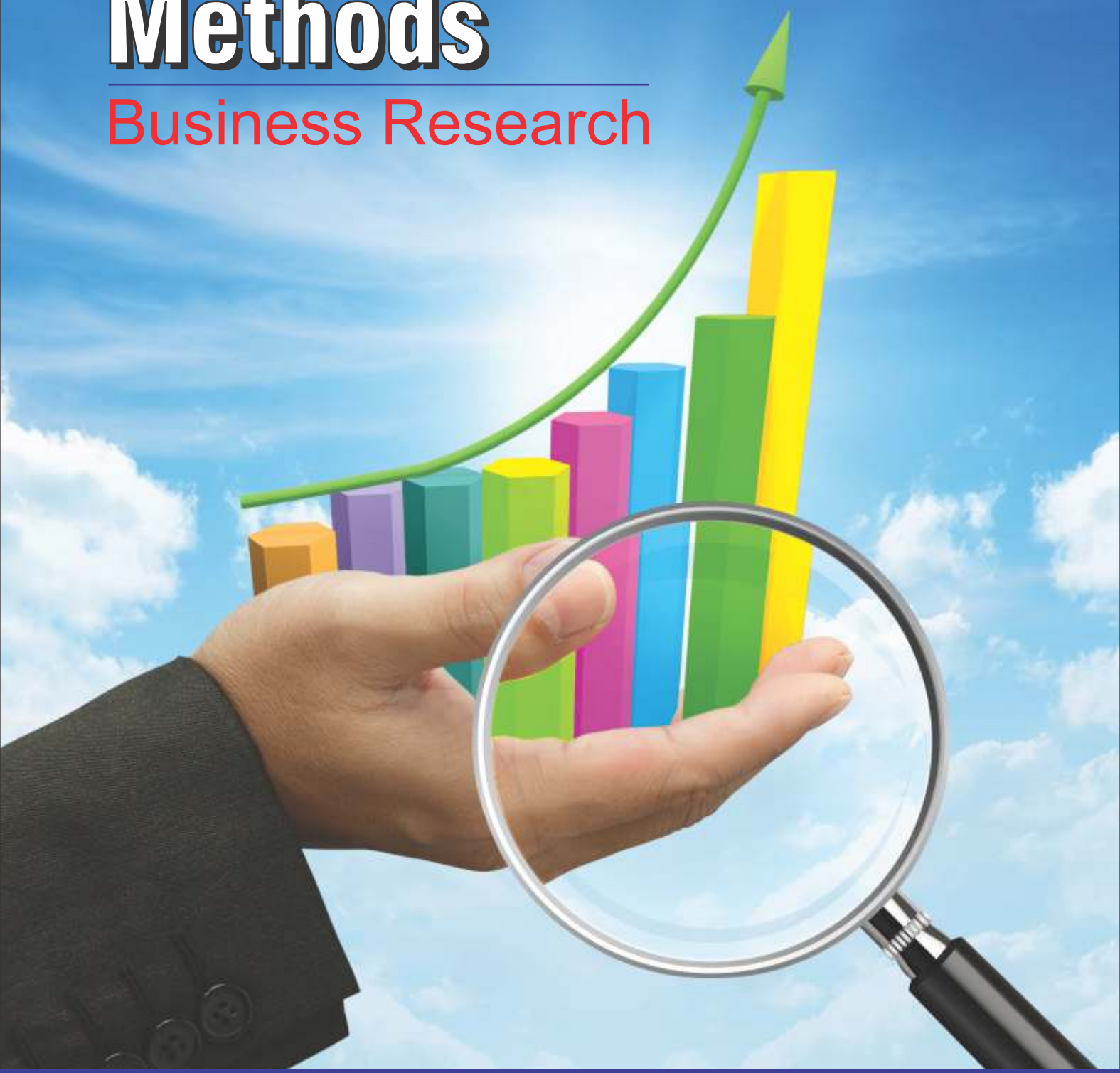
Block-VI

Quantitative Methods

Business Research



Block

VI

BUSINESS RESEARCH

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BLOCK VI: BUSINESS RESEARCH

Block 6 is about business research. It highlights the importance or application of statistics in business or management research. Statistical and management techniques are used at very important stage of business research known as data analysis. This block answers the questions such as how to do business research?, what is the business research process?, what kind of instruments can be used in business research?, how to design questionnaire?, how to frame and sentence a question? and how to document the research findings as a report. The block 6 consists of 3 units comprising introduction to business research methods, questionnaire design and report writing.

Unit-16 Introduction to Business Research Methods defines research and explains the meaning of research. Different types of research are mentioned. The features of a good research study are specified in the unit. The research process is explained with a diagram. Different types of research design such as exploratory, descriptive and casual research are distinguished. More detailed explanation of descriptive research design is provided. Different survey methods and observation methods are explained. The possible errors in survey research are mentioned in the unit.

Unit-17 Questionnaire Design explains the meaning of questionnaire. Preliminary decisions taken during initial stages of questionnaire design are discussed. The content of questionnaire is explained. The response formats are discussed. The wording in questionnaire and sequence of questions are discussed in detail. Pre-testing the questionnaire, revision and preparation of final draft are discussed. Measurement and scales are explained. Different statistical techniques used in data analysis are mentioned in the unit.

Unit-18 Report Writing is about writing different types of reports used in both business/industry and academia/research. Different types of research reports such as case study reports, industry/firm reports and business decision reports are described. Business and academic writing are distinguished. Style guides for both business and academic reports are given. Formats of research report for business audience and template of research report for academic audience are provided in the unit.

Unit 16

Introduction to Business Research Methods

Structure

16.1 Introduction

In the previous unit, linear programming, formulating linear programming model, the graphical methods and simplex methods of linear programming were explained. Post optimality analysis, duality and transportation problem were also discussed in the unit. The objective of this unit is to introduce the business research methods. In this unit, we discuss different types of research, features of a good research study, the research process, three major types of research designs, such as: exploratory, descriptive and causal research designs. The descriptive research design is explained in detail. Different survey methods such as personal interviews, telephonic interviews, self-administered interviews and mail surveys are discussed. Factors impacting the choice of survey research and different types of possible errors in survey research are mentioned. Different observation methods which do not use verbal communication are also discussed. This unit is designed in such a way that the reader can appreciate these concepts by considering the examples and multiple choice questions, which would better elicit and convince the concept understanding.

