced by making a special effort to contact underrepresented groups. In addition, response bias occurs when a response to a questionnaire is falsified or misrepresented, either intentionally or inadvertently. There are four specific categories of response bias: acquiescence bias, extremity bias, interviewer bias, and social desirability bias. An additional source of survey error comes from administrative problems such as inconsistencies in interviewers' abilities, cheating, coding mistakes, and so forth.

4. Distinguish among the various categories of surveys. Surveys may be classified according to methods of communication, by the degrees of structure and disguise in the questionnaires, and on a temporal basis. Questionnaires may be structured, with limited choices of responses, or unstructured, to allow open-ended responses. Disguised questions camouflage the real purpose and may be used to probe sensitive topics. Surveys may consider the population at a given moment or follow trends over a period of time. The first approach, the cross-sectional study, usually is intended to separate the population into meaningful subgroups. The second type of study, the longitudinal study, can reveal important population changes over time. Longitudinal studies may involve contacting different sets of respondents or the same ones repeatedly. One form of longitudinal study is the consumer panel. Consumer panels are expensive to conduct, so firms often hire contractors who provide services to many companies, thus spreading costs over many clients

Questions

1. Name several nonbusiness applications of survey research.
2. What is self-selection bias? How might we avoid this?
3. Do surveys tend to gather qualitative or quantitative data? What types of information are commonly measured with surveys?
4. Give an example of each type of error
5. In a survey, chief executive officers (CEOs) indicated that they would prefer to relocate their businesses to Atlanta (first choice), San Diego, Tampa, Los Angeles, or Boston. The CEOs who said they planned on building new office space in the following year were asked where they were going to build. They indicated they were going to build in New York, Los Angeles, San Francisco, or Chicago. Explain the difference between these two responses
6. What type of communication medium would you use to conduct the following surveys? Why?
   a. Survey of the buying motives of industrial engineers
   b. Survey of the satisfaction levels of hourly support staff
   c. Survey of television commercial advertising awareness
   d. Survey of top corporate executives
7. A publisher offers college professors one of four best-selling mass-market books as an incentive for filling out a 10-page mail questionnaire about a new textbook. What advantages and disadvantages does this incentive have?
8. "Individuals are less willing to cooperate with surveys today than they were 3.20 years ago." Comment on this statement.
9. What do you think should be the maximum length of a self administered e-mail questionnaire?
10. Do most surveys use a single communication mode (for example, the telephone), as most textbooks suggest?
11. A survey researcher reports that "203.2 usable questionnaires out of 942 questionnaires delivered in our mail survey converts to a 21.7 percent response rate." What are the subtle implications of this statement?

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UNIT 4

8

MEASUREMENT CONCEPTS, SAMPLING AND FIELD WORK

A. LEVELS OF SCALE MEASUREMENT

Unit Structure

8A.0 Objectives

Following are the objectives of this unit:

- ✓ To understand the levels of measurement
- ✓ To differentiate between different scales of measurement
- ✓ To analyse scales
- ✓ To understand index measures
- ✓ To implement reliability
- ✓ To analyse validity
- ✓ To differentiate between reliability and validity
- ✓ To understand sensitivity

8A.1 Introduction

Measurement is a procedure of allocating numerical value to some characteristics or variables or events according to scientific rules. It is the process observing and recording the observations which are collected as part of a research effort. Measurement means the description of data in terms of numbers – accuracy; objectivity and communication. The combined form of these three is the actual measurement.

In this unit, we will understand different levels of measurement and see their types.

Definition:

'Measurement is the process of observing and recording the observations that are collected as part of a research effort.'

'Measurement is a process of describing some property of a phenomenon of interest, usually by assigning numbers in a reliable and valid way.'

The decision statement, corresponding research questions, and research hypotheses can be used to decide what concepts need to be measured in a given project. Measurement is the process of describing some property of a phenomenon of interest, usually by assigning numbers in a reliable and valid way. The numbers convey information about the property being measured. When numbers are used, the researcher must have a rule for assigning a number to an observation in a way that provides an accurate description. Measurement can be illustrated by thinking about the way instructors assign students' grades.

Example:

A – (above 60% score)

B – (between 50 – 60% score)

C – (between 40 – 50 % score

Here A, B, C can also be termed as scales of measurement. Some scales may better classify the data and each scale has the potential of producing error or some lack of validity

8A.2 Levels of Measurement

Level of measurement refers to the relationship among the values that are assigned to the attributes for a variable. It is important because –

- ✓ Knowing the level of measurement helps you decide how to interpret the data from that variable
- ✓ Knowing that a measure is nominal, then you know that the numerical values are just short codes for the longer names.
- ✓ Knowing the level of measurement helps you decide what statistical analysis is appropriate on the values that were assigned.

If a measure is nominal, then you know that you would never average the data values or do a t-test on the data. There are four distinguish levels of measurement. The levels are –

- ✓ Nominal
- ✓ Ordinal
- ✓ Interval
- ✓ Ratio

Levels of measurement are important for two reasons.

i) First, they emphasize the generality of the concept of measurement. Although people do not normally think of categorizing or ranking individuals as measurement, in fact they are as long as they are done so that they represent some characteristic of the individuals.

ii) Second, the levels of measurement can serve as a rough guide to the statistical procedures that can be used with the data and the conclusions that can be drawn from them.

8A.2.1 Nominal Scale

The nominal scale (called as dummy coding) simply places people, events, perceptions, etc. into categories based on some common trait. Some data are naturally suited to the nominal scale such as males vs. females, white vs. black vs. blue, and American vs. Asian. The nominal scale forms the basis for such analyses as Analysis of Variance (ANOVA) because those analyses require that some category is compared to at least one other category.

The nominal scale is the lowest form of measurement because it doesn't capture information about the focal object other than whether the object belongs or doesn't belong to a category; either you are a smoker or not a smoker, you attended university or you didn't, a subject has some experience with computers, an average amount of experience with computers, or extensive experience with computers.

No data is captured that can place the measured object on any kind of scale say, for example, on a continuum from one to ten. Coding of nominal scale data can be accomplished using numbers, letters, labels, or any symbol that represents a category into which an object can either belong or not belong. In research activities a Yes/No scale is nominal. It has no order and there is no distance between Yes and No.

The statistics which can be used with nominal scales are in the non-parametric group. The most likely ones would be - mode; crosstabulation - with chi-square. There are also highly sophisticated modelling techniques available for nominal data.

8A.2.2 Ordinal Scale

An ordinal level of measurement uses symbols to classify observations into categories that are not only mutually exclusive and exhaustive; in addition, the categories have some explicit relationship among them. For example, observations may be classified into categories such as taller and shorter, greater and lesser, faster and slower, harder and easier, and so forth.

However, each observation must still fall into one of the categories (the categories are exhaustive) but no more than one (the categories are mutually exclusive). Most of the commonly used questions which ask about job satisfaction use the ordinal level of measurement.

For example, asking whether one is very satisfied, satisfied, neutral, dissatisfied, or very dissatisfied with one's job is using an ordinal scale of measurement. The simplest ordinal scale is a ranking.

Ordinal data would use non-parametric statistics. These would include - median and mode; rank order correlation; non-parametric analysis of variance. Modelling techniques can also be used with ordinal data.

8A.2.3 Interval Scale

An interval level of measurement classifies observations into categories that are not only mutually exclusive and exhaustive, and have some explicit relationship among them, but the relationship between the categories is known and exact. This is the first quantitative application of numbers. In the interval level, a common and constant unit of measurement has been established between the categories.

For example, the commonly used measures of temperature are interval level scales. We know that a temperature of 75 degrees is one degree warmer than a temperature of 74 degrees.

Numbers may be assigned to the observations because the relationship between the categories is assumed to be the same as the relationship between numbers in the number system.

For example, 74+1= 75 and 41+1= 42. The intervals between categories are equal, but they originate from some arbitrary origin, that is, there is no meaningful zero point on an interval scale. The standard survey rating scale is an interval scale.

When you are asked to rate your satisfaction with a piece of software on a 7 point scale, from Dissatisfied to Satisfied, you are using an interval scale. Interval scale data would use parametric statistical techniques - Mean and standard deviation; Correlation; Regression; Analysis of variance; Factor analysis; and whole range of advanced multivariate and modelling techniques.

8A.2.4 Ratio

The ratio level of measurement is the same as the interval level, with the addition of a meaningful zero point. There is a meaningful and non-arbitrary zero point from which the equal intervals between categories originate.

For example, weight, area, speed, and velocity are measured on a ratio level scale.

In public policy and administration, budgets and the number of program participants are measured on ratio scales. In many cases, interval and ratio scales are treated alike in terms of the statistical tests that are applied. A ratio scale is the top level of measurement and is not often available in social research. The factor which clearly defines a ratio scale is that it has a true zero point.

The simple way to understand the levels of measurement or to select a measurement scale is as follows –

- ✓ If one object is different from another, then we use a nominal scale.
- ✓ If one object is bigger or better or more of anything than another, then we use an ordinal scale.
- ✓ If one object is so many units (degrees, inches, etc.) more than another, then we use an interval scale.
- ✓ If one object is certain times as big or bright or tall or heavy as another, then we use a ratio scale.

The following criteria should be considered in the selection of the measurement scale for variables in a study. Researcher should consider the scale that will be most suitable for each variable under study. Important points in the selection of measurement scale for a variable are:

- ✓ Scale selected should be appropriate for the variables one wishes to categorise.
- ✓ It should be of practical use.
- ✓ It should be clearly defined.
- ✓ The number of categories created (when necessary) should cover all possible values.
- ✓ The number of categories created (when necessary) should not overlap, i.e., it should be mutually exclusive.
- ✓ The scale should be sufficiently powerful. Variables measured at a higher level can always be converted to a lower level, but not vice versa.

For example, observations of actual age (ratio scale) can be converted to categories of older and younger (ordinal scale), but age measured as simply older or younger cannot be converted to measures of actual age.

The four levels of measurement discussed above have an important impact on how you collect data and how you analyze them later. Collect at the wrong level, and you will end of having to adjust your research, your design, and your analyzes. Make sure you consider carefully the level at which you collect your data, especially in light of what statistical procedures you intend to use once you have the data in hand.

8A.3 Analysis of Scales

Mathematical operations can be performed with numbers from nominal scales, the result may not have a great deal of meaning. Although you can put numbers into

formulas and perform calculations with almost any numbers, the researcher has to know the meaning behind the numbers before meaningful conclusions can be drawn.

8A.3.1 Discrete Measures

Discrete measures are those that take on only one of a finite number of values. A discrete scale is most often used to represent a classification variable. Therefore, discrete scales do not represent intensity of measures, only membership. Common discrete scales include any yes-or-no response, matching, colour choices, or practically any scale that involves selecting from among a small number of categories. Thus, when someone is asked to choose from the following responses:

- ✓ Disagree
- ✓ Neutral
- ✓ Agree

the result is a discrete value that can be coded 1, 2, or 3, respectively. This is also an ordinal scale to the extent that it represents an ordered arrangement of agreement. Nominal and ordinal scales are discrete measures.

8A.3.2 Continuous Measures

Continuous measures are those assigning values anywhere along some scale range in a place that corresponds to the intensity of some concept. Ratio measures are continuous measures. Thus, when we measure sales for each salesperson using the money (every rupee) amount sold, he is assigning a continuous measure. A number line could be constructed ranging from the least amount sold to the most, and a spot on the line would correspond exactly to a salesperson's performance.

Table 8A.1: Example of Continuous scales

Question/ Rating	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I learned a lot from this study material.	5	4	3	2	1

This is a discrete scale because only the values 1, 2, 3, 4, or 5 can be assigned. Moreover, it is an ordinal scale because it only orders based on agreement. We really have no way of knowing that the difference in agreement of somebody marking a 5 instead of a 4 is the same as the difference in agreement of somebody marking a 2 instead of a 1.

(For calculation purpose: Only the mean is not an appropriate way of stating central tendency and, technically, we really shouldn't use many common statistics on these responses.)

A scaled response of this type (refer table 1.1) takes on more values, the error introduced by assuming that the differences between the discrete points are equal becomes smaller. This may be seen by imagining a ***Likert scale*** (the traditional business research agreement scale shown above) with a thousand levels of agreement rather than three.

The differences between the different levels become so small with a thousand levels that only tiny errors could be introduced by assuming each interval is the same. Therefore, business researchers generally treat interval scales containing five or more categories of response as interval. (They are commonly called 5-point Likert scale; 7-point Likert scale and so on)

When fewer than five categories are used, this assumption is inappropriate. The researcher should keep in mind, however, the distinction between ratio and interval measures. Errors in judgment can be made when interval measures are treated as ratio.

8A.4 Index Measures

Multi-item instruments for measuring a construct are called index measures, or composite measures. An index measure assigns a value based on how much of the concept being measured is associated with an observation. Indexes often are formed by putting several variables together.

For example, a social class index might be based on three weighted variables: occupation, education, and area of residence. Usually, occupation is seen as the single best indicator and would be weighted highest. With an index, the different attributes may not be strongly correlated with each other.

A person's education does not always relate strongly to their area of residence. The Consumer Satisfaction Index shows how satisfied consumers are based on an index of satisfaction scores. Readers are likely not surprised to know that certain consumers appear more satisfied with soft drinks than they are with cable TV companies based on this index.

Composite measures also assign a value based on a mathematical derivation of multiple variables.

For example, salesperson satisfaction may be measured by combining questions such as "How satisfied are you with your job? How satisfied are you with your territory? How satisfied are you with the opportunity your job offers?" For most practical applications, composite measures and indexes are computed in the same way.

Definitions:

Index Measure: An index assigns a value based on how much of the concept being measured is associated with an observation. Indexes often are formed by putting several variables together.

Attribute: A single characteristic or fundamental feature of an object, person, situation, or issue.

Composite Measures: Assign a value to an observation based on a mathematical derivation of multiple variables.

8A.4.1 Computing Scale Values

The below stated example is a computation of the data collected using Likert Scale. For this scale, the value of Strongly Agree (SA) is 5, Agree (A) is 4, Neutral (N) is 3, Disagree (D) is 2 and Strongly Disagree (SD) is 1. For the total score obtained for these segments of questions is 5 + 2 + 3 + 4 = 14

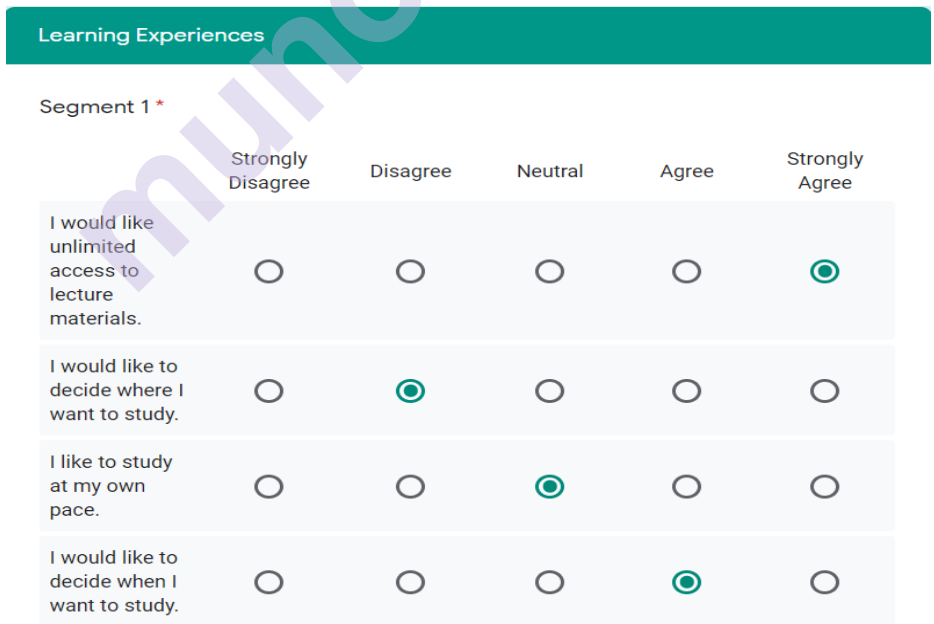

Figure 1.1: Sample of Likert Scale

Such scales are also called as Summated scales.

Definition:

Summated Scale: A scale created by simply summing (adding together) the response to each item making up the composite measure.

Sometimes, a response may need to be reverse-coded before computing a summated or averaged scale value. Reverse coding means that the value assigned for a response is treated oppositely from the other items. Thus, on a 5-point scale, the values are reversed as follows:

- 5 becomes 1
- 4 becomes 2
- 3 stays 3
- 2 becomes 4
- 1 becomes 5

This happens for questions which are negative in nature. An ideal scale must have 60-70 % questions positive in nature and 30-40 % questions negative in nature. This is done to ensure that the person filling the questions is not selecting options randomly.

Example of a negative question: I would not like to decide when I want to study (based on the questions given in figure 1.1)

8A.5 Criteria For Good Measurement

8A.5.1 Reliability

Reliability refers to the consistency or repeatability of an operationalized measure. A reliable measure will yield the same results over and over again when applied to the same thing. It is the degree to which a test consistently measures whatever it measures. If you have a survey question that can be interpreted several different ways, it is going to be unreliable. One person may interpret it one way and another may interpret it another way. You do not know which interpretation people are taking.

Even answers to questions that are clear may be unreliable, depending on how they are interpreted. Reliability refers to the consistency of scores obtained by the same persons when they are re-examined with the same tests on different occasions, or with different sets of equivalent items, or under other variable examining conditions.

Research requires dependable measurement. Measurements are reliable to the extent that they are repeatable and that any random influence which tends to make measurements different from occasion to occasion or circumstance to circumstance is a source of measurement error. Errors of measurement that affect reliability are random errors and errors of measurement that affect validity are systematic or constant errors. Reliability of any research is the degree to which it gives an accurate score across a range of measurement. It can thus be viewed as being 'repeatability' or 'consistency'.

Internal consistency: Different questions, same construct. Test-retest, equivalent forms and split-half reliability are all determined through correlation. There are a number of ways of determining the reliability of an instrument. The procedure can be classified into two groups –

External Consistency Procedures: It compare findings from two independent processes of data collection with each other as a means of verifying the reliability of the measure. *For example*, test-retest reliability, parallel forms of the same test, etc.

Internal Consistency Procedures: The idea behind this procedure is that items measuring the same phenomenon should produce similar results. For example, split-half technique.

8A.5.1.1 Types of Reliability

1) Test-Retest Reliability

The most obvious method for finding the reliability of test scores is by repeating the identical test on a second occasion. Test-retest reliability is a measure of reliability obtained by administering the same test twice over a period of time to a group of individuals.

For Example- A test designed to assess student learning in psychology could be given to a group of students twice, with the second administration perhaps coming a week after the first. The obtained correlation coefficient would indicate the stability of the scores.

2) Split-Half Reliability

Split-half reliability is a subtype of internal consistency reliability. In split half reliability we randomly divide all items that purport to measure the same construct into two sets. We administer the entire instrument to a sample of people and calculate the total score for each randomly divided half. The most commonly used method to split the test into two is using the odd-even strategy.

3) Inter-Rater Reliability

Inter-rater reliability is a measure of reliability used to assess the degree to which different judges or raters agree in their assessment decisions. Inter-rater reliability is also known as inter-observer reliability or inter-coder reliability. Inter-rater reliability is useful because human observers will not necessarily interpret answers the same way; raters may disagree as to how well certain responses or material demonstrate knowledge of the construct or skill being assessed. Inter-rater reliability might be employed when different judges are evaluating the degree to which art portfolios meet certain standards. Inter-rater reliability is especially useful when judgments can be considered relatively subjective.

4) Parallel-Forms Reliability

Parallel forms reliability is a measure of reliability obtained by administering different versions of an assessment tool to the same group of individuals. The scores from the two versions can then be correlated in order to evaluate the consistency of results across alternate versions.

5) Coefficient alpha (α):

It is the most commonly applied estimate of a multiple-item scale's reliability. Coefficient α represents internal consistency by computing the average of all possible split-half reliabilities for a multiple-item scale. The coefficient demonstrates whether or not the different items converge. Although coefficient α does not address validity, many researchers use α as the sole indicator of a scale's quality. Coefficient alpha ranges in value from 0, meaning no consistency, to 1, meaning complete consistency

8A.5.2 Validity

Validity refers to whether the measure actually measures what it is supposed to measure. If a measure is unreliable, it is also invalid. That is, if you do not know what it is measuring, it certainly cannot be said to be measuring what it is supposed to be measuring. On the other hand, you can have a consistently unreliable measure.

For example, if we measure income level by asking someone how many years of formal education they have completed, we will get consistent results, but education is not income (although they are positively related).

In general, validity is an indication of how sound your research is. More specifically, validity applies to both the design and the methods of your research.

Validity in data collection means that your findings truly represent the phenomenon you are claiming to measure. Valid claims are solid claims.

There are two main types of validity, internal and external. Internal validity refers to the validity of the measurement and test itself, whereas external validity refers to the ability to generalize the findings to the target population.

8A.5.2.1 Types of Validity

1) Face Validity

Face validity refers to the degree to which a test appears to measure what it purports to measure. The stakeholders can easily assess face validity. Although this is not a very 'scientific' type of validity, it may be an essential component in enlisting motivation of stakeholders. If the stakeholders do not believe the measure is an accurate assessment of the ability, they may become disengaged with the task.

For example, if a measure of art appreciation is created all of the items should be related to the different components and types of art. If the questions are regarding historical time periods, with no reference to any artistic movement, stakeholders may not be motivated to give their best effort or invest in this measure because they do not believe it is a true assessment of art appreciation.

2) Predictive Validity

Predictive validity refers to whether a new measure of something has the same predictive relationship with something else that the old measure had. In predictive validity, we assess the operationalization's ability to predict something it should theoretically be able to predict.

For example, we might theorize that a measure of math ability should be able to predict how well a person will do in an engineering-based profession. We could give our measure to experienced engineers and see if there is a high correlation between scores on the measure and their salaries as engineers. A high correlation would provide evidence for predictive validity - it would show that our measure can correctly predict something that we theoretically think it should be able to predict.

3) Criterion-Related Validity

Criterion validity is a test of a measure when the measure has several different parts or indicators in it - compound measures. Each part or criterion of the

measure should have a relationship with all the parts in the measure for the variable to which the first measure is related in a hypothesis. When you are expecting a future performance based on the scores obtained currently by the measure, correlate the scores obtained with the performance. The later performance is called the criterion and the current score is the prediction. It is used to predict future or current performance - it correlates test results with another criterion of interest.

For example, if a physics program designed a measure to assess cumulative student learning throughout the major. The new measure could be correlated with a standardized measure of ability in this discipline, such as GRE subject test. The higher the correlation between the established measure and new measure, the more faith stakeholders can have in the new assessment tool.

4) Content Validity

In content validity, you essentially check the operationalization against the relevant content domain for the construct. This approach assumes that you have a good detailed description of the content domain, something that's not always true. In content validity, the criteria are the construct definition itself - it is a direct comparison. In criterion-related validity, we usually make a prediction about how the operationalization will perform based on our theory of the construct. When we want to find out if the entire content of the behavior/ construct/ area is represented in the test we compare the test task with the content of the behavior. This is a logical method, not an empirical one.

For Example, if we want to test knowledge on Bangladesh Geography it is not fair to have most questions limited to the geography of Australia.

5) Convergent Validity

Convergent validity refers to whether two different measures of presumably the same thing are consistent with each other - whether they converge to give the same measurement. In convergent validity, we examine the degree to which the operationalization is similar to (converges on) other operationalizations that it theoretically should be similar to.

For example, to show the convergent validity of a test of arithmetic skills, we might correlate the scores on test with scores on other tests that purport to measure basic math ability, where high correlations would be evidence of convergent validity. Or, if SAT scores and GRE scores are convergent, then

someone who scores high on one test should also score high on the other. Different measures of ideology should classify the same people the same way. If they do not, then they lack convergent validity.

6) Concurrent Validity:

Concurrent validity is the degree to which the scores on a test are related to the scores on another already established, test administered at the same time or to some other valid criterion available at the same time. This compares the results from a new measurement technique to those of a more established technique that claims to measure the same variable to see if they are related. In concurrent validity, we assess the operationalization's ability to distinguish between groups that it should theoretically be able to distinguish between.

For example, if we come up with a way of assessing manic-depression, our measure should be able to distinguish between people who are diagnosed manic-depression and those diagnosed paranoid schizophrenic. If we want to assess the concurrent validity of a new measure of empowerment, we might give the measure to both migrant farm workers and to the farm owners, theorizing that our measure should show that the farm owners are higher in empowerment. As in any discriminating test, the results are more powerful if you are able to show that you can discriminate between two groups that are very similar.

7) Construct Validity

Construct validity is used to ensure that the measure is actually measure what it is intended to measure (i.e. the construct), and not other variables. Using a panel of 'experts' familiar with the construct is a way in which this type of validity can be assessed. The experts can examine the items and decide what that specific item is intended to measure. This is whether the measurements of a variable in a study behave in exactly the same way as the variable itself. This involves examining past research regarding different aspects of the same variable. It is also the degree to which a test measures an intended hypothetical construct.

For example, if we want to validate a measure of anxiety. We have a hypothesis that anxiety increases when subjects are under the threat of an electric shock, then the threat of an electric shock should increase anxiety scores.

8) Formative Validity

When applied to outcomes assessment it is used to assess how well a measure is able to provide information to help improve the program under study.

For example - when designing a rubric for history one could assess student's knowledge across the discipline. If the measure can provide information that students are lacking knowledge in a certain area, for instance the Civil Rights Movement, then that assessment tool is providing meaningful information that can be used to improve the course or program requirements.

9) Sampling Validity

Sampling validity ensures that the measure covers the broad range of areas within the concept under study. Not everything can be covered, so items need to be sampled from all of the domains. This may need to be completed using a panel of 'experts' to ensure that the content area is adequately sampled. Additionally, a panel can help limit 'expert' bias.

For example - when designing an assessment of learning in the theatre department, it would not be sufficient to only cover issues related to acting. Other areas of theatre such as lighting, sound, functions of stage managers should all be included. The assessment should reflect the content area in its entirety.

10) Discriminant Validity

In discriminant validity, we examine the degree to which the operationalization is not similar to (diverges from) other operationalizations that it theoretically should be not be similar to.

For example, to show the discriminant validity of a Head Start program, we might gather evidence that shows that the program is not similar to other early childhood programs that don't label themselves as Head Start programs.

8A.5.2.2 Reliability Versus Validity

Reliability is a necessary but not sufficient condition for validity. A reliable scale may not be valid. For example, a purchase intention measurement technique may consistently indicate that 20 percent of those sampled are willing to purchase a new product. Whether the measure is valid depends on whether 20 percent of the population indeed purchases the product. A reliable but invalid instrument will yield consistently inaccurate results.

8A.5.3 Sensitivity

The sensitivity of a scale is an important measurement concept, particularly when changes in attitudes or other hypothetical constructs are under investigation. Sensitivity refers to an instrument's ability to accurately measure variability in a concept. A dichotomous response category, such as "agree or disagree," does not allow the recording of subtle attitude changes. A more sensitive measure with numerous categories on the scale may be needed.

For example, adding "strongly agree," "mildly agree," "neither agree nor disagree," "mildly disagree," and "strongly disagree" will increase the scale's sensitivity. The sensitivity of a scale based on a single question or single item can also be increased by adding questions or items. In other words, because composite measures allow for a greater range of possible scores, they are more sensitive than single-item scales. Thus, sensitivity is generally increased by adding more response points or adding scale items.

Summary

In this unit, we understood what is meant by Measurement when considered in research. Some key definitions we saw were:

Measurement: Measurement is the process of observing and recording the observations that are collected as part of a research effort.

Index Measure: An index assigns a value based on how much of the concept being measured is associated with an observation. Indexes often are formed by putting several variables together.

Attribute: A single characteristic or fundamental feature of an object, person, situation, or issue.

Composite Measures: Assign a value to an observation based on a mathematical derivation of multiple variables.

Summated Scale: A scale created by simply summing (adding together) the response to each item making up the composite measure.

We also understood the important concepts like reliability and validity and understood the difference between them.

Questions

1. Discuss different levels of measurement.
2. Using appropriate examples, write notes on:
   a. Nominal Scale
   b. Ordinal Scale
   c. Interval Scale
3. What is meant by analysis of scales?
4. Elaborate on the criteria for good measurement.
5. Write a note on sensitivity as a criteria for measurement.

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B. ATTITUDE MEASUREMENT & QUESTIONNAIRE DESIGN

Unit Structure

8B.1 Objectives

Following are the objectives of this unit:

- ✓ To understand the attitude rating scale
- ✓ To categorise different attitude rating scales
- ✓ To understand the development of questionnaire procedure

8B.2 Introduction

Attitude can be defined as a tendency to react favourably, neutrally, or unfavourably toward a particular class of stimuli, such as a custom, institutional practice, or national group. There are two challenges a researcher faces when measuring an individual's attitude. First, an individual's attitude toward an object

cannot be observed directly but must be inferred from observed behaviour, such as responses to a questionnaire. And second, there is no inherent scale associated with the observed behaviour. Techniques for measuring attitude are:

1. *Ranking*: A measurement task that requires respondents to rank order a small number of stores, brands, or objects on the basis of overall preference or some characteristic of the stimulus.
2. *Rating*: A measurement task that requires respondents to estimate the magnitude of a characteristic or quality that a brand, store, or object possesses.
3. *Sorting*: A measurement task that presents a respondent with several objects or product concepts and requires the respondent to arrange the objects into piles or classify the product concepts.

Along with attitude, another critical part of the survey is the creation of questions that must be framed in such a way that it results in obtaining the desired information from the respondents. There are no scientific principles that assure an ideal questionnaire and in fact, the questionnaire design is the skill which is learned through experience. In this unit, we will see Attitude rating scales and Questionnaire designing

8B.3 Attitude Rating Scales

Simple attitude scaling may be used when questionnaires are extremely long, when respondents have little education, or for other specific reasons. A number of simplified scales are merely checklists: A respondent indicates past experience, preference, and the like merely by checking an item.

In many cases the items are adjectives that describe a particular object. In a survey of small-business owners and managers, respondents indicated whether they found working in a small firm more rewarding than working in a large firm, as well as whether they agreed with a series of attitude statements about small businesses. For example, 77 percent said small and mid-sized businesses “have less bureaucracy,” and 76 percent said smaller companies “have more flexibility” than large ones.

8B.3.1 Category Scale

A rating scale that consists of several response categories, often providing respondents with alternatives to indicate positions on a continuum.

Table 8B.1: Sample of category scale

How frequently do you use online payment modes?				
Never	Rarely	Sometimes	Often	Very Often

The simplest rating scale contains only two response categories: agree/disagree. Expanding the response categories provides the respondent with more flexibility in the rating task. Even more information is provided if the categories are ordered according to a particular descriptive or evaluative dimension.

This category scale is a more sensitive measure than a scale that has only two response categories. By having more choices for a respondent, the potential exists to provide more information. However, if the researcher tries to represent something that is truly bipolar (yes/no, female/male, member/non-member, and so on) with more than two categories, error may be introduced.

8B.3.2 Likert Scale

A Likert scale is a psychometric scale commonly used in questionnaires, and is the most widely used scale in survey research. When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement. The scale is named after its inventor, psychologist Rensis Likert. The Likert scale can also be used to measure attitudes of people. When responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item.

Definition:

A measure of attitudes designed to allow respondents to rate how strongly they agree or disagree with carefully constructed statements, ranging from very positive to very negative attitudes toward some object.

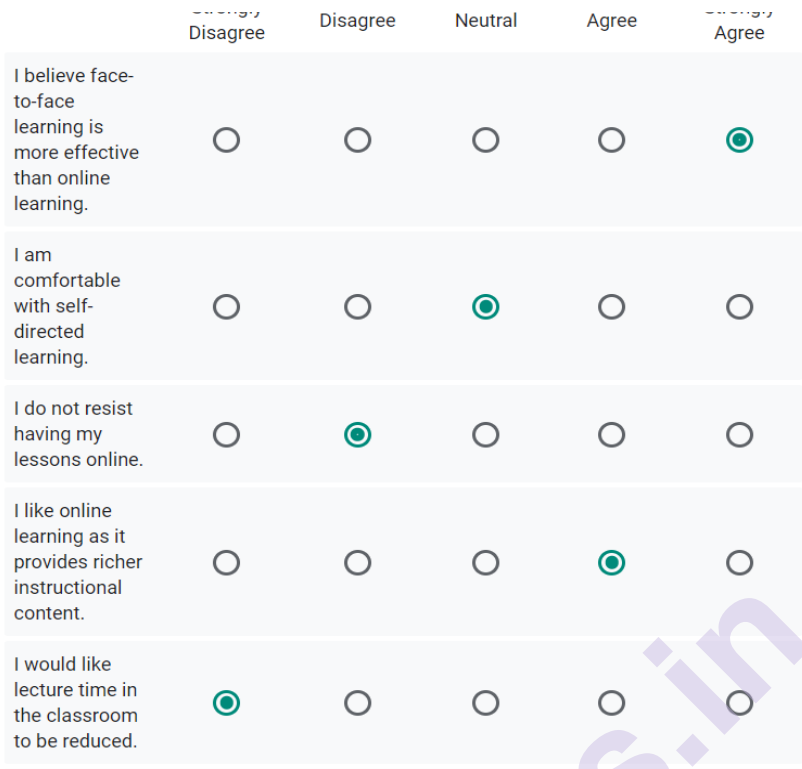

Figure 8B.1: Sample of 5-point Likert Scale

Reverse Recording

The statement given in this example (figure 8B.1) is positively framed. If a statement is framed negatively (such as "I dislike online learning as it provides richer instructional content"), the numerical scores would need to be reversed. This is done by reverse recoding the negative item so that a strong agreement really indicates an unfavourable response rather than a favourable attitude. In the case of a five-point scale, the recoding is done as follows:

Table 8B.2: Reverse Scoring of Likert Scale

Old Value	New Value
1	5
2	4
3	3
4	2
5	1

8B.3.3 Composite Scaling

A Likert scale may include several scale items to form a composite scale. Each statement is assumed to represent an aspect of a common attitudinal domain. The total score is the summation of the numerical scores assigned to an individual's responses. Based on the example given in figure 1.1, twethe maximum possible score for the composite would be 20 if a 5 were assigned to "strongly agree" responses for each of the positively worded statements and a 5 to "strongly disagree" responses for the negative statement. Item 3 is negatively worded and therefore it is reverse coded, prior to being used to create the composite scale.

Definition:

Composite Scaling: A way of representing a latent construct by summing or averaging respondents' reactions to multiple items each assumed to indicate the latent construct.

8B.3.4 Semantic Differential

The semantic differential is actually a series of attitude scales. This popular attitude measurement technique consists of getting respondents to react to some concept using a series of seven-point bipolar rating scales. Bipolar adjectives—such as "good" and "bad," "modern" and "old fashioned," or "clean" and "dirty"—anchor the beginning and the end (or poles) of the scale. The subject makes repeated judgments about the concept under investigation on each of the scales.