16.2 Objectives

The objectives of this chapter are:

- Define the *research*
- Explain different types of research done in the industry
- Mention features of a good research study
- Describe the research process with a diagram
- Discuss exploratory, descriptive and causal research designs
- Explain the descriptive research in detail.
- Describe different survey methods
- Mention factors impacting the choice of survey research
- Explain different possible errors in survey research
- Discuss the observation methods of research
- Discuss how factor analysis is used to measure relationships between large numbers of variables
- Identify cluster analysis used in classification

16.3 Types of Research

Research means searching again. It is searching again for the facts. Research includes both *invention* and *discovery*. That is, research can find things which are not there, or it can find things which were not discovered earlier in literature. *Discovery* is the process of finding something hidden in the world. *Invention* is the process of finding something not existing thing in the world.

Basically business research is of three types. They are

1) Primary research or empirical research
2) Secondary research
3) Case study based Research

Primary research or *empirical research* is done based on the first hand data collection. That is, primary research is based on the analysis of data directly collected from the sample population. It uses statistical techniques to analyze the data collected. Different tools such as questionnaires, interviews and telephonic conversations are used to collect data in primary research.

Secondary research is based on the data collected from the secondary sources such as trade publications, databases, journals, industry associations and bodies, statistical databases, governmental databases, journals, magazines, newspapers and any other published sources. Usually secondary research is based on extensive literature review.

Case study based research is based on direct observation or monitoring of employees, teams, managers, processes, and products at selected organizations.

Case study based research also uses tools such as structured or semi structured interviews.

Another categorization of research is *qualitative research* and *quantitative research*. Qualitative research is based on qualitative comments from the population. It requires text mining and natural language processing techniques to analyze. Quantitative research is based on numerical values of the items in the questionnaire. It uses statistical and mathematical techniques for analysis purpose.

16.4 Features of a Good Research Study

A good research study proves or disproves the defined hypothesis. It consists of well-defined research problem. Research problem is clear and unambiguous. Hypothesis testing is based on either primary data or the earlier scholarly literature. The data collected undergoes cleansing process. The questionnaire is modified based on feedback from pilot study. The questionnaire reliability is checked. The questionnaire internal consistency, and content and construct validity are verified. The research hypotheses are derived or proposed based on valid and authentic information. The errors of interviewer and responder are minimized.

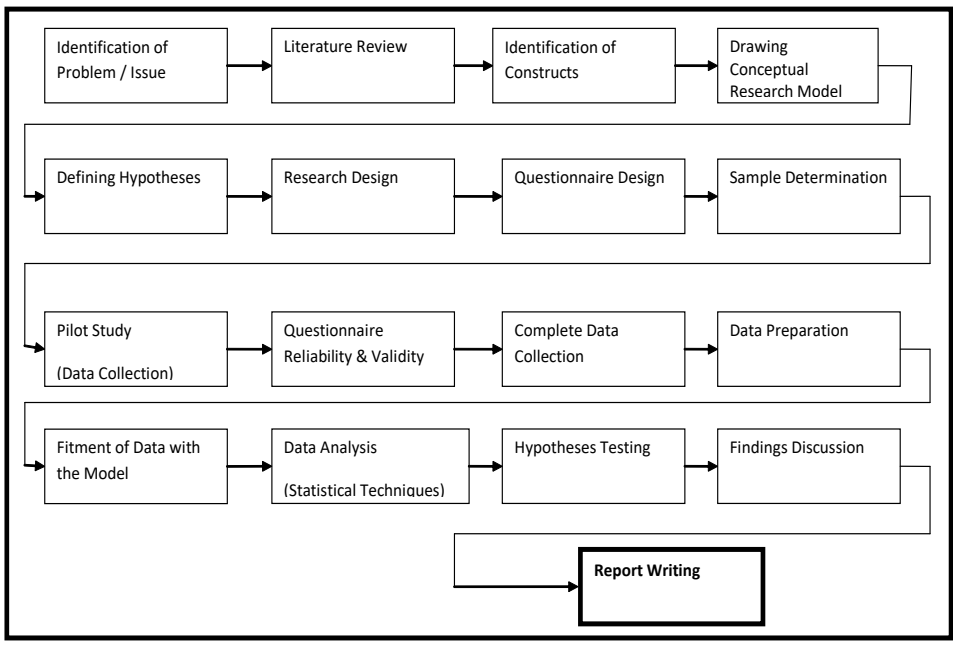
The data collected in a good research study fits the conceptual model drawn. It uses statistical techniques for hypotheses testing. Findings are discussed and well documented in a report form. A good research study has implications for both industry and research communities. A good research study finds a solution to a problem or effects of causes. Good research involves lot of *innovation*. Research is to be applicable to the industry and society at large. A research study can be customized to different countries. Research has also cultural impact. The researcher skills, team skills, resources, organizational culture, national culture, and funding have impact on the quality and outcomes of the research process.

16.5 Research Process

The business research process is as shown in Figure 16.1. The *research process* starts with identification of a problem or an issue. Literature review is carried out on the identified problem. Based on the literature review conceptual constructs and their relationships are identified and presented as a *conceptual model*. Based on the conceptual model, various hypotheses or propositions are defined. These are the hypotheses to be tested after collecting and analyzing data. Next, research design consisting of questionnaire design, sample determination and sampling technique are to be done. The designed questionnaire has to undergo pilot study. Based on the data collected from pilot study, questionnaire reliability and validity are to be checked. Based on this, some items in questionnaire need to be dropped or added.

Then, full-fledged data collection has to take place. After data is collected, the data has to be cleansed using different techniques for missing, redundant and problematic data. Data analysis has to be done based on statistical and mathematical techniques to test the hypotheses. Once hypotheses are proved or disproved, the final findings need to be discussed and documented. This is the generic business research process.

Figure 16.1: The Business Research Process



The following example shows how a research process was carried out in McKinsey.

Example: McKinsey & London School of Economics Research Study on Women CEOs

McKinsey and LeanIn.Org have conducted a research study of 423 organizations employing 12 million people to find out the representation of women in Corporate America. They provided an overview of HR policies and programs—including diversity, equity, and inclusion (DEI) practices—and explored the intersectional experiences of different groups of women at work. In this study the *research process* involved designing an instrument/ interview schedules based on McKinsey's practices targeted American companies; conducted surveys with 65,000 people on their workplace experiences;. The in-depth interviews were also conducted with women of diverse identities, including women of color, LGBTQ+ women, and women with disabilities and interviews are conducted by specially trained interviewers.

Contd….

It was summarized that in spite of the challenges of the COVID-19 crisis, women's representation improved across all levels of the corporate pipeline in 2020. This is an encouraging sign—and worth celebrating after an incredibly difficult year. But there are also persistent gaps in the pipeline: promotions at the first step up to manager are not equitable, and women of color lose ground in representation at every level.