Definition

Semantic Scaling: It's a measure of attitudes that consists of a series of seven point rating scales that use bipolar adjectives to anchor the beginning and end of each scale.

The scoring of the semantic differential can be illustrated using the scale bounded by the anchors "modern" and "old-fashioned." Respondents are instructed to check the place that indicates the nearest appropriate adjective. From left to right, the scale intervals are interpreted as "extremely modern," "very modern," "slightly modern," "both modern and old-fashioned," "slightly old-fashioned," "very old-fashioned," and "extremely old-fashioned":

Modern---------- Old-fashioned

8B.3.5 Numeric Scaling

A numerical scale simply provides numbers rather than a semantic space or verbal descriptions to identify response options or categories (response positions). For

example, a scale using five response positions is called a five-point numerical scale. A six-point scale has six positions and a seven-point scale seven positions, and so on. Consider the following numerical scale:

Now that you've had your laptop for about one year, please tell us how satisfied you are.

Extremely Dissatisfied 1 2 3 4 5 6 7 Extremely Satisfied

This numerical scale uses bipolar adjectives in the same manner as the semantic differential. In practice, researchers have found that a scale with numerical labels for intermediate points on the scale is as effective a measure as the true semantic differential.

Definition

Numeric Scaling: An attitude rating scale similar to a semantic differential except that it uses numbers, instead of verbal descriptions, as response options to identify response positions.

8B.3.6 Stapel Scale

The Stapel scale, is used to measure simultaneously the direction and intensity of an attitude. Modern versions of the scale, with a single adjective, are used as a substitute for the semantic differential when it is difficult to create pairs of bipolar adjectives. The modified Stapel scale places a single adjective in the center of an even number of numerical values (ranging, perhaps, from +3 to –3). The scale measures how close to or distant from the adjective a given stimulus is perceived to be.

The advantages and disadvantages of the Stapel scale are very similar to those of the semantic differential. However, the Stapel scale is markedly easier to administer, especially over the telephone. Because the Stapel scale does not require bipolar adjectives, it is easier to construct than the semantic differential.

Definition

Staple Scale: A measure of attitudes that consists of a single adjective in the center of an even number of numerical values.

8B.3.7 Constant Sum Scale

A constant sum scale is a type of question used in a market research survey in which respondents are required to divide a specific number of points or percent as part of a total **sum**. The allocation of points is divided to detail the variance and weight of each category. A constant-sum scale requires respondents to divide a

fixed number of points among several attributes corresponding to their relative importance or weight.

Definition

Constant Sum Scale: A measure of attitudes in which respondents are asked to divide a constant sum to indicate the relative importance of attributes; respondents often sort cards, but the task may also be a rating task.

For Example:

Question: Using 100 points, please apply a number of points to each factor based on how important each is to you when buying a home. You must total 100 points divided among the factors.

Answer: Price, Location, School District, Inside Features, etc.

The respondent is given 100 points. They may choose to apply 80 to price, 15 to location, and spread out the remaining 5 points among other factors. When you analyze this data set, the differentiation between factors becomes evident. Most survey software will automatically tally and sum the point values to ensure they add to a constant sum of 100.

This constant sum scale adds another layer of analytical thinking for the respondent rather than just selecting one, running through a checklist of choices, or selecting from a grid or scaling question. It forces respondents to slow down and understand the relative value of each factor and compare the importance of one over another. It maximizes the chances of creating differentiation between your choices.

8B.3.8 Graphic Rating Scale

A graphic rating scale lists the traits each employee should have and rates workers on a numbered scale for each trait. The scores are meant to separate employees into tiers of performers, which can play a role in determining promotions and salary adjustments. A graphic rating scale presents respondents with a graphic continuum. The respondents are allowed to choose any point on the continuum to indicate their attitude.

Definition

Graphic Rating Scale: A measure of attitude that allows respondents to rate an object by choosing any point along a graphic continuum.

For Example:

Table 8B.3: Example of Analyses performance of employees working on Project A from April to June 2020

	Extremely Poor	**Bad**	**Average**	**Good**	**Excellent**
Attention to detail					
Knowledge					
Teamwork					
Initiative					
Creative					

A variation of the graphic ratings scale is the ladder scale. This scale also includes numerical options.

Example: This ladder scale represents the "ladder of life." As you see, it is a ladder with eleven rungs numbered 0 to 10. Let's suppose the top of the ladder represents the best possible life for you as you describe it, and the bottom rung represents the worst possible life for you as you describe it.

On which rung of the ladder do you feel your life is today?

0 1 2 3 4 5 6 7 8 9 10

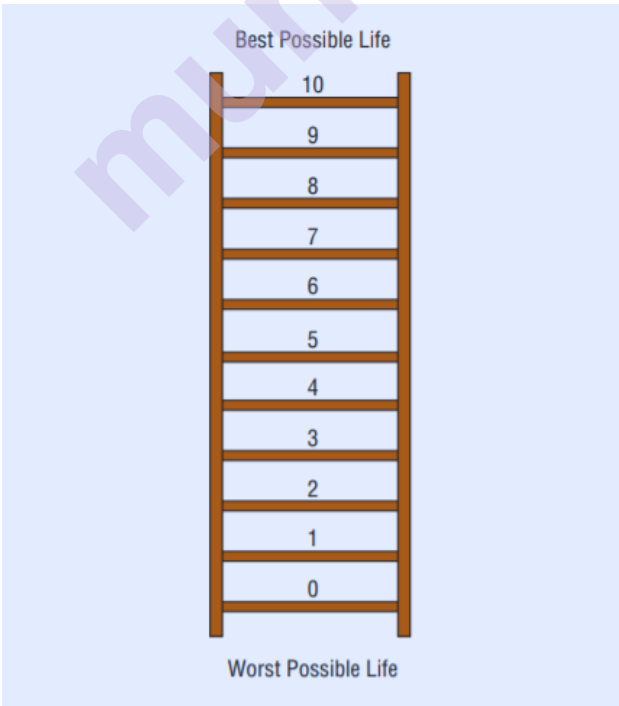

Figure 8B.2 Ladder Scale example

8B.3.9 THURSTONE INTERVAL SCALE

It is an attitude scale in which judges assign scale values to attitudinal statements and subjects are asked to respond to these statements. This was developed because the attitudes vary along continua and should be measured accordingly. A Thurstone scale has a number of "agree" or "disagree" statements. It is a unidimensional scale to measure attitudes towards people. The construction of a Thurstone scale is a fairly complex process that requires two stages. The first stage is a ranking operation, performed by judges who assign scale values to attitudinal statements. The second stage consists of asking subjects to respond to the attitudinal statements.

8B.4 Questionnaire Design

Questionnaire is a systematic, data collection technique consists of a series of questions required to be answered by the respondents to identify their attitude, experience, and behavior towards the subject of research.

The following steps are involved in the questionnaire design process:

1. **Specify the Information Needed:** The first and the foremost step in designing the questionnaire is to specify the information needed from the respondents such that the objective of the survey is fulfilled. The researcher must completely review the components of the problem, particularly the hypothesis, research questions, and the information needed.

2. **Define the Target Respondent:** At the very outset, the researcher must identify the target respondent from whom the information is to be collected. The questions must be designed keeping in mind the type of respondents under study. Such as, the questions that are appropriate for serviceman might not be appropriate for a businessman. The less diversified respondent group shall be selected because the more diversified the group is, the more difficult it will be to design a single questionnaire that is appropriate for the entire group.

3. **Specify the type of Interviewing Method:** The next step is to identify the way in which the respondents are reached. In personal interviews, the respondent is presented with a questionnaire and interacts face-to-face with the interviewer. Thus, lengthy, complex and varied questions can be asked using the personal interview method. In telephone interviews, the respondent is required to give answers to the questions over the telephone. Here the

respondent cannot see the questionnaire and hence this method restricts the use of small, simple and precise questions.

The questionnaire can be sent through mail or post. It should be self-explanatory and contain all the important information such that the respondent is able to understand every question and gives a complete response. The electronic questionnaires are sent directly to the mail ids of the respondents and are required to give answers online.

4. **Determine the Content of Individual Questions:** Once the information needed is specified and the interviewing methods are determined, the next step is to decide the content of the question. The researcher must decide on what should be included in the question such that it contributes to the information needed or serve some specific purpose.

   In some situations, the indirect questions which are not directly related to the information needed may be asked. It is useful to ask neutral questions at the beginning of a questionnaire with intent to establish respondent's involvement and rapport. This is mainly done when the subject of a questionnaire is sensitive or controversial. The researcher must try to avoid the use of double-barrelled questions. A question that talks about two issues simultaneously, such as Is the Real juice tasty and a refreshing health drink?

5. **Overcome Respondent's Inability and Unwillingness to Answer:** The researcher should not presume that the respondent can provide accurate responses to all the questions. He must attempt to overcome the respondent's inability to answer. The questions must be designed in a simple and easy language such that it is easily understood by each respondent. In situations, where the respondent is not at all informed about the topic of interest, then the researcher may ask the filter questions, an initial question asked in the questionnaire to identify the prospective respondents to ensure that they fulfil the requirements of the sample.

   Despite being able to answer the question, the respondent is unwilling to devote time in providing information. The researcher must attempt to understand the reason behind such unwillingness and design the questionnaire in such a way that it helps in retaining the respondent's attention.

6. **Decide on the Question Structure:** The researcher must decide on the structure of questions to be included in the questionnaire. The question can

be structured or unstructured. The unstructured questions are the open-ended questions which are answered by the respondents in their own words. These questions are also called as a free-response or free-answer questions.

While, the structured questions are called as closed-ended questions that pre-specify the response alternatives. These questions could be a multiple-choice question, dichotomous (yes or no) or a scale.

7. **Determine the Question Wording:** The desired question content and structure must be translated into words which are easily understood by the respondents. At this step, the researcher must translate the questions in easy words such that the information received from the respondents is similar to what was intended.

   In case the question is written poorly, then the respondent might refuse to answer it or might give a wrong answer. In case, the respondent is reluctant to give answers, then "nonresponse**"** arises which increases the complexity of data analysis. On the other hand, if the wrong information is given, then "response error" arises due to which the result is biased.

8. **Determine the Order of Questions:** At this step, the researcher must decide the sequence in which the questions are to be asked. The opening questions are crucial in establishing respondent's involvement and rapport, and therefore, these questions must be interesting, non-threatening and easy. Usually, the open-ended questions which ask respondents for their opinions are considered as good opening questions, because people like to express their opinions.

9. **Identify the Form and Layout:** The format, positioning and spacing of questions has a significant effect on the results. The layout of a questionnaire is specifically important for the self-administered questionnaires. The questionnaires must be divided into several parts, and each part shall be numbered accurately to clearly define the branches of a question.

10. **Reproduction of Questionnaire:** Here, we talk about the appearance of the questionnaire, i.e. the quality of paper on which the questionnaire is either written or printed. In case, the questionnaire is reproduced on a poor-quality paper; then the respondent might feel the research is unimportant due to which the quality of response gets adversely affected.

    Thus, it is recommended to reproduce the questionnaire on a good-quality paper having a professional appearance. In case, the questionnaire has several

pages, then it should be presented in the form of a booklet rather than the sheets clipped or stapled together.

11. **Pretesting:** Pretesting means testing the questionnaires on a few selected respondents or a small sample of actual respondents with a purpose of improving the questionnaire by identifying and eliminating the potential problems. All the aspects of the questionnaire must be tested such as question content, structure, wording, sequence, form and layout, instructions, and question difficulty. The researcher must ensure that the respondents in the pre-test should be similar to those who are to be finally surveyed.

Thus, the questionnaire design is a multistage process that requires the researcher's attention to many details.

Summary

In this unit, we saw the attitude of measurement and process of designing a questionnaire. Attitude can be defined as a tendency to react favourably, neutrally, or unfavourably toward a particular class of stimuli, such as a custom, institutional practice, or national group. A questionnaire is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. Questionnaires can be thought of as a kind of written interview. ... Often a questionnaire uses both open and closed questions to collect data.

Some of the key definitions in this section include:

Likert Scale: A measure of attitudes designed to allow respondents to rate how strongly they agree or disagree with carefully constructed statements, ranging from very positive to very negative attitudes toward some object.

Composite Scaling: A way of representing a latent construct by summing or averaging respondents' reactions to multiple items each assumed to indicate the latent construct.

Numeric Scaling: An attitude rating scale similar to a semantic differential except that it uses numbers, instead of verbal descriptions, as response options to identify response positions.

Graphic Rating Scale: A measure of attitude that allows respondents to rate an object by choosing any point along a graphic continuum.

Questions

1 What is attitude rating scale? Discuss any two scales using appropriate examples.

2 Discuss the structure of Likert scale.

3 What is understood by Numeric scaling?

4 Discuss in details the steps of Questionnaire Design.

5 Write a note on Graphic rating scale.

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C. SAMPLING DESIGNS AND PROCEDURES
D. DETERMINATION OF SAMPLE SIZE

Unit Structure

8C.0 Objectives

Following are the objectives of this unit:

- ✓ To get well versed with Sampling terminologies
- ✓ To understand the purpose of sampling
- ✓ To analyse the stages of sampling

- ✓ To understand the techniques of sampling
- ✓ To differentiate between different types of sampling techniques
- ✓ To calculate the sample size

8C.1 Introduction

Sampling is a familiar part of daily life. A customer in a bookstore picks up a book, looks at the cover, and skims a few pages to get a sense of the writing style and content before deciding whether to buy. A high school student visits a college classroom to listen to a professor's lecture. Selecting a university on the basis of one classroom visit may not be scientific sampling, but in a personal situation, it may be a practical sampling experience. When measuring every item in a population is impossible, inconvenient, or too expensive, we intuitively take a sample. Although sampling is commonplace in daily activities, these familiar samples are seldom scientific. For researchers, the process of sampling can be quite complex. Sampling is a central aspect of business research, requiring in-depth examination.

Formally defining sampling: It is a process used in statistical analysis in which a predetermined number of observations are taken from a larger population. The methodology used to sample from a larger population depends on the type of analysis being performed, but it may include simple random sampling or systematic sampling.

To choose the right size of sample is the next section of this unit titled as determination of sample size. Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample.

This unit explains the nature of sampling and ways to determine the appropriate sample design.

8C.2 Sampling Terminologies

- ✓ **Population**: Total of items about which information is desired. It can be classified into two categories- finite and infinite. The population is said to be finite if it consists of a fixed number of elements so that it is possible to enumerate in its totality.

Examples of finite population are the populations of a city, the number of workers in a factory, etc.

An infinite population is that population in which it is theoretically impossible to observe all the elements. In an infinite population the number of items is infinite.

Example of infinite population is the number of stars in sky. From practical consideration, we use the term infinite population for a population that cannot be enumerated in a reasonable period of time.

- ✓ **Sample**: It is part of the population that represents the characteristics of the population.
- ✓ **Population Sample Sampling:** It is the process of selecting the sample for estimating the population characteristics. In other words, it is the process of obtaining information about an entire population by examining only a part of it.
- ✓ **Sampling Unit:** Elementary units or group of such units which besides being clearly defined, identifiable and observable, are convenient for purpose of sampling are called sampling units. For instance, in a family budget enquiry, usually a family is considered as the sampling unit since it is found to be convenient for sampling and for ascertaining the required information. In a crop survey, a farm or a group of farms owned or operated by a household may be considered as the sampling unit.
- ✓ **Sampling Frame:** A list containing all sampling units is known as sampling frame. Sampling frame consists of a list of items from which the sample is to be drawn. Sample Survey: An investigation in which elaborate information is collected on a sample basis is known as sample survey.
- ✓ **Statistic**: Characteristics of the sample. For example, sample Mean, proportion, etc.
- ✓ **Parameter**: Characteristics of the population. For example, population Mean, proportion, etc.
- ✓ **Target Population:** A target population is the entire group about which information is desired and conclusion is made.
- ✓ **Sampled Population**: The population, which we actually sample, is the sampled population. It is also called survey population.

- ✓ **Sampling With and Without Replacement:** Sampling schemes may be without replacement ('WOR' - no element can be selected more than once in the same sample) or with replacement ('WR' - an element may appear multiple times in the one sample). For example, if we catch fish, measure them, and immediately return them to the water before continuing with the sample, this is a WR design, because we might end up catching and measuring the same fish more than once. However, if we do not return the fish to the water (e.g. if we eat the fish), this becomes a WOR design.

- ✓ **Sample Design:** Sample design refers to the plans and methods to be followed in selecting sample from the target population and the estimation technique formula for computing the sample statistics. These statistics are the estimates used to infer the population parameters.

8C.3 Purpose of Sampling

The basic purpose of sampling is to provide an estimate of the population parameter and to test the hypothesis. Advantages of sampling are –

- ✓ Save time and money
- ✓ Enable collection of comprehensive data
- ✓ Enable more accurate measurement as it conducted by trained and experienced investigators
- ✓ Sampling remains the only way when population contains infinitely many members
- ✓ In certain situation, sampling is the only way of data collection. For example, in testing the pathological status of blood, boiling status of rice, etc
- ✓ It provides a valid estimation of sampling error

8C.4 Stages of Sampling Process

The sampling process comprises several stages

1. Define the population.
2. Specifying the sampling frame.
3. Specifying the sampling unit.
4. Selection of the sampling method.
5. Determination of sample size.
6. Specifying the sampling plan.
7. Selecting the sample.

Define the Population: Population must be defined in terms of elements, sampling units, extent and time. Because there is very rarely enough time or money to gather information from everyone or everything in a population, the goal becomes finding a representative sample (or subset) of that population.