Adapted from Women in the Workplace 2021, https://www.mckinsey.com/featured-insights/diversity-and-inclusion/women-in-the-workplace, September 27, 2021

Check Your Progress - 1

1. The objective of a research study is _____.
   a. To find a solution to the problem
   b. To create problems
   c. To spend money
   d. All of the above
   e. None of the above
2. A business research study can be _____.
   a. Primary research
   b. Secondary research
   c. Case study based research
   d. a or b or c
   e. None of the above
3. In Business research, literate review takes place _____ data analysis.
   a. After
   b. Before
   c. Parallel to
   d. All of the above
   e. Not required
4. Primary research is based on _____.
   a. Literature review
   b. Old data in databases
   c. First hand data
   d. All of the above
   e. None of the above

16.6 Research Design: Exploratory, Descriptive and Causal Designs

Exploratory research is done to find out the actual problem. It is mostly based on extensive literature review. It is not used to find the solution. It is used to find the business problem. Once actual problem is identified in exploratory research, other research methods are used to test the hypotheses. Exploratory research is done to define the hypotheses. For example, finding reasons for sales drop is an exploratory research problem.

Descriptive research starts with well defined hypotheses. It proves or disproves the defined hypotheses. It concludes certain hypotheses. It uses a well defined model. It uses the well defined techniques to collect data and is based on well defined sample. It finds solution to the business problem. For example, finding the relationship between employee competence and job satisfaction is a descriptive research. Other example can be finding the impact of employee attitude on organizational culture.

Causal research finds the effects for certain causes in the business. For example, effect of vendor drop out on organizational performance can be found using casual research. Next section explains descriptive research in detail.

16.7 Descriptive Research Design

16.7.1 Questionnaire Design

Questionnaire design is a vital issue in interviewing. A properly designed questionnaire can tap the necessary information from the respondent. Therefore, researchers always design a tactful set of questions to probe and prompt the interviewee to give useful answers. Questionnaires fall under various categories, such as structured, unstructured, disguised and undisguised. But in this section, we will limit our discussion to the study of structured and disguised questions.

A structured question is one which has a specified number of responses. Hence, the interviewee has to choose from among the alternatives given. Structured interviews are for the most part, orally administered questionnaires. Such questions restrict the interviewee from giving his own answers and require him to choose from among the alternatives given. This saves a considerable amount of time as the respondent is quick to choose from among the options given to him. Thus, rather than going off the track, the interviewer takes the interview in the required direction. The structured questionnaire makes the interview somewhat ‘funnel’ shaped, wherein the interviewer consciously guides the interviewee through a sequential, pre-formulated set of tactful questions to extract the ‘factual’ responses without any influencing factors. This leads to the goal of the interview being accomplished. Some common features of structured interviews are as follows:

- A common vocabulary for all interviewees.
- Question formats have the same meaning for all.

- All respondents are interviewed in exactly the same way.
- The questions are set in advance with their order and the range of possible responses the same for all respondents.
- These features enhance the effectiveness of a structured questionnaire in the following ways:
- Structured questions are easy and the interviewee can answer them quickly.
- Similar questions and a uniform format make the answers easy to decode and analyze.
- The factual information has a high degree of reliability.
- The possibility of any interviewer bias is reduced.

Although structured questionnaires help the researcher in eliciting programmed responses, they fail to probe into the actual motives of the respondent. This drawback can be overcome by including some unstructured questions in the questionnaire. Unstructured questionnaires are usually open-ended and try to probe into the mind of respondent, allowing the interviewee to express his own thoughts rather than restricting him to the available response options.

Sometimes, it might happen that a questionnaire has a set of personal and sensitive questions to which the respondent might give incorrect answers. These are a set of questions to which the interviewee might take offence or questions that might threaten his ego or prestige. In such situations, interviewee may knowingly give the wrong information. To nullify such instances of deliberate falsification, the interviewer frames the questions in a disguised manner. These disguised questions framed in a tactful manner help to elicit the right information from the respondent in an indirect manner, thus leading to the accomplishment of the research objective.

Depending upon the degree of structure and disguise involved, questionnaires can be further categorized as structured-undisguised, unstructured-undisguised and structured-disguised.

However, these classifications have a number of limitations. Firstly, the variance in the degree of structure and disguise in the questions makes them less straightforward and liable to misunderstanding by the respondent. Secondly, since the number of responses is limited, interviewees feel forced to choose one even if it does not divulge their true feelings. Thirdly, since surveys have a mix of personal and general questions they tend to adopt a hybrid style of questionnaire format including structured, unstructured, disguised, and undisguised questions. This leaves no alternative other than response bias to creep into the research data.

Since some research projects have a limited purpose, the data required can be gathered in a single survey. However, there are other research studies which require multiple surveys for a consensus on data and conclusions to be reached,

and hence extend over a longer period of time. Classifying research surveys based on the time period over which they extend, we have cross-sectional and longitudinal studies, which are discussed below.

16.7.2 Cross-Sectional and Longitudinal Studies

Most cross-sectional surveys gather information at a single point in time. Most surveys fall into this category. In this type of survey, the total target population is divided into various segments and then data is collected from all these segments using a sampling method. Data collected is then analyzed to define the relationship among the various variables based on cross-tabulation.

For example, a study designed to establish the relationship between ethics of parents and their views on internet filtering is likely to bring in varied responses from different sections of society who are studied at the same time.

The advantages of cross-sectional surveys lie in the fact that they are more representative of the population. These surveys can be used to study the differences in the consumption levels or trends in income, job changes and buying behavior of individuals hailing from various groups and sub-groups of the population. But when it comes to defining the same research objectives over a period of time, cross-sectional studies cannot be used. Here, longitudinal studies are required.

Longitudinal studies are those research studies that use multiple surveys to gather data over a period of time. They help in monitoring the behavioral changes taking place in the population that is of interest to the researcher. This type of survey is flexible and can over a period of time, interview different respondents provided the new subjects are also from the same group or sub-group originally interviewed. Hence, longitudinal surveys are essential not only to learn about current social situations, but also to measure their variation over a time period.

A number of different designs are available for the construction of longitudinal surveys. They are:

- Trend studies
- Panel surveys
- Cohort panels

Trend Studies

Longitudinal surveys consisting of a series of cross-sectional surveys conducted at two or more points in time, with a new sample on each occasion are known as trend studies. But it should be ensured that the new sample is from the same category or segment of population originally surveyed, as trend studies focus on the changing patterns of a particular population. Since each survey brings out the existing trend at a particular point of time, data from several cross-sectional

studies of the same population can be integrated and a time trend analysis can be established into the longitudinal survey. This can be done by using consistent questions in each of the cross-sectional studies.