Sampling Frame: As a remedy, we seek a sampling frame which has the property that we can identify every single element and include any in our sample. The most straightforward type of frame is a list of elements of the population (preferably the entire population) with appropriate contact information. A sampling frame may be a telephone book, a city directory, an employee roster, a listing of all students attending a university, or a list of all possible phone numbers.

Sampling Unit: A sampling unit is a basic unit that contains a single element or a group of elements of the population to be sampled. The sampling unit selected is often dependent upon the sampling frame. If a relatively complete and accurate listing of elements is available (e.g. register of purchasing agents) one may well want to sample them directly. If no such register is available, one may need to sample companies as the basic sampling unit.

Sampling Method: The sampling method outlines the way in which the sample units are to be selected. The choice of the sampling method is influenced by the objectives of the research, availability of financial resources, time constraints, and the nature of the problem to be investigated. All sampling methods can be grouped under two distinct heads, that is, probability and non-probability sampling.

Sample Size: The sample size calculation depends primarily on the type of sampling designs used. However, for all sampling designs, the estimates for the expected sample characteristics (e.g. mean, proportion or total) desired level of certainty, and the level of precision must be clearly specified in advanced. The statement of the precision desired might be made by giving the amount of error that we are willing to tolerate in the resulting estimates. Common levels of precisions are 5% and 10%.

Sampling Plan: In this step, the specifications and decisions regarding the implementation of the research process are outlined. As the interviewers and their co-workers will be on field duty of most of the time, a proper specification of the sampling plans would make their work easy and they would not have to reverting operational problems.

Select the Sample: The final step in the sampling process is the actual selection of the sample elements. This requires a substantial amount of office and fieldwork, particularly if personal interviews are involved.

8C.5 Techniques of Sampling

There are two basic approaches to sampling: Probability Sampling and Non-probability Sampling.

8C.5.1 Probability Sampling

Probability sampling is also known as random sampling or chance sampling. In this, sample is taken in such a manner that each and every unit of the population has an equal and positive chance of being selected. In this way, it is ensured that the sample would truly represent the overall population. Probability sampling can be achieved by random selection of the sample among all the units of the population.

Major random sampling procedures are –

- ✓ Simple Random Sample
- ✓ Systematic Random Sample
- ✓ Stratified Random Sample
- ✓ Cluster/ Multistage Sample

8C.5.1.1 Simple Random Sample

For this, each member of the population is numbered. Then, a given size of the sample is drawn with the help of a random number chart. The other way is to do a lottery. Write all the numbers on small, uniform pieces of paper, fold the papers, put them in a container and take out the required lot in a random manner from the container as is done in the kitty parties. It is relatively simple to implement but the final sample may miss out small sub groups.

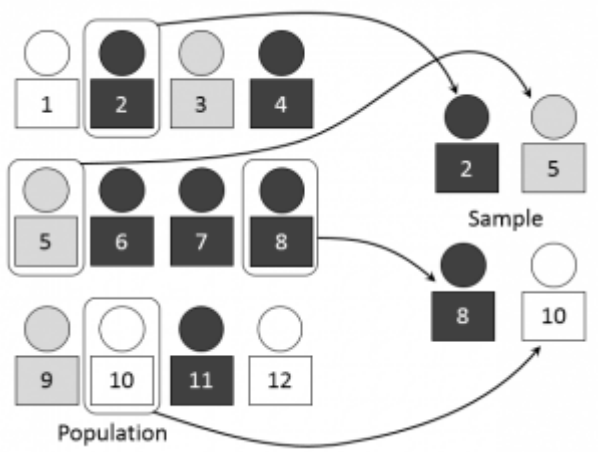

Figure 3.1: Example of Simple Random Sampling

A simple random sample is chosen in such a way that every set of individuals has an equal chance to be in the selected sample.

For example, if you wanted to study all the adults in the India who had high cholesterol, the list would be practically impossible to get unless you surveyed every person in the country. Therefore, other sampling methods would probably be better suited to that particular experiment.

Advantages:

The sample will be free from Bias (i.e. it's random!).

Disadvantages:

Difficult to obtain

Due to its very randomness, "freak" results can sometimes be obtained that are not representative of the population. In addition, these freak results may be difficult to spot. Increasing the sample size is the best way to eradicate this problem.

8C.5.1.2 Systematic Random Sample

Systematic sampling is one method in the broader category of random sampling (for this reason, it requires precise control of the sampling frame of selectable individuals and of the probability that they will be selected). It involves choosing a first individual at random from the population, then selecting every following nth individual within the sampling frame to make up the sample.

Systematic sampling is a very simple process that requires choosing only one individual at random. The rest of the process is fast and easy. As with simple random sampling, the results that we obtain are representative of the population, provided that there is no factor intrinsic to the individuals selected that regularly repeats certain characteristics of the population every certain number of individuals—which is very rarely the case.

The *process* for conducting systematic sampling is as follows:

1. We prepare an ordered list of N individuals in the population; this will be our sampling frame.
2. We divide the sampling frame into n fragments, where n is our desired sample size. The size of these fragments will be

$K=N/n$

where K is called the interval or lift coefficient.

3. The initial number: we randomly obtain a whole number A, which is less than or equal to the interval. The number corresponds to the first subject who we select for the sample within the first fragment into which we have divided the population.

4. Selection of the remaining n-1 individuals: We select the subsequent individuals based on where they fall, in simple arithmetic succession, after the randomly selected individual, selecting individuals who occupy the same position as the initial subject in the rest of the fragment into which we have divided the sample. This is the equivalent of saying that we will select the individuals

   A, A + K, A + 2K, A + 3K, ..., A + (n-1)K

Example

Let's say that our sampling frame includes 5,000 individuals and we want a 100-individual sample. First, we divide the sampling frame into 100 fragments of 50 individuals. Then, we randomly select one number between 1 and 50 in order to randomly select the first individual for the first fragment. Let's say we select 24. The sample is defined by this individual; we select the remaining individuals from the list at intervals of 50 units: 24, 74, 124, 174, ..., 4.974

It also requires numbering the entire population. Then every nth number (say every 5th or 10th number, as the case may be) is selected to constitute the sample. It is easier and more likely to represent different subgroups.

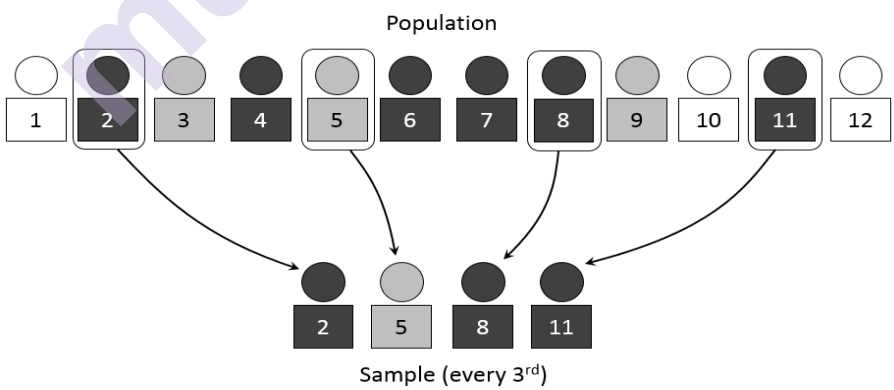

Figure 3.2: Example of Systematic Random Sampling

Advantages

Can eliminate other sources of bias.

Disadvantages

Can introduce bias where the pattern used for the samples coincides with a pattern in the population.

8C.5.1.3 Stratified Random Sample

At first, the population is first divided into groups or strata each of which is homogeneous with respect to the given characteristic feature. From each strata, then, samples are drawn at random. This is called stratified random sampling.

For example, with respect to the level of socio-economic status, the population may first be grouped in such strata as high, middle, low and very low socio-economic levels as per pre-determined criteria, and random sample drawn from each group.

The sample size for each sub-group can be fixed to get representative sample. This way, it is possible that different categories in the population are fairly represented in the sample, which could have been left out otherwise in simple random sample.

As with stratified samples, the population is broken down into different categories. However, the size of the sample of each category does not reflect the population as a whole. The Quota sampling technique can be used where an unrepresentative sample is desirable (e.g. you might want to interview more children than adults for a survey on computer games), or where it would be too difficult to undertake a stratified sample.

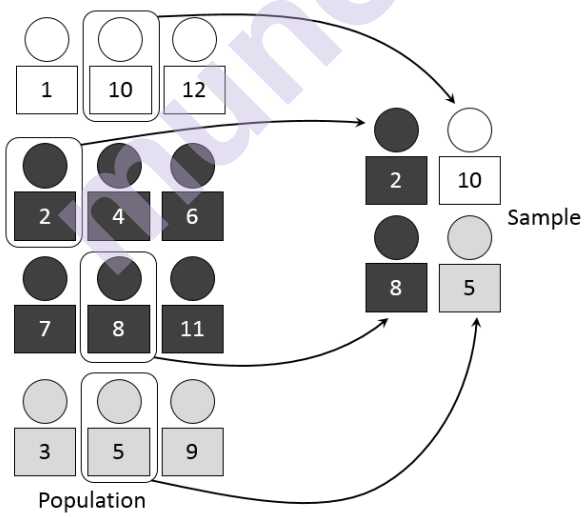

Figure 3.3: Example of Stratified Random Sampling

Advantages

Yields more accurate results than simple random sampling

Can show different tendencies within each category (e.g. men and women)

Disadvantage

Nil

8C.5.1.4 Cluster/ Multistage Sampling

In some cases, the selection of units may pass through various stages, before you finally reach your sample of study. For this, a State, for example, may be divided into districts, districts into blocks, blocks into villages, and villages into identifiable groups of people, and then taking the random or quota sample from each group.

For example, taking a random selection of 3 out of 15 districts of a State, 6 blocks from each selected district, 10 villages from each selected block and 20 households from each selected village, totalling 3600 respondents. This design is used for large-scale surveys spread over large areas.

The advantage is that it needs detailed sampling frame for selected clusters only rather than for the entire target area. There are savings in travel costs and time as well. However, there is a risk of missing on important sub-groups and not having complete representation of the target population.

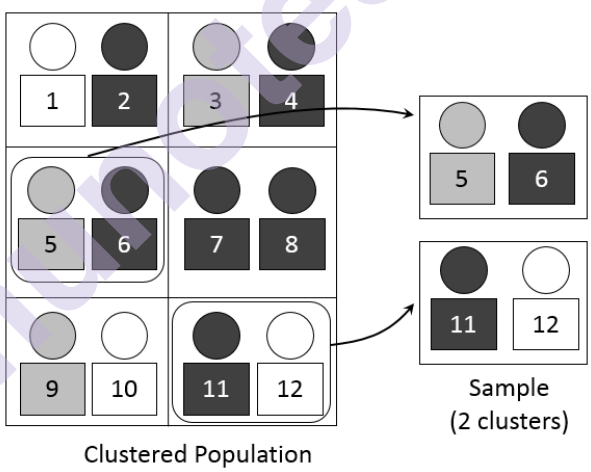

Figure 3.4: Example of Cluster Sampling

Advantages

Less expensive and time consuming than a fully random sample.

Can show 'regional' variations.

Disadvantages

Not a genuine random sample.

Likely to yield a biased result (especially if only a few clusters are sampled).

8C.5.2 Non-Probability Sampling

Non-probability sampling is any sampling method where some elements of the population have no chance of selection (these are sometimes referred to as 'out of coverage'/'under covered'), or where the probability of selection can't be accurately determined. It involves the selection of elements based on assumptions regarding the population of interest, which forms the criteria for selection.

Hence, because the selection of elements is non-random, non-probability sampling does not allow the estimation of sampling errors. Non-probability sampling is a non-random and subjective method of sampling where the selection of the population elements comprising the sample depends on the personal judgment or the discretion of the sampler.

Non-probability sampling includes:

- ✓ Accidental/ Convenience Sampling
- ✓ Quota Sampling
- ✓ Judgment/ Subjective/ Purposive Sampling
- ✓ Snowball Sampling

8C.5.2.1 Convenience/ Accidental Sampling

Accidental sampling is a type of non-probability sampling which involves the sample being drawn from that part of the population which is close to hand. That is, a sample population selected because it is readily available and convenient.

The researcher using such a sample cannot scientifically make generalizations about the total population from this sample because it would not be representative enough.

For example, if the interviewer was to conduct such a survey at a shopping center early in the morning on a given day, the people that s/he could interview would be limited to those given there at that given time, which would not represent the views of other members of society in such an area, if the survey was to be conducted at different times of day and several times per week. This type of sampling is most useful for pilot testing.

The primary problem with availability sampling is that you can never be certain what population the participants in the study represent. The population is unknown, the method for selecting cases is haphazard, and the cases studied probably don't represent any population you could come up with. However, there are some situations in which this kind of design has advantages.

For example, survey designers often want to have some people respond to their survey before it is given out in the 'real' research setting as a way of making certain the questions make sense to respondents. For this purpose, availability sampling is not a bad way to get a group to take a survey, though in this case researchers care less about the specific responses given than whether the instrument is confusing or makes people feel bad.

Advantages

Expedited data collection: When time is of the essence, many researchers turn to convenience sampling for data collection, as they can swiftly gather data and begin their calculations.

Ease of research: For researchers who are not looking for an accurate sampling, they can simply collect their information and move on to other aspects of their study. This type of sampling can be done by simply creating a questionnaire and distributing it to their targeted group.

Ready availability: Since most convenience sampling is collected with the populations on hand, the data is readily available for the researcher to collect.

Cost effectiveness: One of the most important aspects of convenience sampling is its cost effectiveness. This method allows for funds to be distributed to other aspects of the project.

Disadvantages

Bias: The results of the convenience sampling cannot be generalized to the target population because of the potential bias of the sampling technique due to under-representation of subgroups in the sample in comparison to the population of interest.

Power: Convenience sampling is characterized with insufficient power to identify differences of population subgroups

8C.5.2.2 Quota Sampling

In quota sampling, the population is first segmented into mutually exclusive sub-groups, just as in stratified sampling. Then judgment is used to select the subjects or units from each segment based on a specified proportion. For example, an interviewer may be told to sample 200 females and 300 males between the age of 45 and 60. In quota sampling the selection of the sample is non-random.

For example: interviewers might be tempted to interview those who look most helpful. The problem is that these samples may be biased because not everyone gets a chance of selection. This random element is its greatest weakness and quota versus probability has been a matter of controversy for many years.

Process

In quota sampling, a population is first segmented into mutually exclusive sub-groups, just as in stratified sampling. Then judgment is used to select the subjects or units from each segment based on a specified proportion. For example, an interviewer may be told to sample 200 females and 300 males between the age of 45 and 60. This means that individuals can put a demand on who they want to sample (targeting).

This second step makes the technique non-probability sampling. In quota sampling, there is non-random sample selection and this can be unreliable. For example, interviewers might be tempted to interview those people in the street who look most helpful, or may choose to use accidental sampling to question those closest to them, to save time. The problem is that these samples may be biased because not everyone gets a chance of selection, whereas in stratified sampling (its probabilistic version), the chance of any unit of the population is the same as 1/n (n= number of units in the population). This non-random element is a source of uncertainty about the nature of the actual sample and quota versus probability has been a matter of controversy for many years.

8C.5.2.3 Subjective or Purposive or Judgment Sampling

In this sampling, the sample is selected with definite purpose in view and the choice of the sampling units depends entirely on the discretion and judgment of the investigator. This sampling suffers from drawbacks of favouritism and nepotism depending upon the beliefs and prejudices of the investigator and thus does not give a representative sample of the population. This sampling method is seldom used and cannot be recommended for general use since it is often biased due to element of subjectivity on the part of the investigator. However, if the investigator is experienced and skilled and this sampling is carefully applied, then judgment samples may yield valuable results. Some purposive sampling strategies that can be used in qualitative studies are given below. Each strategy serves a particular data gathering and analysis purpose. Extreme Case Sampling: It focuses on cases that are rich in information because they are unusual or special in some way. e.g. the only community in a region that prohibits felling of trees.

8C.5.2.4 Snowball Sampling

Snowball sampling is a method in which a researcher identifies one member of some population of interest, speaks to him/her, and then asks that person to identify others in the population that the researcher might speak to. This person is then asked to refer the researcher to yet another person, and so on.

This sampling technique is used against low incidence or rare populations. Sampling is a big problem in this case, as the defined population from which the sample can be drawn is not available. Therefore, the process sampling depends on the chain system of referrals. Although small sample sizes and low costs are the clear advantages of snowball sampling, bias is one of its disadvantages.

The referral names obtained from those sampled in the initial stages may be similar to those initially sampled. Therefore, the sample may not represent a cross-section of the total population. It may also happen that visitors to the site or interviewers may refuse to disclose the names of those whom they know.

Snowball sampling uses a small pool of initial informants to nominate, through their social networks, other participants who meet the eligibility criteria and could potentially contribute to a specific study. The term "snowball sampling" reflects an analogy to a snowball increasing in size as it rolls downhill.

Method

- ✓ Draft a participation program (likely to be subject to change, but indicative).
- ✓ Approach stakeholders and ask for contacts.
- ✓ Gain contacts and ask them to participate.
- ✓ Community issues groups may emerge that can be included in the participation program.
- ✓ Continue the snowballing with contacts to gain more stakeholders if necessary.
- ✓ Ensure a diversity of contacts by widening the profile of persons involved in the snowballing exercise.

Advantages

- ✓ Locate hidden populations: It is possible for the surveyors to include people in the survey that they would not have known but, through the use of social network.
- ✓ Locating people of a specific population: There are no lists or other obvious sources for locating members of the population.
- ✓ Methodology: As subjects are used to locate the hidden population, the researcher invests less money and time in sampling. Snowball sampling method does not require complex planning and the staffing required is considerably smaller in comparison to other sampling methods.

Disadvantages

- ✓ Community bias: The first participants will have a strong impact on the sample.
- ✓ Non-random: Snowball sampling contravenes many of the assumptions supporting conventional notions of random selection and representativeness.
- ✓ Unknown sampling population size: There is no way to know the total size of the overall population.
- ✓ Anchoring: Lack of definite knowledge as to whether or not the sample is an accurate reading of the target population.
- ✓ Lack of control over sampling method: As the subjects locate the hidden population, the research has very little control over the sampling method, which becomes mainly dependent on the original and subsequent subjects, who may add to the known sampling pool using a method outside of the researcher's control.

***(Some more types of Non- Probability Sampling Methods are listed after the references of this chapter to get a through understanding of this topic)**

8D. Determination of Sample Size

Determination of sample size is probably one of the most important phases in the sampling process. Generally the larger the sample size, the better is the estimation. But always larger sample sizes cannot be used in view of time and budget constraints. Moreover, when a probability sample reaches a certain size the precision of an estimator cannot be significantly increased by increasing the sample size any further. Indeed, for a large population the precision of an estimator depends on the sample size, not on what proportion of the population has been sampled. It can be stated that whenever a sample study is made, there arises some sampling error which can be controlled by selecting a sample of adequate size.

Sample size is a frequently-used term in statistics and market research, and one that inevitably comes up whenever you're surveying a large population of respondents. It relates to the way research is conducted on large populations.

When you survey a large population of respondents, you're interested in the entire group, but it's not realistically possible to get answers or results from absolutely everyone. So you take a random sample of individuals which represents the population as a whole.

The size of the sample is very important for getting accurate, statistically significant results and running your study successfully.

If your sample is too small, you may include a disproportionate number of individuals which are outliers and anomalies. These skew the results and you don't get a fair picture of the whole population.

If the sample is too big, the whole study becomes complex, expensive and time-consuming to run, and although the results are more accurate, the benefits don't outweigh the costs.

If you've already worked out your variables you can get to the right sample size quickly with the online sample size calculator below:

Confidence Level:
95%

Population Size:
10000

Margin of Error:
5%

Ideal Sample Size:
370

If you want to start from scratch in determining the right sample size for your market research, let us walk you through the steps.

Learn how to determine sample size

To choose the correct sample size, you need to consider a few different factors that affect your research, and gain a basic understanding of the statistics involved. You'll then be able to use a sample size formula to bring everything together and sample confidently, knowing that there is a high probability that your survey is statistically accurate.

The steps that follow are suitable for finding a sample size for continuous data – i.e. data that is counted numerically. It doesn't apply to categorical data – i.e. put into categories like green, blue, male, female etc.

STAGE 1: Consider your sample size variables

Before you can calculate a sample size, you need to determine a few things about the target population and the level of accuracy you need:

1. Population size

How many people are you talking about in total? To find this out, you need to be clear about who does and doesn't fit into your group. For example, if you want to know about dog owners, you'll include everyone who has at some point owned at least one dog. (You may include or exclude those who owned a dog in the past, depending on your research goals.) Don't worry if you're unable to calculate the exact number. It's common to have an unknown number or an estimated range.

2. Margin of error (confidence interval)

Errors are inevitable – the question is how much error you'll allow. The margin of error, AKA confidence interval, is expressed in terms of mean numbers. You can set how much difference you'll allow between the mean number of your sample and the mean number of your population. If you've ever seen a political poll on the news, you've seen a confidence interval and how it's expressed. It will look something like this: "68% of voters said yes to Proposition Z, with a margin of error of +/- 5%."

3. Confidence level

This is a separate step to the similarly-named confidence interval in step 2. It deals with how confident you want to be that the actual mean falls within your margin of error. The most common confidence intervals are 90% confident, 95% confident, and 99% confident.

4. Standard deviation

This step asks you to estimate how much the responses you receive will vary from each other and from the mean number. A low standard deviation means that all the values will be clustered around the mean number, whereas a high standard deviation means they are spread out across a much wider range with very small and very large outlying figures. Since you haven't yet run your survey, a safe choice is a standard deviation of .5 which will help make sure your sample size is large enough.

STAGE 2: Calculate sample size

Now that you've got answers for steps 1 – 4, you're ready to calculate the sample size you need. This can be done using an online sample size calculator or with paper and pencil.

5. Find your Z-score

Next, you need to turn your confidence level into a Z-score. Here are the Z-scores for the most common confidence levels:

90% – Z Score = 1.645

95% – Z Score = 1.96

99% – Z Score = 2.576

6. Use the sample size formula

Plug in your Z-score, standard of deviation, and confidence interval into the sample size calculator or use this sample size formula to work it out yourself:

Necessary Sample Size =

$$\frac{(Z-score)^2 \times StdDev \times (1-StdDev)}{(Margin\ of\ error)^2}$$

This equation is for an unknown population size or a very large population size. If your population is smaller and known, just use the sample size calculator.

Solved example:

assuming you chose a 95% confidence level, 0.5 standard deviation, and a margin of error (confidence interval) of +/- 5%.

= $((1.96)^2$ x .5(.5)) / $(.05)^2$

= (3.8416 x .25) / .0025

= 0.9604 / .0025

= 384.16

385 respondents are needed

Summary

In this unit we saw sampling which is a process used in statistical analysis in which a predetermined number of observations are taken from a larger population. The methodology used to sample from a larger population depends on the type of analysis being performed, but it may include simple random sampling or systematic sampling.

We also saw the terminologies used along with sampling which includes population, sample, parameter, target population, sampled population etc. We further analysed the purpose of sampling along with understating the stages of sampling which included 7 steps. Later, in this unit, we saw the techniques of sampling (Probability Sampling and non-Probability Sampling techniques)

Later we understood the concept of determining the size of sample. To choose the right size of sample is the next section of this unit titled as determination of sample size. Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample.

Questions

1. Write a note on purpose of sampling.
2. Discuss the seven stages of sampling.
3. What are sampling techniques? Why do we need them?
4. Elaborate on Probability sampling and state its 3 types.
5. Elaborate on Non-Probability sampling and state its 3 types.
6. Why do we need to determine a sample size? Justify your answer.
7. Explain with appropriate example, snowball sampling.
8. Explain with appropriate figure and example, simple random sampling.
9. Discuss the steps for determining of the sample size.

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*** Some more types of Non-Probability Sampling Techniques**

8C.5.2.5 Maximum Variation Sampling

Aims at capturing the central themes that cut across participant variations. e.g. persons of different age, gender, religion and marital status in an area protesting against child marriage. Homogeneous Sampling: Picks up a small sample with similar characteristics to describe some particular sub-group in depth. e.g. firewood cutters or snake charmers or bonded laborers.

8C.5.2.6 Typical Case Sampling

Uses one or more typical cases (individuals, families / households) to provide a local profile. The typical cases are carefully selected with the co-operation of the local people/ extension workers.

8C.5.2.7 Critical Case Sampling

Looks for critical cases that can make a point quite dramatically. e.g. farmers who have set up an unusually high yield record of a crop. Chain Sampling: Begins by asking people, 'who knows a lot about _____'. By asking a number of people, you can identify specific kinds of cases e.g. critical, typical, extreme etc.

8C.5.2.8 Criterion Sampling

Reviews and studies cases that meet some pre-set criterion of importance e.g. farming households where women take the decisions. In short, purposive sampling is best used with small numbers of individuals/groups which may well be sufficient for understanding human perceptions, problems, needs, behaviours and contexts, which are the main justification for a qualitative audience research.

8C.5.2.9 Matched Random Sampling

A method of assigning participants to groups in which pairs of participants are first matched on some characteristic and then individually assigned randomly to groups. The Procedure for Matched random sampling can be briefed with the following contexts- (a) Two samples in which the members are clearly paired, or are matched explicitly by the researcher. For example, IQ measurements or pairs of identical twins. (b) Those samples in which the same attribute, or variable, is measured twice on each subject, under different circumstances. Commonly called repeated measures.

8C.5.2.10 Mechanical Sampling

Mechanical sampling is typically used in sampling solids, liquids and gases, using devices such as grabs, scoops; thief probes etc. Care is needed in ensuring that the sample is representative of the frame.

8C.5.2.11 Line-Intercept Sampling

Line-intercept sampling is a method of sampling elements in a region whereby an element is sampled if a chosen line segment, called a 'transect', intersects the element.

8C.5.2.12 Panel Sampling

Panel sampling is the method of first selecting a group of participants through a random sampling method and then asking that group for the same information again several times over a period of time. Therefore, each participant is given the same survey or interview at two or more time points; each period of data collection is called a 'wave'. This sampling methodology is often chosen for large scale or nation-wide studies in order to gauge changes in the population with regard to any number of variables from chronic illness to job stress to weekly food expenditures. Panel sampling can also be used to inform researchers about within-person health changes due to age or help explain changes in continuous dependent variables such as spousal interaction.

8C.5.2.13 Rank Sampling

A non-probability sample is drawn and ranked. The highest value is chosen as the first value of the targeted sample. Another sample is drawn and ranked; the second highest value is chosen for the targeted sample. The process is repeated until the lowest value of the targeted sample is chosen. This sampling method can be used in forestry to measure the average diameter of the trees.

8C.5.2.14 Voluntary Sample

A voluntary sample is made up of people who self-select into the survey. Often, these folks have a strong interest in the main topic of the survey. Suppose, for example, that a news show asks viewers to participate in an on-line poll. This would be a volunteer sample. The sample is chosen by the viewers, not by the survey administrator.

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UNIT 5

9

DATA ANALYIS AND PRESENTATION

A. EDITING AND CODING

Unit Structure

9A.0 Objectives

Following are the objectives of this unit:

- To understand Data Analysis and its phases
- To gain an understanding of how the data are represented in a data file
- To know when a response is an error and how it should be edited
- To implement Computers for Data Processing
- To understand Error Checking

9A.1 Introduction

Once the data from the survey is collected which is raw in nature, the next step to be conducted is that the data must be edited. “The data editing process consists of reviewing the data and making adjustments to the data collected.” The Data editing helps the Researcher to have a consistent, clear and integrated data. This data helps us to generate accurate statistics for which the research is conducted.

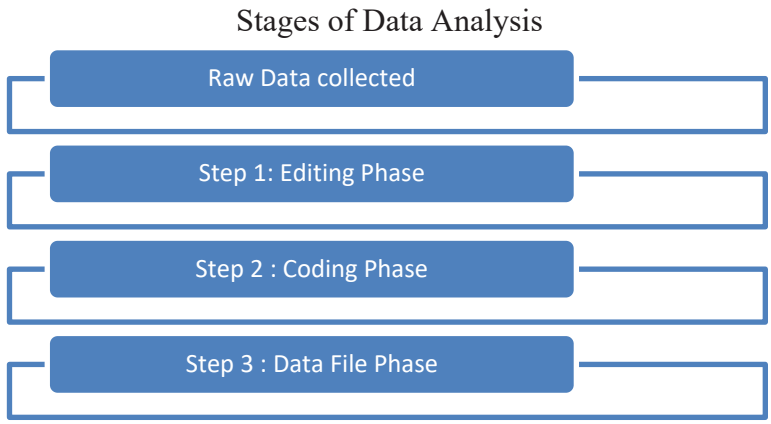
The reasons to carry Data Editing are as following:

- To find the errors in the data
- To validate the data.
- To provide accurate data.
- To find if there is any inconsistency in the data and if found then it is removed.

9A.2 Stages of Data Analysis

The data analysis process used by researchers is to reduce the raw data into meaningful, integrated and consistent chunks of data which is effectively used for application area of research.

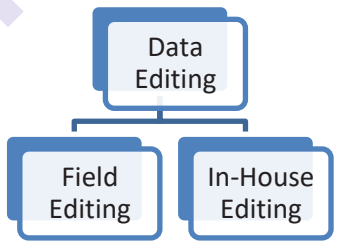
The data whether it is quantitative or qualitative will not be of any use, unless and until it is not analyzed or interpreted by using various scientific methods. The stages of the Data Analysis process focuses on finding the errors in the data. If the error remains in the data then the results generated will be more risky and generating the conclusions of the research will be difficult.



9A.2.1 Stage 1: Data Editing

The Data Editing is the process in which the checking and making adjustments to the data like omitted data, making the data consistent; modifications in the errors are done. Once the editing process is done, the data is in integrated and consistent form which can be electronically used for analysis. The data which is collected lacks in uniformity. For example: The data which is collected from questionnaires does not have answers ticked at the right places or sometimes we also see that the answers are left blank. There are times at which the data is collected in monthly form but later needs to be converted to an annual form. The Researcher needs to make the decisions to transform the data according to the objectivity of the Research.

The Data Editing is categorized into the following forms :



9A.2.1.1 Field Editing

The field editing is done by the field supervisor and the field editing is done the same day when the interview is conducted to collect the data. The main objective is :

- To find the technical omissions in the form.
- All the responses which are inconsistent or in conceptual in nature are clarified.
- Handwriting legibility is checked.

There are situations when there are gaps present from the conducting of interviews then in such case it is important that instead of making a guess work, a call back should be made and find out what response is by the respondent. The main purpose of field editing is to control the quality of the existing data.

Example: Blank page on an interview form.

9A.2.1.2 In-House Editing

In the process of in-house editing, the results are investigated from the results of data which is collected and various coding functions and editing process is carried out.

Example: If age is not indicated, then the respondent will be called to ensure the information.

9A.2.2 STAGE 2: CODING PHASE

Coding is defined as the process in which the assigning of numbers or symbols is done to the answers so that the responses can be grouped into a limited number of classes or categories. The coding process helps the researcher to reduce the thousands of answers to a limited number of categories which contains only the relevant and critical information for that particular question which is asked to collect the data. When the questionnaire is being prepared, numerical coding depending upon the nature of the data to be collected is used. This process is also called as Pre-coding. The Pre-coding can be applied only to those questions where we know what all will be the categories of the answers for e.g. sex, religion,Status etc. The questions which are answered are called as Post-coding. When the qualitative research is carried out the data is collected from interviews, questionnaires or observations made. The main objective of the coding is to give meaning to the data which the respondent has given. The data coder extracts the codes which are preliminary in nature from the data which is observed and then the preliminary data is filtered and refining is done so that accurate, précised and concise codes are generated. The objective is not to eliminate the excess amount of data but also summarize it in such a way that it becomes meaningful. The data coder sees that during the coding process the important points are not lost.

9A.2.3 STAGE 3: DATA FILE PHASE

Once the coding phase is done, the next step is to enter the coded information into a file which can be stored on a disc, tape or any other storage media. The data is stored in the form of a matrix which is more like a spreadsheet. It is represented in the form of rows and columns. Each row represents the score of a variable given

by the respondents and the row represents a variable for which a value is given by the respondent's. A very common example to store a data file used is Spreadsheet like Excel. Now more advanced programs like SAS, SPSS and many more which works well with the Excel Spreadsheet. The most important thing which needs to be considered is the construction of data files.

9A.3 Code Construction

Code construction should be done keeping in mind two rules which are as following:

1) The coding category should be there for all the possible responses. The coder has to see that the responses should be made available for the entire categorical variable such as sex and also for the categories where the response falls into a class which is not found. The missing data should also be represented with acode. A blank response now these days is considered as a missing data.
2) The categories of the coding are independent and mutually exclusive. It is to be ensured that the response can be placed in only one category among the specified.

9A.4 Precoding Fixed Alternative Questions

Whenever a survey is conducted, in Precoded Fixed Alternative Questions there are several responses are given for a question and the participant is asked to pick up the correct or the response which is best suited to the question.

For example:

1) Have you conducted a research earlier?
    - Yes
    - No
2) Which of the following most closely corresponds to your salary per month?
    - 10,000 or lesser than it
    - 11000 to 19000
    - 20000 to 39000
    - 40,000 to 49000
    - 50,000 or more than

9A.5 Code Book

The Codebooks are used by the researchers because of the two main reasons:

1) Codebooks are used as a guide for coding response
2) Codebooks are used as a documentation which defines the layout and the code definitions which are used in a data file.

Codebooks are used to document the values associated with the answer options for a given survey question by the respondent. Every answer category is given a unique numeric value, and these unique numeric values are later used for the conclusions of the research.

9A.6 Editing and Coding Combined

The person who sometimes who codes the questionnaire also does the editing functions. For example: Suppose the respondent is asked for description of job and the respondent instead of indicating "teaching" as their occupation they write teaching in defence,or teaching in Social Science. So in such situations the coder is provided with the instructions that they must do the editing function.

9A.7 Computerized Survey Data Processing

The results which are collected from the Survey plays a very important role. The survey data which is collected requires time to enter into the system and also for the processing process. The research where the sample size id very large ,computers can be used for the processing of the data. The Computerized Survey data processing consists of the following phases:

1) Survey Designing
2) Data entry and data capture
3) Data quality assurance and analysis
4) Reporting and Data Tabulation

The data entry process consists of transferring the entire research data project to computers. The optical scanning systems are also used o read the data directly into

the memory of the computer from the mark sensed questionnaires. Computer assisted telephone interviewing or a self administered internet questionnaire is used where the responses from the respondent are automatically stored and presented in the reports in the tabular form. Use of Computer's have become a growing phenomenon in the Business Research field.

9A.8 Error Checking

The final stage in the coding process is error checking and verification, or *data cleaning,* to ensure that all codes are legitimate. If any mistake is found in the data then the adjustments are made and data is represented in the correct form.