Panel Surveys

A longitudinal survey that involves collecting data from the same sample of individuals or households across time is called a panel survey. The selected sample is called a panel. Panel surveys enable the researcher to detect and establish the nature of changes occurring in the population over a period of time. These changes can be traced to the level of the individual as the surveys are conducted on the same panel over a period of time. A particular sample of interviewees might respond or react to an impulse in a certain way, which might differentiate them from others over a period of time. The very basis of longitudinal surveys lies in detecting these changes. Although they provide highly specific information, they have certain drawbacks. They are time consuming, expensive and are also known to have high attrition rates as people often drop out of the study. The following example shows the panel survey by Gensler, a design firm.

Example: Gensler India Workplace Survey 2021

For example, in 2021, Gensler, a global design firm conducted a study on Indian workplace. Gensler's India Workplace Survey found that India's professional workforce reported high effectiveness while working remotely — as the workplace reopens, productivity and well-being will be top of mind. This data is collected from 2,500 full-time office workers in India. This survey of 2,500 workers in India was conducted online via an anonymous, panel-based survey from March 8 to 24, 2021. Respondents were required to be working full-time for a company, organization, or firm of 100 or more people, and to have worked in an office environment prior to the COVID-19 pandemic. At the time of data collection, respondents worked in a variety of scenarios: full-time from home, part-time in the office (hybrid work model), and full-time in the office. Respondents represent a wide range of seniority levels, roles, ages, and geographies across India.

Adopted from https://www.gensler.com/gri/india-workplace-survey-2021

Cohort Panels

A cohort is defined as those people within a geographically or otherwise delineated population who experienced the same significant life event within a given period of time. Cohort panels can be considered as a specific form of panel study that takes the process of generation replacement explicitly into account. Thus, one or more generations are followed over their life course. The study usually probes into the long-term changes and the individual development processes. If, in each particular generation the same sample people are

investigated, a cohort study amounts to a series of panel studies whereas, if a new sample of respondents is drawn in each generation, in each period of observation, a cohort study consists of a series of trend studies.

16.8 Survey Methods

Surveys are conducted through interviews and are generally classified based on the method of communication used in the interview.

The following are some of the common methods of conducting surveys.

- Personal Interviews
- Telephonic Interviews
- Self-Administered Interviews
- Mail Surveys

16.8.1 Personal Interviews

Based on the respondents to be interviewed and the means to contact them, the different methods of personal interviews can be classified into the following types:

- Door-to-door Interviewing
- Executive Interviewing
- Mall Intercept Surveys

Personal interviews are characterized by the presence of four entities i.e. the researcher, the interviewer, the interviewee and the interview environment. The first three participants have some inherent and acquired characteristics specific to each of them. As such, they are able to influence the interviewing process in some way or the other. The choice of the fourth entity i.e. the interview environment is chosen by the researcher based upon the type of data to be collected. Before we move on to discuss the various personal interviewing methods classified according to the interview environment, it would be prudent to look at the advantages of personal interviews.

Advantages of Personal Interviews

Face-to-face personal interviews have a number of inherent advantages over non-personal interviews. These advantages are discussed below.

Feedback Opportunities: The opportunity to clarify the doubts of the interviewee is one of the features that put personal interviews ahead of other methods of gathering data. A respondent hesitant to provide sensitive information can be assured of the confidentiality of the information provided.

Probing: The interviewer, in a personal interview has the advantage of probing the respondent for complex answers. A respondent might reveal her likes/dislikes for a certain soft drink which is of no use to the researcher. But with the interviewer present, the actual reason can be traced back to any of the

product attributes. The interviewer, by asking further questions, can probe respondents to zero-in on the specific product attribute that they like/dislike. This kind of information is more useful to the researcher.

Length of Interview: As compared to other survey methods, the length of interview is appreciably better in personal interviews. This is so because it is easy for a reluctant respondent to hang up the phone or not respond to a mail rather than avoid someone in a face-to-face interview. Hence, the chance of the respondent answering all the questions is greater as compared to other non-personal survey methods. Some respondents, though reluctant to participate in a non-personal survey method, feel comfortable about sharing information with an interviewer present right in front. This leads to an increase in the length of the interview and an improvement in the quality of response in the case of personal interviews.

Door-to-door Interviewing

This traditional survey method, supposedly the best, involves consumers being interviewed in their homes. There are a number of reasons why this method is considered the best. Firstly, door-to-door interview involves a direct, face-to-face contact with the interviewee. Therefore, it has the inherent advantages of instant feedback and explanation of complex and difficult tasks. Secondly, special questionnaire techniques requiring visual contact to improve data quality can be used in this method. Thirdly, where complex product concepts are to be explained to the customer, door-to-door interviewing is an obvious choice. Fourthly, it is also helpful to the interviewer since as the customer being at home is at ease and is likely to reveal factual information.

Another advantage is that it provides a sample that is more representative of the population as compared to mail questionnaires. Even people who do not have a telephone or whose numbers are not listed in the telephone directory can be reached by door-to-door interviewing. It is the best possible way for in-home product tests, which require either establishing facts about the product or explaining complex product features to the customer. Since, it involves direct, face-to-face interaction it reduces the chances of non-response error. However, owing to the large number of drawbacks involved, there has been a slow decline in the usage of door-to-door interviewing. Some of its drawbacks are listed below.

- The number of potential respondents is low in a population where both adults work outside the home.
- Unsafe areas, distance and lack of accessibility pose a hindrance in reaching the desired sample.
- Dearth of qualified interviewers.
- Fluctuations in weather conditions, vehicle breakdown or sickness are also factors that might pose a hindrance to reaching the target samples.

- It might not be possible to interview individuals who reside in high-rise apartments or are too busy to entertain personal interviews. Hence, these individuals have to be excluded from the list.
- Although door-to-door interviewing does not enjoy the status it once had, yet it will remain in use for the variety of reasons for which it is particularly useful.

Executive Interviewing

Executive interviewing is similar to door-to-door interviewing with the only difference that it is specific to workplace respondents. Executive interviewing is concerned with finding out information related to some industrial product or service, and hence requires the interviewing of business people who use these products in their offices.

If an ERP solutions provider seeks to identify the latest user preferences, then it should at first identify and get in touch with the end users of its ERP products. After making a list of suitable names, the interviewer should contact the respondents over the phone asking them to spare some time for the interview. The process is expensive but it is worth it. This is because the users more often than not, make time for the interview, as they too are interested in expressing their opinions and learning more about the products and services they use at work. The interviewer should ensure that he reaches the venue on time. Often, the interviewees are busy at work and the interviewer might be required to wait for the meeting; at other times, the appointment might be postponed due to time constraints. Since executive interviews are similar to door-to-door interviews, they share the same advantages and disadvantages as door-to-door interviews.