Summary

In this chapter we understood the critical key steps of the data entry process and coding. The detailed attention is required for the data editing process and coding. The complete data analysis process with its detailed phases underlines how important it is in the research process. The different methods in which the data can be represented in the data file is discussed. The importance of error checking and validation was discussed in the coding phase. Evaluating the response as an error and how it should be edited is explained.

Questions

1. Explain the objective of Editing process?
2. Justify when the raw data from the respondent be alters by a data editor.
3. Write a short note on Code Book.
4. Explain how Computers plays a role in Survey Data Processing.
5. Discuss the Data Analysis process in detail.

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B. BASIC DATA ANALYSIS : DESCRIPTIVE STATISTICS

Unit Structure

9B.0 Objectives

- To understand what Descriptive analysis is and the reason why are they use.
- To study the need and objectives of Tabulation
- To explore the various methods used for Displaying the data
- To study the various Statistical tools used for analysis
- To understand how the data is interpreted

9B.1 Introduction

Descriptive analysis is a statistical analysis which is used to organize and summarize the characteristics of a data set. Descriptive statistics is used for the following objectives:

1) to provide basic information about variables in a dataset and

2) to highlight potential relationships between variables.

It summarizes the response which is received from large number of respondents in a simple form of statistics.

9B.2 The Nature of Descriptive Analysis

Descriptive Analysis is the process in which the elementary transformation of data is done. This process describes the basic characteristics such as variability, distribution and central tendency.

9B.3 Tabulation

Tabulation is defined as the systematic & logical presentation of numeric data. The data is represented in the form of rows and columns so that comparison and statistical analysis can be performed. The comparison of data is performed by bringing information which is related close to each other and then statistical analysis and interpretation is performed.

It is also defined as one of the methods of placing organized data into a tabular form is called as tabulation.

When we are counting the different ways in which the respondents have answered the question and we arrange them in a simple tabular form it is called as a Frequency Table. The tabulation also tells the researcher how frequently each response occurs.

9B.3.1 Objectives Of Tabulation:

(1) To Simplify the Complex Data

(2) To Bring Out Essential Features of the Data

(3) To Facilitate Comparison

(4) To Facilitate Statistical Analysis

(5) Saving of Space

Example: A simple tabulation of Grades obtained by Students obtained in Class X having a strength of 100.

Grades obtained by Students of Class X	No. of Students
A+(above 80)	60
A (70 to 80)	25
B (60 to 70)	5
C (50 to 60)	3
D (40 to 50)	5
Below 40	2

9B.4 Cross – Tabulation

During the analysis of survey, another method of quantitative research method which is used is called as Cross tabulation. This methodology is used to analyze the relationship between two or more variables. It also helps to analyze and compare the results of one or more variables with the results of another.

Some of the survey results are presented in aggregate only – meaning, the data tables are based on the entire group of survey respondents. Cross tabulations are simply data tables that present the results of the entire group of respondents as well as results from sub-groups of survey respondents. Cross tabulations enables us to examine relationships within the data that might not be readily apparent when analyzing total survey responses.

9B.4.1 Contingency Tables

This is one of the tool which is used by the statisticians when the data has more than one variable. These are also called as Cross tabulation tables or cross tab. These tables are displayed in the form of grid or matrix. The numbers displayed in the table represent the frequency of each data point. The contingency table

represents the better understanding of the data using probability and relative frequencies.

Example:

Here we can see that we have data of 100 people who have pets were polled to see if there was a correlation between gender and whether they had a dog or a cat. This is a contingency table outlining the data.

	Dog	Cat
Female	32	20
Male	10	38
Total	42	58

The number of males, females, dog owners and cat owners are called marginal totals. The total number of people involved in the study is called the **grand total**.

By placing the data in a table, some conclusions can be drawn. The user can see that there seems to be a correlation between gender and pet ownership. If there is a correlation between the sets of data (in this example, the strong correlation between gender and pet ownership) the data is said to be **contingent**, or dependent. If there is not a relationship between the data, then the data is not contingent, or independent.

The contingency tables can have any number of rows and columns depending on the amount of data.

9B.4.2 Percentage Cross-Tabulations

When the data which is available from the survey and it is represented in the percentage cross tabulation form, it becomes easy for the researcher to understand the relationship by making the comparisons in an simpler way. The total number is used as a statistical base for calculating the percentage in the cell. The conventional rule determines the direction of percentages. The marginal total of the independent variable should be used as a base for calculating the percentages.

Example:

	Dog	Cat	Total
Female	32	20	52
Male	10	38	48
Total	42	58	100

9B.4.3 Elaboration and Refinement

Sometimes the researcher after examining the relationship between two variables wants to investigate the relationship under a variety of more conditions. A third variable is introduced into the analysis so that the research can be made more refined and also have a deeper understanding of the conditions under which the relationship between the first two variables is strongest and weakest.

"Elaboration analysis involves the basic cross tabulation within various subgroups of the sample". The researcher breaks down the analysis for each level of another variable. For example: If the researcher has cross-tabulated travelling trips preference by gender and wishes to investigate another variable (say, marital status), a more elaborate analysis may be conducted

	Single		Married	
	Men	Women	Men	Women
Do you wish to travel trips?				
Yes	54%	80%	87%	80%
No	46%	20%	13%	20%

The data analyzed from the above table shows that the women whether married or single have the same preference for travelling trips. Whereas the married men like more to travel for trips as compared to men who are single. The analysis says that the relationship between the travelling and the gender behavior for women has to be retained. Married men more frequently travelling trips at Target than do single men.

The combination of the two variables, gender and marital status, is associated with differences in the dependent variable. Interactions between variables examine moderating variables. A moderator variable is a third variable that changes the nature of a relationship between the original independent and dependent variables. Marital status is a moderator variable in this case. The interaction effect suggests that marriage changes the relationship between gender and travelling trips preference.

9B.4.4 Quadrant Analysis

In this technique the responses which are made to two rating scale questions are plotted in the four quadrants of a two-dimensional table. A common quadrant analysis in business research portrays or plots relationships between average responses about a product attribute's importance and average ratings of a

company's performance on that product feature. The term importance-performance analysis is sometimes used because consumer's rate perceived importance of several attributes and rate how well the company's brand performs on that attribute. The business would like to end up in the quadrant indicating high performance on an important attribute.

9B.5 Data Transformation

9B.5.1 Simple Transformations

Whenever we analyze the information, it requires analyzing it in such a way that the structured and accessible data is available for the best results. Data transformation enables organizations to alter the structure and format of raw data as needed.

"Data transformation is the process of changing the format, structure, or values of data."

9B.5.2 Benefits of Data Transformations:

Data is transformed to make it better-organized.

Properly formatted and validated data improves data quality and protects applications from potential landmines such as null values, unexpected duplicates, incorrect indexing, and incompatible formats.

Data transformation facilitates compatibility between applications, systems, and types of data.

9B.5.3 Problems with Data Transformations:

Data transformation can be expensive. The cost is dependent on the specific infrastructure, software, and tools used to process data. Expenses may include those related to licensing, computing resources, and hiring necessary personnel.

Data transformation processes can be resource-intensive. Performing transformations in an on-premises data warehouse after loading, or transforming data before feeding it into applications, can create a computational burden that slows down other operations. If you use a cloud-based data warehouse, you can do the transformations after loading because the platform can scale up to meet demand.

Lack of expertise and carelessness can introduce problems during transformation. Data analysts without appropriate subject matter expertise are less likely to notice typos or incorrect data because they are less familiar with the range of accurate and

permissible values. For example, someone working on medical data who is unfamiliar with relevant terms might fail to flag disease names that should be mapped to a singular value or notice misspellings.

9B.5.4 Index Numbers

It is one of the methods which measure the changes in a variable or the group of variables with respect to certain characteristics. To name a few are consumer price index and wholesale price index are the secondary data sources which are used by the business researchers. Price indexes, like other index numbers, represent simple data transformations that allow researchers to track a variable's value over time and compare a variable(s) with other variables.

9B.6 Calculating Rank Order

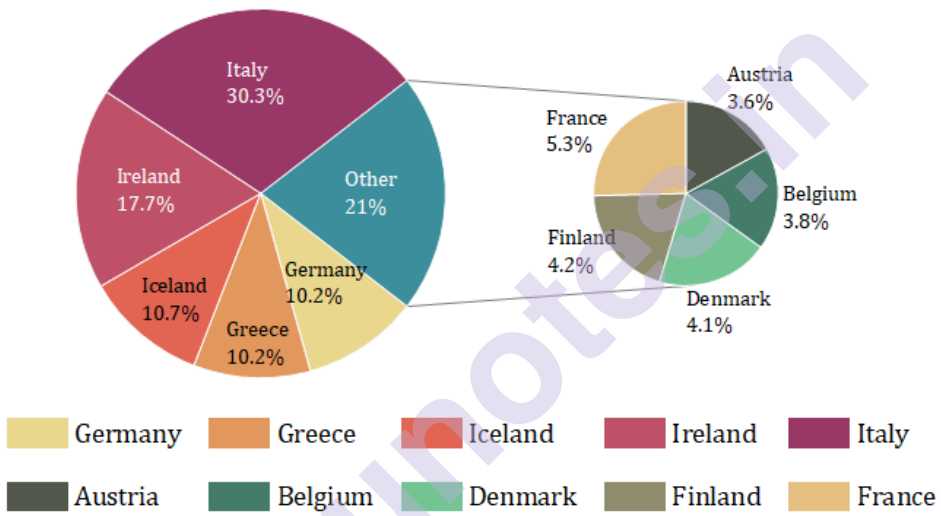
The respondents of the survey are asked to rank their preference of some items.For example consumers are sometimes asked to rank there favourite brands or sometimes employees provide Ranking data can be summarized by performing a data transformation. The transformation involves multiplying the frequency by the ranking score for each choice to result in a new scale. For example, suppose a Manager has 10 team leaders rank their preferences for locations in which to hold the company's annual conference.

Team Leaders	Chennai	Mumbai	Delhi	Kolkatta
1	1	2	4	3
2	1	3	4	2
3	2	1	3	4
4	2	4	3	1
5	2	1	3	4
6	3	4	3	2
7	2	3	3	4
8	1	4	1	3
9	4	3	1	1
10	2	1	2	1

9B.7 Tabular and Graphic Method of Displaying Data

Another way of analyzing numerical data is Graphical representation. A graph is a chart through which statistical data are represented in the form of lines or curves drawn across the coordinated points plotted on its surface. Graphs help us to

understand the cause and effect relationship between two variables. Graphs help to measure the extent of change in one variable when another variable changes by a certain amount. Researcher uses many convenient tools to quickly produce charts, graphs, or tables. Even common programs such as Excel and Word include chart functions that can construct the chart within the text document. Bar charts (histograms), pie charts, curve/line diagrams, and scatter plots are among the most widely used tools. Some choices match well with certain types of data and analyses. Bar charts and pie charts are very effective in communicating frequency tabulations and simple cross-tabulations. A pie chart is a circular statistical graphic, which is divided into slices to illustrate numerical proportion. In a pie chart, the arc length of each slice is proportional to the quantity it represents.



9B.8 Computer Programs for Analysis

9B.8.1 Statistical Analysis

Statistical software or **statistical** analysis **software** is one of the tools that helps in the **statistics**-based collection and helps in analysis of data. The basic statistical features are now menu driven, reducing the need to memorize function labels. Spreadsheet packages like Excel continue to evolve and become more viable for performing many basic statistical analyses. Despite the advances in spreadsheet applications, commercialized statistical software packages remain extremely popular among researchers. They continue to become easier to use and more compatible with other data interface tools including spreadsheets and word processors. Like any specialized tool, statistical packages are more tailored to the types of analyses performed by statistical analysts, including business researchers.

Thus, any serious business or social science researcher should still become familiar with at least one general computer software package.

9B.8.2 Benefits

- Increases efficiency from streamlined and automated business data analysis workflows
- Returns more accurate predictions based on machine learning, statistical algorithms and hypothesis testing
- Easy customization allows you to ensure the software correctly processes the data and results you want
- Grants access to larger databases which reduces sampling error and enables more precise conclusions
- Empowers you to make data-driven decisions with confidence

9B.8.3 Commonly used tools which are used for statistical analysis are as following :

9B.8.3.1 SPSS Statistics

SPSS Statistics is statistical software from IBM that can quickly crunch large data sets to provide insights for decision-making and research. According to IBM's website, 81% of reviewers rank SPSS as easy to use, making it a good choice for novice users as well as expert statisticians. It also can estimate and uncover missing values in data sets, allowing for more accurate reports. Scalable and agile, SPSS Statistics is built to work with large volumes of data with as many user licenses as needed, performing anything from descriptive analytics to advanced statistics simulations.

9B.8.3.2 SAS/STAT

SAS/STAT is a cloud-based platform that allows users to harness tools and procedures for statistical analysis and data visualization. Designed to address both specialized and enterprise-wide analytics needs, it is used by business analysts, statisticians, data scientists, researchers and engineers primarily for statistical modeling, observing trends and patterns in data and aiding in decision-making. Its procedures are multithreaded, performing multiple operations at once, increasing the efficiency and stability of the program. Users can create hundreds of built-in, customizable statistical charts and graphs.

SAS has an established reputation in the industry for reliable results and ensures that code produced with SAS/STAT is documented and verified to meet corporate

and governmental compliance requirements. An open-source analytics platform, SAS allows users the freedom to experiment and program in either the interface or the coding language of their choice.

9B.8.4 Computer Graphics and Computer Mapping

Graphic aids which are prepared by the computers have replaced graphic presentation aids which are drawn by artists. Computer graphics are extremely useful for descriptive analysis. Decision support systems can generate two- or three-dimensional computer maps to portray data about sales, demographics, lifestyles, retail stores, and other features. Computer mapping uses the speed and versatility of computer graphics to display spatial data.

9B.9 Interpretation

Interpretation is the process of reviewing data through some predefined processes which will help assign some meaning to the data and arrive at a relevant conclusion. It involves taking the result of data analysis, making inferences on the relations studied, and using them to conclude. Interpretation is concerned with relationships within the collected data. “Interpretation is drawing inferences from the analysis of results. Each statistical analysis produces the results which are interpreted so that we can come to a particular decision. The logical and statistical analysis is done to make conclusion of the research. When we talk about the perspective of the management, the qualitative meaning of the data and there implications are an important aspect of process of Interpretation.

Summary

In this chapter we studied about Descriptive analysis which is defined as is a statistical analysis which is used to organize and summarize the characteristics of a data set. Statistical Tabulation is a technique with the help of which the counting of number of observations in each response was done is explained. The complete understanding of cross-tabulations is explained to display the relationship. Data transformations were used to assist in data analysis. The different computer software products are explained which helps in descriptive analysis. The researcher role is well explained in the interpretation of the data.

Questions

1. Describe the three basic data transformations.
2. Write short note on SPSS.
3. Explain the role of researcher in Interpretation of data.
4. Justify how computer software products help in descriptive statistical analysis
5. What is Cross Tabulation? How does it reveals relationships?

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C. UNIVARIATE STATISTICAL ANALYSIS

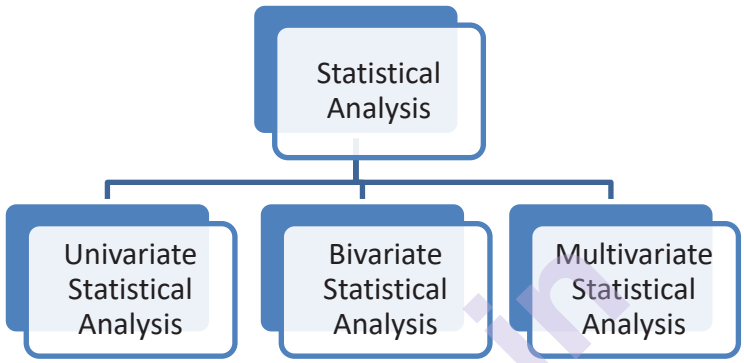
Unit Structure

9C.0 Objective

- To learn the hypothesis-testing procedure
- To understand Type I and Type II Errors
- To choose the Appropriate Statistical Technique
- To learn the Chi-square test for Goodness of Fit
- To analyze Hypothesis test of a Proportion

9C.1 Introduction

Univariate analysis is one of the simplest form of analyzing data. In this analysis the data which is analyzed contains only one variable. Since it's a single variable it doesn't deal with causes or relationships. The main objective of **univariate analysis** is to describe the data and find patterns that exist within it. Statistical analysis can be divided into the following groups:



9C.2 Hypothesis Testing

Hypothesis testing is a formal procedure for investigating the data of the research. Hypotheses are formal statements of explanations stated in a testable form. Most of the times the hypotheses should be stated in concrete manner so that the method of empirical testing can be done

The different types of hypotheses test which are commonly conducted in the business research are as following:

1. Relational hypotheses

2. Hypotheses about differences between groups

3. Hypotheses about differences from some standard

The various factors which are considered while formulating hypothesis are as :

- Hypothesis should be clear and precise.
- Hypothesis should be capable of being tested.
- Hypothesis should state relationship between variables.
- Hypothesis should be limited in scope and must be specific.
- Hypothesis should be stated as far as possible in most simple terms so that the same is easily understandable by all concerned.

- Hypothesis should be amenable to testing within a reasonable time.
- Hypothesis must explain empirical reference.

9C.2.1 The Hypothesis –Testing Procedure

The Procedure which is carried out to conduct hypothesis testing consists of all those steps that we undertake for making a choice between the two actions i.e., rejection and acceptance of a null hypothesis.