Mall Intercept Surveys

Marketing practitioners and advertising researchers base vital business decisions on available market research information. The concept of mall interviewing (a predominant type of personal interview in the United States today) has become a popular way to collect survey data. The technique gained popularity in early 1960’s when big, enclosed shopping centers attracted a large number of people from various sections of society (something of an ideal sample for researchers).

Mall intercept interviews are often viewed as an inexpensive substitute for door-to-door interviews. Shopping mall-intercept interviewing involves exactly what the name implies – stopping or intercepting shoppers in a mall at random, qualifying them if necessary, asking whether they would be willing to participate in a research study, and conducting the interview right on the spot or taking them to the research agency's interviewing facilities located in the mall. Prior to the mall intercept, surveys were conducted in other places having a high concentration of people, such as supermarkets, discount stores, theatres and railway stations.

Since its inception, mall intercept surveys have come a long way. The present period is witnessing huge developments and advancements in mall intercept surveys with enterprising researchers opening permanent offices and test centers in malls. Today, some mall research facilities are equipped with complete food preparation/storage facilities for conducting taste tests, focus group facilities, video tape equipment, etc. Since, each mall has its own customer characteristics, the chances of deriving biased information is more as compared to door-to-door sampling.

Mall intercept interviews are useful when the chances of demographic influences are negligible or the target group is a special population. It comes in handy for surveys that require coordination and timing such as cooking and tasting food products and for products that need to be demonstrated. Purchase Intercept Technique is a special case of mall intercept interviewing. This technique involves an in-store observation and in-store interviewing, where consumers are intercepted and interviewed while buying a specific product. The interviewer then probes into the reasons for selecting the particular product. Mall intercept surveys score over other modes of survey interviews in the following respects: cost of research and degree of control, time taken for execution, and the quality of information collected. Mall intercept interviews have the following advantages:

- Depth of response is greater for mall intercept interviews than for any other face-to-face interview.
- The interviewing environment is controlled by the researcher.
- Interviewer can notice and react to the non-verbal indications of the interviewee.
- Various types of equipment are available to analyze the responses.
- The memories about the shopping experience are fresh, and hence the situation is conducive for studying purchase behavior.
- Although the advantages of mall intercept interviews are considerable, yet their adoption without recognition of their shortcomings is not prudent. Some of the drawbacks of mall intercept interviews are as follows:
- Getting personal information from respondents is not easy and involves many problems.
- Social desirability effect.
- Interviewer bias.
- Shoppers and respondents who are in a hurry might respond carelessly leading to wrong information.
- Samples drawn may not be representative of the population.
- Lower completion rates of questionnaires.
- Inapplicability of probability-based sampling techniques.
- The respondents might be in a hurry to leave the mall.

Disadvantages of Personal Interviews

Although personal interviews have a number of advantages they are also known to have some disadvantages such as high cost, lack of anonymity of respondent and necessity for callbacks. These points are discussed below.

Cost: As compared to mail, internet and telephonic surveys, personal interviews are generally expensive. The costs are directly related to the number and the quality of the workforce employed; the reach of respondents; the length and complexity of questionnaires and also the extent of non-response due to non-availability and ignorance.

Lack of Anonymity of Respondents: A respondent in a personal interview may hesitate to provide the right information as his identity is known to the interviewer. Questions like smoking habits during driving and extra marital affairs are sure to fetch falsified answers. Thus, the interview suffers from social desirability bias. To overcome this issue, interviewers spend a lot of time in framing questions in the best possible way so as to be able to prompt the true responses from the interviewees even for sensitive issues.

Necessity for Callbacks: We have already discussed that the characteristics of those who remain at home like (non-working women and retired people) are different from those who go to work. Hence, it becomes necessary to recontact people who were unavailable at the first call. This requires a systematic procedure, and often turns out more costly than interviewing the individual in the first call itself.

16.8.2 Telephonic Interviews

Telephonic interviews, once thought of as “quick and dirty”, providing less reliable or valid data, has finally come of age, and are currently judged as one of the best cost-effective alternatives to face-to-face interviews and mail surveys. The shift of focus to telephonic interviews of late has happened for several reasons, prominent among which are:

- Plunging response rates in face-to-face interviews in certain urban areas.
- Lower cost of telephonic interviews as interviewer travel time and mileage are eliminated.
- Introduction of random digit dialing as a remedy to previous problems (cited below) of telephonic interviews, and
- Adoption of new technology in telephonic interviewing in the form of computer-assisted telephone interviewing (CATI) and computer voice activated telephonic interviewing.

The use of random digit dialing as a sampling procedure eradicated many problems associated with telephonic interviews. Instead of sampling from existing telephone directories, it used sampling via a random number procedure. This ensured that even those individuals in the sample who had shifted or

changed their telephone numbers could be included. But the sampling frame for telephonic interviews is not restricted only to directories. Researchers are also known to make use of student registers, hospital and clinic records, census tract information and employee lists of corporations as sampling frames for telephonic interviews. Before we move on to discuss the various developments in telephonic interviewing, we take a quick glance at the advantages and disadvantages of telephonic interviewing.

Advantages

- Speed in data collection.
- Potential to produce a high-quality sample through improved techniques.
- Increased co-operation and quality of data as individuals reluctant to respond to face-to-face interviews feel more comfortable with telephonic interviews.
- Ability to interview respondents in high-crime areas, which is a limitation for face-to-face interviews.
- Facilitation of collection of socially undesirable responses which is a drawback in face-to-face interviews.
- Making callbacks is easier.

Disadvantages

- Absence of face-to-face contacts which results in the inability of the interviewer to display products, concepts and advertisements, or to judge the respondent on demographic characteristics.
- Time length of interviews is less and it is easy for a reluctant respondent to hang up the phone rather than avoid someone in a face-to-face interview.
- Interviews on sensitive topics, although they may exceed the expected length of time give rise to doubts regarding the quality of data.
- Greater tendency among respondents to give shorter answers generating ‘not ascertained’ responses as compared to face-to-face interviews.
- Absence of face-to-face contact also results in the respondent continuing to speak without realizing that the interviewer is still engaged noting the previous response.
- Uses of screening devices such as Caller ID and answering machines have increased the non-response rates for telephonic interviews, with respondents more willing to participate in a legitimate survey rather than entertaining callers who wish to sell products.
- Samples are usually not representative when the interest group consists of the general population, and directories are used as sampling frames.
- Adoption of advanced techniques in telephonic interviews has helped interviewers to overcome many of the problems associated with this method. These advanced techniques are discussed below.

Central Location Telephone Interviews (CLTI)

For central location telephone interviews, the interviewers make calls from a centrally located marketing research facility to reach and interview respondents. Wide-Area Telecommunications Service (WATS) lines are used for making the calls. These lines facilitate unlimited long distance calls throughout the country or geographical area at fixed rates. The superiority of CLTI can be attributed to one factor i.e. control. The whole interviewing process can be monitored by supervisors using special monitoring equipment. This means that interviewers who do not conduct the interview properly can either be corrected or removed. This also facilitates editing and checking interviews for quality on the spot. Interviewers can be appraised of any deficiencies in their work. Finally, since interviewers report in and out of the workplace, it helps to scrutinize and control their work hours.

Computer-Assisted Telephone Interviewing (CATI)

The process in which the telephonic interview responses can be directly entered into the computer is known as computer-assisted telephone interviewing. Here, the telephonic interviewer is seated at a computer terminal while interviewing qualified respondents. The questions are usually close-ended. The questions along with their possible response options appear on the computer screen (one at a time) in front of the interviewer. The interviewer reads out the questions and enters the corresponding answers of the interviewee into the computer. Once the answer to the question is entered, the computer automatically skips to the next question. Since the interview consists of close-ended questions with possible options for each, the questionnaire needs to be highly structured.

The processing of the CATI has become much easier with the use of latest technology. This technology includes telephone management systems which take care of everything, starting from selecting telephone numbers at random to dialing them. Another call management feature is automatic callback scheduling where the computer is programmed to make the necessary recalls as per the desired timings. Thus, timings can be set to recall ‘busy numbers’ after 15 minutes and ‘no-contacts’ after 1 hour. The computer can also be programmed to fill a certain quota and to deliver daily status reports according to the quota. Even though this process can be done in the traditional way using pencil and paper, there are many advantages attached to CATI. A separate step of editing is not required as data can be edited with their subsequent data entry. Moreover, tabulations which would require a week or more to compile in the traditional way, can be done at the click of a button using CATI. This speed in tabulations also proves to be advantageous in indicating clearly whether certain questions need to be deleted or added to the existing questionnaire to make it more specific.

Completely Automated Telephone Surveys (CATS)

This process which combines computerized telephone dialing and voice-activated computer messages makes use of Interactive Voice Response (IVR) technology to record the responses of the interviewees. The need for an interviewer is eliminated since CATS involves a voice-synthesized module controlled by a microprocessor. The questions are highly structured, and close-ended with response options. The functioning of the technique is explained as follows.

The computer uses the recorded voice of a professional interviewer to ask the questions. Interviewees are required to answer by choosing from the options available and then pressing a number button on their telephone sets to mark their choice of options. The options selected are thus recorded by the computer. The system is so designed that if a respondent does not answer the first couple of questions the computer moves on to dial the next respondent. The use of CATS is handy for short, simple questionnaires. CATS technology is known to produce quality data at good speed and is also considered to be much economical compared to other telephonic methods. Since the computer handles the entire interview, CATS shares the same advantages as CATI. The flexibility of the system extends its usability to various research needs such as customer satisfaction surveys, monitoring service quality, in-home product testing and electoral polling.

The Direct Computer Interview is another related method. This is very similar in functioning to the other computer assisted interviewing methods with the only difference being that the interviewee is intercepted in a mall, made to sit in front of a terminal in the mall and given basic instructions as to the filling of the questions. Here however, the interviewee enters the answers instead of the interviewer.

Example: A study on Motivation in Romania

Androniceanu, A. (2011) has conducted a research study on 460 employees from 3 different organizations in Romania. The objective of the study is to find out the relationship between degree of motivation in the employee and the organizational development. In this study, the researcher first used a structured questionnaire based survey followed by interviews with the respondents. The findings of the research include employees are not motivated because they are not getting the extra wages and incentives. Salary is not a motivating factor for them. It is also found in the research that the organizational stress is impacting the degree of motivation in employees. In this study both the questionnaire and the personal interview techniques of survey methods are used.

Source: Androniceanu, A. (2011), "Motivation of the Human Resources for a Sustainable Organization Development", Economica.Seria Management, Vol. 14, Issue 2,

Check Your Progress - 2

5. _____ kind of research design is meant for finding the major problems in a business scenario.
   a. Exploratory Research
   b. Descriptive Research
   c. Casual Research
   d. All of the above
   e. None of the above
6. Descriptive Research _____.
   a. Proves or Disproves the Hypotheses
   b. Uses Surveys
   c. Both a and b
   d. Used to define Hypotheses only
   e. None of the above
7. _____ is not a survey method.
   a. Personal Interviews
   b. Telephonic Interviews
   c. Mail Surveys
   d. Self-Administered Interviews
   e. None of the above
8. _____ is/are disadvantages with personal interviews.
   a. Cost
   b. Need for Callbacks
   c. Disclosure of Anonymity
   d. All of the above
   e. None of the above

16.8.3 Self-Administered Interviews

An interview where the questionnaire is filled out by the respondent without the intervention of an interviewer is known as a self-administered interview. Respondents of such interviews are not assisted by interviewer or the computer. These self-administered interviews are mostly conducted in shopping malls, supermarkets, hotels, theatres and airlines as these locations provide captive audiences. Passengers and regular customers are given brief questionnaires to enquire about their views of the quality of service offered in an airline or hotel. The absence of the interviewer however, results in a limitation, namely that clarifications on responses to open-ended questions cannot be obtained. A customer might just indicate his/her liking as a reason for buying a particular

product/brand, which is of no utility from a managerial perspective. The absence of the interviewer thus makes it difficult to trace the buying decision of the customer to any of the product/brand attributes. Even the quantity of information generated is limited. However, the absence of the interviewer proves to be a boon in disguise as it eliminates the possibility of interviewer bias.

The use of kiosks is another recent improvement in self-administered interviews. Kiosks are multi-media, touch-screen computers contained in freestanding cabinets. The capacity of these pre-programmed computers to administer complex surveys is enhanced by their ability to display full-color scanned images, play stereo sound clips and show videos. These kiosks having been successfully tested at trade shows are now being tried in retail stores due to their numerous applications. Kiosk interviewing is less expensive and is known to derive more honest results than methods that involve an interviewer.

16.8.4 Mail Surveys

A survey where questionnaires are sent to qualified respondents by mail or e-mail, is known as a mail survey. For instance, Maruti Suzuki conducts a mail survey with its new customers to get feedback and experience on the process once the entire purchase process is completed. Two types of mail surveys are used in business research. They are ad hoc mail surveys and mail panels. The only difference between the two is that there is no prior contact in the case of ad hoc mail surveys. A questionnaire is just sent to a sample selected from an appropriate source and responses are awaited. The selected sample is used only for a single project.