9C.2.2 The various steps involved in hypothesis testing are stated below:

1. Making a formal statement:

   The step consists in making a formal statement of the null hypothesis (H0) and also of the alternative hypothesis (Ha or H1). This means that hypotheses should be clearly stated, considering the nature of the research problem.

2. Selecting a significance level:

   The hypotheses are tested on a pre-determined level of significance and as such the same should be specified. Generally, in practice, either 5% level or 1% level is adopted for the purpose.

3. Deciding the distribution to use:

   After deciding the level of significance, the next step in hypothesis testing is to determine the appropriate sampling distribution. The choice generally remains between normal distribution and the t-distribution.

4. Selecting a random sample and computing an appropriate value:

   Another step is to select a random sample(s) and compute an appropriate value from the sample data concerning the test statistic utilizing the relevant distribution. In other words, draw a sample to furnish empirical data.

5. Calculation of the probability:

   One has then to calculate the probability that the sample result would diverge as widely as it has from expectations, if the null hypothesis were in fact true.

6. Comparing the probability and Decision making:

   Yet another step consists in comparing the probability thus calculated with the specified value for α, the significance level. If the calculated probability is equal to or smaller than the α value in case of one-tailed test (and α /2 in case of two-tailed test), then reject the null hypothesis (i.e., accept the alternative hypothesis), but if the calculated probability is greater, then accept the null hypothesis.

9C.2.3 Significance level AND p-Values

A significance level is a critical probability associated with a statistical hypothesis test that indicates how likely it is that an inference supporting a difference between an observed value and some statistical expectation is true. The term p-value stands for probability-value and is essentially another name for an observed or computed significance level.

The P value is defined as the probability under the assumption of no effect or no difference (null hypothesis), of obtaining a result equal to or more extreme than what was actually observed. The P stands for probability and measures how likely it is that any observed difference between groups is due to chance. Being a probability, P can take any value between 0 and $\frac{1}{}$. Values close to 0 indicate that the observed difference is unlikely to be due to chance, whereas a P value close to 1 suggests no difference between the groups other than due to chance. efore the advent of computers and statistical software, researchers depended on tabulated values of P to make decisions. This practice is now obsolete and the use of exact P value is much preferred. Statistical software can give the exact P value and allows appreciation of the range of values that P can take up between 0 and 1.

9C.2.4 Type I and Type II Errors in Hypothesis Testing

There are basically two types of errors in hypothesis testing. Creatively, they call these errors Type I and Type II errors. Both types of error relate to incorrect conclusions about the null hypothesis.

9C.2.4.1 Type I Errors

These are the errors which results in when the null hypothesis is rejected when it is true. and has a probability of alpha. A Type I error occurs when the researcher concludes that a relationship or difference exists whereas in reality it does not exist.

9C.2.4.2 Type II Errors

When we failed to reject the null hypothesis and the alternative hypothesis is true ,in such situation these types of errors occur. It has a probability of beta. The researcher in Type II Error makes a conclusion that no relationship or difference exists whereas actually one does exist.

9C.3 Choosing the Appropriate Statistical Technique

There are different statistical techniques which help the researcher in interpretation of the data. Whenever we are considering which statistical technique to select following are the factors which needs to be considered:

1. What is the type or nature of question to be answered
2. What are the number of variables involved
3. How much is the levelof scale measurement

9C.3.1 Type of question to be answered

The nature or type of question the researcher is attempting to answer has to be considered while making a choice of selecting a

statistical technique. For example, a researcher may be concerned simply with the central tendency of a variable or with the distribution of a variable. The Comparison of different business divisions' sales results with some target level will require a one-sample *t*-test. Comparison of two salespeople's average monthly sales will require a *t*-test of two means, but a comparison of quarterly sales distributions will require a chi-square test. The researcher should consider the method of statistical analysis before choosing the research design and before determining the type of data to collect.

9C.3.2 Number of Variables

A primary consideration in the choice of statistical technique. Is what is the number of variables which will be simultaneously investigated For example researcher who is interested only in the average number of times a prospective home buyer visits financial institutions to shop for interest rates can concentrateon investigating only one variable at a time. In case the researcher is trying to measure multiple complex organizational variables cannot do the same. The statistical procedure such as univariate, bivariate, and multivariate are differentiated only on the basis of the number of variables involved in an Analysis process.

9C.3.3 The level of Scale of Measurement

This is one of the factor which helps us to select the best statistical techniques and the most appropriate empirical operations. Testing a hypothesis about a mean, is best used for interval scaled or ratio scaled data. For example a researcher is working with a nominal scale

which identifies users versus nonusers of bank credit cards. Because of the type of scale, the researcher may use only the mode as a measure of central tendency. In other situations, where data are measured on an ordinal scale, the median may be used as the average or a percentile may be used as a measure of dispersion. The Nominal and ordinal data are analyzed using frequencies or cross-tabulation.

9C.3.4 Parametric versus Nonparametric Hypothesis Tests

The statistical procedures can be divided into two categories which are as following:

- Parametric statistics
- Nonparametric statistics

One of the basic differences between them is the underlying assumptions about the data which has to be analyzed. Parametric statistics involve numbers with known, continuous distributions. When the data is in interval or ratio scaled and the sample size is large, in such cases the parametric statistical procedures are appropriate. Nonparametric statistics works best in the scenarios when the numbers do not conform to a known distribution. Parametric statistics are based on the assumption that the data in the study are drawn from a population with a normal distribution or normal sampling distribution. For example, if an investigator has two interval-scaled measures, such as gross national product (GNP) and industry sales volume, parametric tests are appropriate. The statistical tests might include product-moment correlation analysis, analysis of variance, regression, or a t-test for a hypothesis about a mean. Nonparametric methods are used when the researcher does not know how the data are distributed. Making the assumption that the population distribution or sampling distribution is normal generally is inappropriate when data are either ordinal or nominal. Thus, nonparametric statistics are known as distribution free.

9C.4 The t-Distribution

The univariate t-test is used for testing hypotheses when we have observed mean against some specified value. The t-distribution is a symmetrical, bell-shaped distribution having mean of 0 and a standard deviation of 1.0. When sample size (n) is larger than 30, the t-distribution and Z-distribution are identical. When the t-test when used involves small sample sizes with unknown standard deviations, then the apply the t-test for comparisons involving the mean of an interval or ratio measure. The precise height and shape of the t-distribution vary with sample size. The shape of the t-distribution is related with the degrees of freedom (df). The degrees of freedom is determined by the number of distinct calculations. In the case of a univariate t-test, the degrees of freedom are equal to the sample size (n) minus one.

9C.5 The Chi-Square Test for Goodness of Fit

Chi-Square goodness of fit test is a non-parametric test which is used to find out how the observed value of a given phenomena is significantly different from the expected value. In Chi-Square goodness of fit test, the term goodness of fit is used to compare the observed sample distribution with the expected probability distribution. Chi-Square goodness of fit test determines how well theoretical distribution (such as normal, binomial, or Poisson) fits the empirical distribution. In Chi-Square goodness of fit test, sample data is divided into intervals. Then the numbers of points that fall into the interval are compared, with the expected numbers of points in each interval.

Procedure for Chi-Square Goodness of Fit Test:
Set up the hypothesis for Chi-Square goodness of fit test:

A. **Null hypothesis:** In Chi-Square goodness of fit test, the null hypothesis assumes that there is no significant difference between the observed and the expected value.

B. **Alternative hypothesis:** In Chi-Square goodness of fit test, the alternative hypothesis assumes that there is a significant difference between the observed and the expected value.

Compute the value of Chi-Square goodness of fit test using the following formula:

$$\chi 2=\sum(Oi-Ei)2$$
$$Ei$$

Where, $\chi 2$ = Chi-Square goodness of fit test

Oi = observed value

Ei = expected value

9C.6 Hypothesis Test of a Proportion

The univariate statistical hypotheses about population proportions. The population proportion (π) can be estimated on the basis of an observed sample proportion (p). Conducting a **hypothesis test of a proportion** is conceptually similar to hypothesis testing when the mean is the characteristic of interest. Mathematically the formulation of the standard error of the proportion differs somewhat, though.

Consider the following example. A state legislature is considering a proposed right-to-work law. One legislator has hypothesized that more than 50 percent of the state's labor force is unionized. In other words, the hypothesis to be tested is that the proportion of union workers in the state is greater than 0.5.The researcher formulates the hypothesis that the population proportion (π) exceeds 50 percent(0.5):

$H1: \_ \pi > 0.5$

9C.7 Additional Applications of Hypothesis Testing

The concept of statistical inference is restricted to examining the difference between an observed sample mean and a population or pre-specified mean, a $\chi 2$ test examines the difference between an observed frequency and the expected frequency for a given distribution and Z-tests to test hypotheses about sample proportions when sample sizes are large. Other hypothesis tests for population parameters estimated from sample statistics exist but are not mentioned here. Many of these tests are no different conceptually in their methods of testing.

Summary

Univariate analyses are used extensively in quality of life research. Univariate analysis is defined as analysis carried out on only one ("uni") variable ("variate") to summarize or describe the variable .Descriptive statistics describe and summarize data. Univariate descriptive statistics describe individual variables. The implementation of the hypothesis testing procedure was done using one variable. The use of p-values were done to test the statistical significance. The differentiation was done between Type I and Type II Errors and these errors are very sensitive to the sample size.

Questions

1) Explain the objective of a statistical hypothesis.

2) Define Significance level? How does a researcher selects a significance level?

3) Differentiate between Type I and Type II Errors.

4) Discuss the factors which are considered while making a choice of the appropriate statistical technique?

5) How is a p-value used to test a hypothesis?

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D. BIVARIATE STATISTICAL ANALYSIS : DIFFERENCE BETWEEN TWO VARIABLES

Unit Structure

9D.0 Objective

- To learn the Bivariate Statistical Analysis
- To analyze the comparison of two proportions using the Z-Test
- To understand the concept of ANOVA
- To learn the use of Cross-Tabulation Tables

9D.1 Introduction

Bivariate analysis means the analysis of bivariate data. It is one of the simplest forms of statistical analysis, used to find out if there is a relationship between two sets of values. It usually involves the variables X and Y. The test of difference is an investigation of a hypothesis stating that two or more groups differentiate on the basis of variables with respect to measurement.

9D.2 What is the appropriate Test of Difference?

.It is commonly seen that the researchers are interested in testing differences in mean scores between groups or in comparing how two groups' scores are distributed across possible response categories. The Construction of contingency tables for $\chi 2$ analysis gives a procedure for comparing observed frequencies of one group with the frequencies of another group. This is a good starting point from which to discuss testing of differences.

9D.3 Cross Tabulation Tables: The X2 Test for Goodness-of-Fit

Cross-tabulation is one of the most widely used statistical techniques among business researchers. Cross-tabulations are intuitive, easily understood, and lend themselves well to graphical analysis using tools like bar charts. Cross-tabs are appropriate when the variables of interest are less-than interval in nature. A cross-tabulation, or contingency table, is a joint frequency distribution of observations on two or more variables. Researchers generally rely on two-variable cross-tabulations the most since the results can be easily communicated. Cross-tabulations are much like tallying. When two variables exist, each with two categories, four cells result. The $\chi 2$ distribution provides a means for testing the statistical significance of a contingency table. In other words, the bivariate $\chi 2$ test examines the statistical significance of relationships between two less-than interval variables. The $\chi 2$ test for a contingency table involves comparing the observed frequencies (Oi) with the expected frequencies (Ei) in each cell of the table. The goodness- (or closeness-) of-fit of the observed distribution with the expected distribution is captured by this statistic. Remember that the convention is that the row variable is considered the independent variable and the column variable is considered the dependent variable.

9D.4 The T-Test for Comparing Two Means

Cross-tabulations and the $\chi 2$ test are appropriate when both variables are less-than interval level. However, researchers often want to compare one interval or ratio level variable across categories of respondents. The Chapter Vignette describes such a situation. The researchers are interested in comparing the ethical perceptions between genders. When a researcher needs to compare means for a variable grouped into two categories based on some less-than interval variable, a t-test is appropriate. One way to think about this is testing the way a dichotomous (two-level) independent variable is associated with changes in a continuous dependent variable. Several variations of the t-test exist.

9D.4.1 Independent Samples T-Test

The researcher will apply the independent samples t-test, which tests the differences between means taken from two independent samples or groups. So, for example, if we measure the price for some designer jeans at 30 different retail stores, of which 15 are Internet-only stores (pure clicks) and 15 are traditional stores, we can test whether or not the prices are different based on store type with an independent samples t-test. The t-test for difference of means assumes the two samples (one Internet and one traditional store) are drawn from normal distributions and that the variances of the two populations are approximately equal.

9D.4.2 Paired-Samples T-Test

What happens when means need to be compared that are not from independent samples? Such might be the case when the same respondent is measured twice—for instance, when the respondent is asked to rate both how much he or she likes shopping on the Internet and how much he or she likes shopping in traditional stores. Since the liking scores are both provided by the same person, the assumption that they are independent is not realistic. Additionally, if one compares the prices the same retailers charge in their stores with the prices they charge on their Web sites, the samples cannot be considered independent because each pair of observations is from the same sampling unit. A paired-samples t-test is appropriate in this situation. Researchers also can compute the paired samples t-test using statistical software. For example, using SPSS, the click-through sequence would be:

Analyze → Compare Means → Paired-Samples t-test

A dialog box then appears in which the "paired variables" should be entered. When a paired- samples t-test is appropriate, the two numbers being compared are usually scored as separate variables.

9D.5 The Z-Test for Comparing Two Proportions

What type of statistical comparison can be made when the observed statistics are proportions? Suppose a researcher wishes to test the hypothesis that wholesalers in the northern and southern United States differ in the proportion of sales they make to discount retailers. Testing whether the population proportion for group 1 (p1) equals the population proportion for group 2 (p2) conceptually the same as the t-test of two means.

9D.6 Analysis Of Variance (ANOVA)

What is ANOVA?

Considering the scenario that if we want to test and see if employee turnover differs across our five production plants? When the means of more than two groups or populations are to be compared, one-way analysis of variance (ANOVA) is the appropriate statistical tool. ANOVA involving only one grouping variable is often referred to as one-way ANOVA because only one independent variable is involved. Another way to define ANOVA is as the appropriate statistical technique to examine the effect of a less-than interval independent variable on an at-least interval dependent variable. Thus, a categorical independent variable and a continuous dependent variable are involved. An independent samples t-test can be thought of as a special case of ANOVA in which the independent variable has only two levels. When more levels exist, the t-test alone cannot handle the problem. The statistical null hypothesis for ANOVA is stated as follows: $\mu 1 = \mu 2 = \mu 3 = \mu 4 =$ ……$= \mu n$ The symbol k is the number of groups or categories for an independent variable. In other words, all group means are equal. The substantive hypothesis tested in ANOVA is At least one group mean is not equal to another group mean. As the term analysis of variance suggests, the problem requires comparing variances to make inferences about the mean

9D.6.1 Partitioning Variance in ANOVA

9D.6.1.1 Total Variability¬

An implicit question with the use of ANOVA is, "How can the dependent variable best be predicted?" Absent any additional information, the error in predicting an observation is minimized by choosing the central tendency, or mean for an interval

variable. For the coffee example, if no information was available about the work shift of each respondent, the best guess for coffee drinking consumption would be four cups. The Sum of Squares Total (SST) or variability that would result from using the grand mean, meaning the mean over all observations, can be thought of as

SST = Total of (Observed Value – Grand Mean) ^{2}

Although the term error is used, this really represents how much total variation exists among the measures. Using the first observation, the error of observation would be (1 cup - 4 cups) 2 = 9 The same squared error could be computed for each observation and these squared errors totaled to give SST.

9D.6.1.2 Between-Groups Variance

ANOVA tests whether "grouping" observations explains variance in the dependent variable. Given this additional information about which shift a respondent works, the prediction changes. Now, instead of guessing the grand mean, the group mean would be used. So, once we know that someone works the day shift, the prediction would be that he or she consumes 2 cups of coffee per day. Similarly, the second and night-shift predictions would be 4 and 6 cups, respectively. Thus, the between-groups variance or Sum of Squares Between-groups (SSB) can be found by taking the total sum of the weighted difference between group means and the overall mean as shown:

SSB = Total of ngroup (Group Mean - Grand Mean)^2

The weighting factor (ngroup) is the specific group sample size. Let's consider the first observation once again. Since this observation is in the day shift, we predict 2 cups of coffee will be consumed. Looking at the day shift group observations, the new error in prediction would be

(2 cups - 4 cups)2 = (2)2 = 4

The error in prediction has been reduced from 3 using the grand mean to 2 using the group mean. This squared difference would be weighted by the group sample size of 5, to yield a contribution to SSB of 20. Next, the same process could be followed for the other groups yielding two more contributions to SSB. Because the second shift group mean is the same as the grand mean, that group's contribution to SSB is 0. Notice that the night-shift group mean is also 2 different than the grand mean, like the day shift, so this group's contribution to SSB is likewise 20. The total SSB then represents the variation explained by the experimental or independent variable. In this case, total SSB is 40.

9D.6.1.3 Within-Group Error

Finally, error within each group would remain. Whereas the group means explain the variation between the total mean and the group mean, the distance from the group mean and each individual observation remains unexplained. This distance is called within group error or variance or the Sum of Squares Error (SSE). The values for each observation can be found by

SSE = Total of (Observed Mean - Group Mean) 2

Again, looking at the first observation, the SSE component would be

SSE = (1 cup - 2 cups) 2 = 1 cup

This process could be computed for all observations and then totaled. The result would be the total error variance—a name used to refer to SSE since it is variability not accounted for by the group means. These three components are used in determining how well an ANOVA model explains a dependent variable.