The functioning of mail panel surveys is explained below.

The process starts with obtaining mailing lists from various sources after ensuring that they have the current, complete address of potential participants. It should be ensured that the list of participants is closely related to the group under study.

The next step involves contacting the sample participants through mail, postcards, letters or telephone. The purpose of their participating in the panel survey is explained to the participants. If the participants contacted agree to take part, they are required to fill in an initial questionnaire pertaining to their background and demographic details, which may be used to determine whether the participant qualifies for inclusion in the survey.

On successful selection, the panel participants are sent questionnaires from time to time.

Participants are thereafter contacted by various means to remind them to mail back the completed questionnaire.

An essential feature in mail panel surveys is that it is a type of longitudinal study where the same respondents are surveyed at different points of time to note specific changes pertaining to the topic of research. The advantages are similar to those of self-administered interviews. The method is cost-effective as the need to recruit, train, monitor and pay the interviewers is eliminated. The questionnaire can be administered from a single location for better control. It is even possible to contact respondents who are hard to reach. Respondents can spend as much time as they like answering the questionnaires and can complete them at their convenience. Thus, the respondents tend to give more detailed responses. However, the absence of a qualified interviewer gives rise to the same limitations in mail surveys as for self-administered interviews. Mail surveys are however characterized by a high rate of non-response. Typical ways to cope with non-response in mail surveys are outlined below.

- Monetary incentives
- Stamped, self-addressed return envelope with a persuasive covering letter
- Premiums such as pen, pencil and other small gifts
- Promise of contributions towards charity
- Entry into drawings for prizes
- Emotional appeals
- Reminder that the respondent participated in previous surveys.

16.8.5 Factors Determining the Choice of Survey Research

The choice of the survey method is influenced by a number of factors. An ideal survey method should provide the researcher with the required data with the specified quality at the lowest possible cost. The various factors that come into play in the choice of a survey method are outlined below.

Sampling Precision

The required level of sampling precision varies from research to research. Therefore, the researcher can select a research survey that suits the accuracy needs of the research. For example, if the researcher requires the results of the sampling survey to be very accurate he can select central location telephone interviewing. On the other hand, mail surveys can be used when there is not much emphasis on the accuracy of the data. A central location telephone interviewing employing a random digit dialing sampling procedure is more likely to deliver a better sample than a mail survey. Hence, the trade-off between the costs and accuracy of a sampling procedure that a researcher is willing to make plays a major role in the selection of the survey method.

Budget

The financial resources available to the researcher to conduct the research have a direct impact on the selection of survey method. A research project supported

by huge amounts of funds can include an appropriate survey method irrespective of its costs. Thus, when a low budget is set apart for the survey, the researcher cannot employ a costly survey method like door-to-door interviewing. In some cases, even if accuracy of the data is important, the researcher may have to settle for a telephonic interview rather than door-to-door or mail surveys to minimize the cost of the research.

Quality of Data

The validity and reliability of the data required plays an important role in the choice of survey methods. Validity refers to the research surveys ability to produce results that are relevant to the researcher. Reliability refers to the consistency with which the results are produced under the same conditions with the same or comparable populations. Quality of data in a survey is affected by factors like choice of questionnaire design, sampling methods, scaling techniques and interviewer qualification and training. It is also affected by the inherent pros and cons of the selected survey method.

For example, an exploratory research study involving an open-ended questionnaire would rather prefer a door-to-door interview over a mall intercept since people on a shopping spree would not be interested in answering open-ended questions.

Need to Expose the Respondent to Various Stimuli

Surveys which need to expose the respondent to certain marketing stimuli like product concepts, components and demonstrations have no better option other than to choose a face-to-face survey method. For example, when a cola major wants to test its customers' response to a new soft drink flavor it is planning to launch, a taste test is necessary and this requires the researcher to select a face-to-face survey method. Similarly, researches aimed at product testing, advertising research, shopping behavior, etc. require direct contact with the customer. Thus, the type of stimulus that is to be provided to the interviewee as part of the interview decides the type of survey method required to conduct the interview.

Incidence Rate

The percentage of households or persons out of the total population that fit the qualifications of people to be interviewed in a particular study is known as the incidence rate. It might so happen that the incidence rate for a research study is very low. Hence, the researcher cannot afford to employ expensive methods like door-to-door interviewing where the cost of searching the respondents would exceed the costs incurred for actual face-to-face interviewing. Hence, the choice here would be definitely a combination of survey methods that could provide desired results at a reasonable cost. People might be screened using telephone or mail surveys, and later an interviewer can be sent to meet the selected respondent in person.

Accuracy of the Resultant Data

The accuracy of the data collected by the survey methods can also influence the choice of survey method in a business research. It might happen that the questionnaire involves sensitive questions or the involvement of the interviewer might bring in some interviewer bias. Personal interviews may not be the right choice in these cases. Mail and self-administered survey methods would be more appropriate. CATI or CATS might also be a choice option since the interviewer would not be in direct face-to-face contact with the interviewee.

16.9 Errors In Survey Research

Technological advancements have led to remarkable improvements in survey techniques and standards. A proper evaluation of the research methodology employed coupled with the standard techniques can give precise results. But survey research can still result in errors in findings and their application. The two major sources of survey error are

- Random sampling error
- Systematic error

16.9.1 Random Sampling Errors

Random sampling error is the error caused by a particular sample not being representative of the population of interest due to random variation. Sampling as an integral part of any survey process exposes a representative cross-section of the target population. Even though a representative sample is taken, there is always a minimal deviation between the true population value and the sample value. This is due to statistical error as the sample selected is not perfectly representative of the test population due to chance variation. Therefore, a small random sampling error is evident. This error cannot be altogether avoided, but it can be brought under acceptable limits by increasing the sample size.

16.9.2 Systematic Errors

Errors that occur due to the nature of the research design and the precision of execution are known as systematic errors. The use of wrong techniques or wrongly calibrated instruments leads to systematic errors. When the results of a sample show consistent deviation, in a direction away from the true value of the population parameter, it is known as a sample error or bias. There are many sources of systematic errors, which can be classified under two broad categories i.e. administrative errors and respondent errors. The following section contains the discussion of these errors.