9D.6.2 The F-Test

he F-test is the key statistical test for an ANOVA model. The F-test determines whether there is more variability in the scores of one sample than in the scores of another sample. The key question is whether the two sample variances are different from each other or whether they are from the same population. Thus, the test breaks down the variance in a total sample and illustrates why ANOVA is analysis of variance. The F-statistic (or F-ratio) can be obtained by taking the larger sample variance and dividing by the smaller sample variance. It is much like using the tables of the Z- and t-distributions that we have previously examined. These tables portray the F-distribution, which is a probability distribution of the ratios of sample variances. These tables indicate that the distribution of F is actually a family of distributions that change quite drastically with changes in sample sizes. Thus, degrees of freedom must be specified. Inspection of an F-table allows the researcher to determine the probability of finding an F as large as a calculated F.

Summary

Bivariate data is when you are studying two variables. For example, if you are studying **a group of college students** to find out **their average SAT score** *and* **their age**, you have two pieces of the puzzle to find (SAT score and age). Or if you want to find out the weights *and* heights of college students, then you also have bivariate data. Bivariate data could also be two sets of items that are dependent

on each other. It helps you to recognize when the bivariate statistical test is right to use. The calculation and interpretation of an independent sample t-test which compares two mean values. ANNOVA is one of the statistical technique which is used to examine the effect of a less*than interval independent variable with three or more categories on an at least interval independent variable.

Questions

1) Explain the t-Test which is used for comparing two means.
2) Write short note on ANOVA.
3) Discuss how does F-Test is the key statistical test for ANOVA Model.
4) Explain Total Variability.
5) Describe the significance of Paired-Samples t-Test.

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E. MULTIVARIATE STATISTICAL ANALYSIS

Unit Structure

9E.0 Objectives

- To understand what Multivariate Statistical Technique is and its types
- To learn how cluster analysis can identify market segments.
- To analyze and Interpret results from multivariate analysis of variance (MANOVA)
- To study how Cluster Analysis classifies multiple observations into a smaller number of mutually exclusive and exhaustive groups
- To learn the significance of Multidimensional Scaling

9E.1 Introduction

Multivariate statistical analysis refers to multiple advanced techniques for examining relationships among multiple variables at the same time. Multivariate procedures are used in research where there are more than one dependent variable, more than one independent variable or both. Research areas which involve multivariate data analysis including most employee motivation research and research that seeks to identify viable market segments.

9E.1.1 The "Variate" in Multivariate

To list another characteristic of multivariate analysis is the variate. The variate is a mathematical way in which a set of variables can be represented with one equation. A variate is formed as a linear combination of variables, each contributing to the overall meaning of the variate based upon an empirically derived weight. To define it in terms of mathematics the variate is a function of the measured variables involved in an analysis:

Vk = f (X1, X2, . . . , Xm)

Vk is the k th variate.

Every analysis could involve multiple sets of variables, each represented by a variate. X1 to Xm represent the measured variables. Suppose we measured nostalgia with five questions during the survey process. With these five variables, a variate of the following form could be created:

Vk = L1X1 + L2X2 + L3X3 + L4X4 + L5X5

Vk represents the score for nostalgia, X1 to X5 represent the observed scores on the five scale items (survey questions) that are expected to indicate nostalgia, and L1 to L5 are parameter estimates much like regression weights that suggest how highly related each variable is to the overall nostalgia score.

9E.2 Classifying Multivariate Techniques

There are two groups of multivariate techniques :

1) Dependence methods
2) Interdependence methods.

9E.2.1 Dependence Techniques

When hypotheses involve distinction between independent and dependent variables, dependence techniques are needed. For instance, when we hypothesize that nostalgia is related positively to purchase intentions, nostalgia takes on the character of an independent variable and purchase intentions take on the character of a dependent variable.

9E.2.2 Interdependence Techniques

When researchers examine questions that do not distinguish between independent and dependent variables, interdependence techniques are used. No one variable or variable subset is to be predicted from or explained by the others. The most common interdependence methods are factor analysis, cluster analysis, and multidimensional scaling.

9E.3 Analysis of Dependence

Multivariate dependence techniques are variants of the **general linear model (GLM)**. Simply, the GLM is a way of modeling some process based on how different variables cause fluctuations from the average dependent variable. Fluctuations can come in the form of group means that differ from the overall mean as in ANOVA or in the form of a significant slope coefficient as in regression. The basic idea can be thought of as follows:

$$Y`i = \mu + \Delta X + \Delta F + \Delta XF$$

Here, μ represents a constant, which can be thought of as the overall mean of the dependent variable, ΔX and ΔF represent changes due to main effect independent variables (such as experimental variables) and blocking independent variables

(such as covariates or grouping variables),respectively, and ΔXF represents the change due to the combination (interaction effect) of those variables. Realize that Yi in this case could represent multiple dependent variables, just as X and F could represent multiple independent variables.

9E.3.1 Multiple Regression Analysis

Multiple regression analysis is an extension of simple regression analysis allowing a metric dependent variable to be predicted by multiple independent variables. Thus, one dependent variable (sales volume) is explained by one independent variable (number of building permits). The independent variables include price, seasonality, interest rates, advertising intensity, consumer income, and other economic factors in the area. The simple regression equation can be expanded to represent multiple regression analysis:

$$Yi = b0 + b1X1 + b2X2 + b3X3 + \ldots + bnXn + ei$$

Thus, as a form of the GLM, dependent variable predictions ($\hat{Y}$) are made by adjusting the constant (bo), which would be equal to the mean if all slope coefficients are 0, based on the slope coefficients associated with each independent variable ($b1, b2, \ldots, bn$).Less-than interval (nonmetric) independent variables can be used in multiple regression. This can be done by implementing dummy variable coding. A **dummy variable** is a variable that uses a 0 and a 1 to code the different levels of dichotomous variable. Multiple dummy variables can be included in a regression model. For example, dummy coding is appropriate when data from two countries are being compared. Suppose the average labor rate for automobile production is included in a sample taken from respondents in the United States and in South Korea. A response from the United States could be assigned a 0 and responses from South Korea could be assigned a 1 to create a country variable appropriate for use with multiple regression.

9E.3.2 Steps in Interpreting a Multiple Regression Model

Multiple regression models often are used to test some proposed theoretical model. A researcher may aske to develop and test a model explaining business unit performance. Why do some business units outperform others? Multiple regression models can be interpreted using these steps:

1. Examine the model F-test. If the test result is not significant, the model should be dismissed and there is no need to proceed to further steps.

2. Examine the individual statistical tests for each parameter estimate. An independent variable with significant results can be considered a significant

explanatory variable. If an independent variable is not significant, the model should be run again with no significant predictors deleted.

3. Examine the model *R*2. No cutoff values exist that can distinguish an acceptable amount of explained variation across all regression models. The absolute value of *R*2 is more important when the researcher is more interested in prediction than in explanation.

4. Examine collinearity diagnostics. **Multicollinearity** in regression analysis refers to how strongly interrelated the independent variables in a model are. When multicollinearity is too high, the individual parameter estimates become difficult to interpret.

9E.3.3 ANOVA (n-Way) and MANOVA

Regression is a form of the GLM with a single continuous dependent measure and continuous independent measure(s). An ANOVA or MANOVA model also represents a form of the GLM. ANOVA can be extended beyond one-way ANOVA to predict a continuous dependent variable with multiple categorical independent variables. Multivariate analysis of variance (MANOVA), is a multivariate technique that predicts multiple continuous dependent variables with multiple independent variables. The independent variables are categorical, although a continuous control variable can be included in the form of a covariate.

9E.3.3.1 N-Way (Univariate) ANOVA

The interpretation of an n-way ANOVA model follows closely from the regression results. The steps involved are essentially the same with the addition of interpreting differences between means:

1. Examine the overall model F-test result. If significant, proceed.
2. Examine individual F-tests for each individual independent variable.
3. For each significant categorical independent variable, interpret the effect by examining the group means.
4. For each significant continuous variable (covariate), interpret the parameter estimate.
5. For each significant interaction, interpret the means for each combination.

9E.3.3.2 Interpreting Manova

Compared to ANOVA, a MANOVA model produces an additional layer of testing. The first layer of testing involves the multivariate F-test, which is based on a statistic called Wilke's Lambda (Λ). This test examines whether or not an

independent variable explains significant variation among the dependent variables within the model. If this test is significant, then the F-test results from individual univariate regression models nested within the MANOVA model are interpreted. The rest of the interpretation results follow from the one-way ANOVA or multiple regression model results above.

9E.3.4 Discriminant Analysis

During the research process the Researchers often need to produce a classification of sampling units. This process may involve using a set of independent variables to decide if a sampling unit belongs in one group or another. A physician might record a person's blood pressure, weight, and blood cholesterol level and then categorize that person as having a high or low probability of a heart attack. A researcher interested in retailing failures might be able to group firms as to whether they eventually failed or did not fail on the basis of independent variables such as location, financial ratios, or management changes. A bank might want to discriminate between potentially successful and unsuccessful sites for electronic fund transfer system machines. The challenge is to find the discriminating variables to use in a predictive equation that will produce better than chance assignment of the individuals to the correct group. Discriminant analysis is a multivariate technique that predicts a categorical dependent variable (rather than a continuous, interval-scaled variable, as in multiple regression) based on a linear combination of independent variables. In each problem above, the researcher determines which variables explain why an observation falls into one of two or more groups. A linear combination of independent variables that explains group memberships is known as a discriminant function. Discriminant analysis is a statistical tool for determining such linear combinations. The researcher's task is to derive the coefficients of the discriminant function (a straight line). We will consider an example of the two-group discriminant analysis problem where the dependent variable, Y, is measured on a nominal scale. (Although n-way discriminant analysis is possible, it is beyond the scope of this discussion.) Suppose a personnel manager for an electrical wholesaler has been keeping records on successful versus unsuccessful sales employees. The personnel manager believes it is possible to predict whether an applicant will succeed on the basis of age, sales aptitude test scores, and mechanical ability scores. As stated the problem is to find a linear function of the independent variables that shows large differences in group means. The first task is to estimate the coefficients of the applicant's discriminant function. To calculate the individuals' discriminant scores, the following linear function is used:

$$Zi = b1X1i + b2X2i + \cdots + bnXni$$

where

Zi = *i*th applicant's discriminant score

bn = discriminant coefficient for the *n*th variable

Xni = *i*th applicant's value on the *n*th independent variable

Using scores for all the individuals in the sample, a discriminant function is determined based on the criterion that the groups be maximally differentiated on the set of independent variables.

9E.4 Analysis of Interdependence

9E.4.1 Factor Analysis

Factor analysis is a prototypical multivariate, interdependence technique. Factor analysis is a technique of statistically identifying a reduced number of factors from a larger number of measured variables. Factor analysis can be divided into two types:

1. Exploratory factor analysis (EFA)—performed when the researcher is uncertain about how many factors may exist among a set of variables. The discussion here concentrates primarily on EFA.

2. Confirmatory factor analysis (CFA)—performed when the researcher has strong theoretical expectations about the factor structure (number of factors and which variables relate to each factor) before performing the analysis. CFA is a good tool for assessing construct validity because it provides a test of how well the researcher's "theory" about the factor structure fits the actual observations. Many books exist on CFA alone and the reader is advised to refer to any of those sources for more on CFA. Suppose a researcher is asked to examine how feelings of nostalgia in a restaurant influence customer loyalty. Three hundred fifty customers at themed restaurants around the country are interviewed and asked to respond to the following

Likert scales (1 = Strongly Disagree to 7 = Strongly Agree):

X1—I feel a strong connection to the past when I am in this place.

X2—This place evokes memories of the past.

X3—I feel a yearning to relive past experiences when I dine here.

X4—This place looks like a page out of the past.

X5—I am willing to pay more to dine in this restaurant.

X6—I feel very loyal to this establishment.

X7—I would recommend this place to others.

X8—I will go out of my way to dine here.

Factor analysis can summarize the information in the eight variables in a smaller number of variables. How many dimensions, or groups of variables, are likely present in this case? More than one technique exists for estimating the variates that form the factors. However, the general idea is to mathematically produce variates that explain the greatest total variance among the set of variables being analyzed. Thus, EFA provides two important pieces of information:

1. How many factors exist among a set of variables?
2. What variables are related to or "load on" which factors?

9E.4.1.1 How Many Factors

One of the first questions the researcher asks is, "How many factors will exist among a large number of variables?" While a detailed discussion is beyond the scope of this text, the question is usually addressed based on the eigenvalues for a factor solution. Eigen values are a measure of how much variance is explained by each factor. The most common rule—and the default for most statistical programs—is to base the number of factors on the number of eigenvalues greater than 1.0. The basic thought is that a factor with an Eigen value of 1.0 has the same total variance as one variable.

9E.4.1.2 Factor Loadings

Each arrow connecting a factor (represented by an oval) to a variable (represented by a box) is associated with a factor loading. A factor loading indicates how strongly correlated a measured variable is with that factor. Loading estimates are provided by factor analysis programs.

9E.4.1.3 Factor Rotation-

Factor rotation is a mathematical way of simplifying factor results. The most common type of factor rotation is a process called varimax. Rotation "clears things up" by producing more obvious patterns of loadings. Users can observe this by looking at the unrotated and rotated solutions in the factor analysis output.

9E.4.1.4 Data Reduction Technique

Factor analysis is considered a data reduction technique. Data reduction techniques allow a researcher to summarize information from many variables into a reduced

set of variates or composite variables. Data reduction is advantageous for many reasons. Factor analysis accomplishes data reduction by capturing variance from many variables with a single variate. Data reduction is also a way of identifying which variables among a large set might be important in some analysis. Thus, data reduction simplifies decision making.

9E.4.1.5 Creating Composite Scales with Factor Results

When a clear pattern of loadings exists as in this case, the researcher may take a simpler approach. F1 could be created simply by summing the four variables with high loadings and creating a summated scale representing nostalgia. F2 could be created by summing the second four variables (those loading highly on F2) and creating a second summated variable. While not necessary, it is often wise to divide these summated scales by the number of items so the scale of the factor is the same as the original items. For example,

F1 would be ((X1 + X2 + X3 + X4)/4)

The result provides a composite score on the 1–7 scale. The composite score approach would introduce very little error given the pattern of loadings. In other words, very low loadings suggest a variable does not contribute much to the factor. The reliability of each summated scale can be tested by computing a coefficient alpha estimate. Then, the researcher could conduct a bivariate regression analysis that would test how much nostalgia contributed to loyalty.

9E.4.1.6 Communality

While factor loadings show the relationship between a variable and each factor, a researcher may also wish to know how much a single variable has in common with all factors. Communality is a measure of the percentage of a variable's variation that is explained by the factors. A relatively high communality indicates that a variable has much in common with the other variables taken as a group. A low communality means that the variable does not have a strong relationship with the other variables.

9E.4.1.7 Total Variance Explained

Along with the factor loadings, the percentage of total variance of original variables explained by the factors can be useful. Recall that common variance is correlation squared. Thus, if each loading is squared and totaled, that total divided by the number of factors provides an estimate of the variance in a set of variables explained by a factor. This explanation of variance is much the same as R 2 in multiple regression. Again, these values are computed by the statistics program so there is seldom a need to compute them manually. In this case, though, the variance accounted for among the eight variables by the nostalgia factor is 0.36 and the variance among the eight variables explained by the loyalty factor is 0.35. Thus,

the two factors explain 71 percent of the variance in the eight variables: 0.36 + 0.35 = 0.71 In other words, the researcher has 71% of the information in two factors that are in the original eight items, another example of the rule of parsimony.

9E.5 Cluster Analysis

Cluster analysis is a multivariate approach for identifying objects or individuals that are similar to one another in some respect. Cluster analysis classifies individuals or objects into a small number of mutually exclusive and exhaustive groups. Objects or individuals are assigned to groups so that there is great similarity within groups and much less similarity between groups. The cluster should have high internal (within-cluster) homogeneity and high external (between-cluster) heterogeneity. Cluster analysis is an important tool for the business researcher. For example, an organization may want to group its employees based on their insurance or retirement needs, or on job performance dimensions. Similarly, a business may wish to identify market segments by identifying subjects or individuals who have similar needs, lifestyles, or responses to marketing promotions. Clusters, or subgroups, of recreational vehicle owners may be identified on the basis of their similarity with respect to recreational vehicle usage and the benefits they want from recreational vehicles.

9E.6 Multidimensional Scaling

Multidimensional scaling provides a means for placing objects in multidimensional space on the basis of respondents' judgments of the similarity of objects. The perceptual difference among objects is reflected in the relative distance among objects in the multidimensional space. In the most common form of multidimensional scaling, subjects are asked to evaluate an object's similarity to other objects.

Summary

Multivariate statistical methods analyze multiple variables or even multiple sets of Variables simultaneously. They are particularly useful for identifying latent constructs using multiple individual measures. Multiple regression analysis predicts a continuous dependent variable with multiple independent variables. MANOVA is an extension of ANOVA involving multiple related dependent variables. Discriminant analysis uses multiple independent variables to classify observations into one of a set of mutually exclusive categories. Cluster analysis classifies multiple observations into a smaller number of mutually exclusive and exhaustive groups.

Questions

1) Define multivariate statistical analysis.

2) What is the variate in multivariate? What is an example of a variate in multiple regressions and in factor analysis?

3) What is the distinction between dependence techniques and interdependence techniques?

4) What is GLM? How can multiple regression and n-way ANOVA be described as GLM approaches?

5) What are the steps in interpreting a multiple regression analysis result?

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