16.9.3 Administrative Errors

An error caused by improper administration or execution of the research task is known as administration error. These are caused due to sample design error or

due to other factors on the personal front such as carelessness, confusion, negligence, omission, etc. The different types of administrative error are given below:

- Sample Selection Error
- Sample Frame Error
- Population Specification Error
- Data Processing Error
- Interviewer Error

16.9.4 Sample selection error

A systematic error that occurs because of an inaccuracy in either the stage of sample design or the execution of the sampling procedure resulting in an unrepresentative sample is known as sample selection error. It can even surface in cases involving a proper sample frame with the population correctly defined. Non-adherence to appropriate sampling procedures and use of incomplete or improper sampling procedures are the main reasons for errors in sample selection. For example, mall intercept interviewers may choose to interview only those customers who they think are neatly dressed or only families with children. As a result, they might not take the opinions of other potential customers or respondents. A political leader during a election campaign in a potential area might wrongly select telephone numbers at random and corresponding names for a door-to-door campaign, rather than ensuring that he pays a visit to all the registered voters in that area. In this case, the leader might miss out on several potential and eligible voters.

16.9.5 Sample frame error

The list of population elements or members from which units to be sampled are selected is known as the sampling frame. A sampling frame error is said to occur when this list of members does not correspond exactly with the target population. For example, if the target population is defined as ‘all the supermarkets in Hyderabad’ and the sample frame does not list all the supermarkets, then it would result in a frame error.

16.9.6 Population specification error

An error that results from an incorrect definition of the universe or population from which the sample is chosen is known as a population specification error. For example, a small electronic car manufacturer trying to estimate the market potential for its cars in Hyderabad might select only other small car users for interviewing. This is a case of population specification error where the actual population should have been all car users in Hyderabad. In this case, the mistake is made, because of uncertainty as to whether only small car users will switch to the new electric car segment. It might happen that with the rising price of petrol or due to personal preferences, other classes of car users might also choose to

buy the new electronic car. If other classes of car users who are very different in terms of their interests are excluded then it will result in biased sample results.

16.9.7 Data processing error

An error that occurs because of incorrect data entry, incorrect computer programming or any other error during data analysis is called data processing error. Data entry into the computer is usually done manually. Hence, there are chances of errors creeping in during the transfer of data from the document to the computer. Programming too is done manually. Hence, the accuracy of data processing by a computer depends on the accuracy of data entry and programming. Data processing error can be minimized by a meticulous verification of each step in the data entry and processing stage.

16.9.8 Interviewer error

Interviewer error is an administrative error caused by mistakes committed by the interviewer while administering the questionnaire or recording the responses. This is due to the interaction of the interviewer with the respondent. Different interviewers differ in their characteristics and abilities. The respondent might be influenced by the interviewer to give untrue or inaccurate data. It might also happen that an interviewer is unable to record the answers correctly as his/her writing speed is not very good. Selective perceptions of the interviewer might also influence the way they interpret and record them. It is possible that the interviewer might record the view of a respondent in the way he understands (specific to his attitudes and perceptions), leading to an error. Tone of voice and verbal cues from the interviewer can also influence telephone respondents. These errors are caused due to improper selection and training of the interviewers. Interviewers should be trained to remain neutral throughout in order to collect answers that are devoid of any influence by the interviewer. Cases of interviewer cheating have become another major cause of survey errors. This is particularly prevalent in door-to-door interviews, where the interviewer in order to save time or avoid asking sensitive questions, deliberately skips questions or fills in the answers to certain questions, resulting in wrong information. Some might even submit false reports of having visited the respondents. This can be checked by forewarning the interviewers that a small number of respondents will be called upon to confirm the authenticity of the answers and whether the interviewer visited them.

16.9.9 Respondent Error

Respondent error as the name suggests are those errors that are observed on the respondents' side. A survey requires the respondents' co-operation in giving answers that contain the correct information. In practice it is very difficult to get the interviewees to co-operate with the interviewer or reveal their true opinions. Hence, the two common types of respondent errors that arise are non-response error and response bias.

16.9.10 Non-response error

It is very difficult for any survey to achieve a 100 percent response rate. The statistical difference in results between a survey that includes only those who responded and a perfect survey that would also include those who failed to respond is known as non-response error. A non-response occurs when a person is not at home both at the time of preliminary call and the subsequent callback. This problem, rampant in mail and internet surveys, is also confronted in telephonic and door-to-door interviews. The number of 'no contacts' is on the rise with the increased usage of caller ID and answering machines. Refusals in telephonic, mail and face-to-face interviews are also prevalent and occur due to personal preference or due to the respondents being too busy with other important engagements. Fear is assumed to be the main reason behind people refusing to participate in a survey. Concealing privacy and sensitive issues are among other reasons for refusing to participate in a survey. One way of measuring response bias is to compare the demographics of the sample with that of the target population. If a certain group of the population is underrepresented, then additional efforts are put in to gather data from the underrepresented categories through personal interviewing rather than telephonic interviewing.

The success of mail surveys is dependent on the extent to which the respondent is involved in the survey. This is referred to as self-selection bias. Thus, a customer who has had good or bad experience with the service of any particular airlines is more prone to fill up a self-administered questionnaire on board or at the airport counter than a person who is indifferent about the airline's service.

16.9.11 Response bias

A survey error that results from the inclination of people to answer a question falsely, either through deliberate misrepresentation or unconscious falsification is known as response bias. Thus, response bias can occur in two basic forms i.e. deliberate falsification and unconscious misrepresentation.

Deliberate Falsification: It might be difficult to reason out why people knowingly misrepresent or give false answers to questions when they are not certain about facts. But, there are many reasons why this happens. People might tend to give false answers in order to appear intelligent or to conceal information they consider personal or embarrassing. Time pressure, social desirability bias, courtesy bias, and uninformed response errors are among other reasons why a respondent would knowingly provide wrong information.

For example, a respondent might remember the number of times he visited a supermarket in the last six months, but he might not be able to exactly recollect which supermarkets he visited and how many times to each of them. Thus, rather than to say a clear cut "Don't Remember", the respondents might provide details banking on their memory. Such responses are also prevalent in employee satisfaction surveys where the employees might conceal their true responses towards the efficiency of their unit or the supervisor. They put themselves in a

safe situation thinking that revealing the truth might put them in a difficult situation. This type of respondent behavior is the result of their urge to be perceived as person with opinions in close proximity to that of the average person.

Unconscious Misrepresentation: Unconscious misrepresentation is a situation where a respondent gives wrong or estimated information due to ignorance and forgetfulness even though he has no intention of doing it. Such situations can arise due to question format, content, etc. It might happen that respondents misunderstand a question and give a wrong or biased answer in the process. Prior inexperience to a subject or activity is also a reason why unconscious misrepresentation on the part of the respondent occurs. Some respondents may also consider it to be a prestige issue and try to answer every question thrown at them in the best possible way rather than admitting that they do not know the answer to a question. A response bias may also pop up when a respondent is taken aback by an unexpected question by the interviewer. Thus, we see that there might be misrepresentation of answers consciously or unconsciously due to a number of factors. These factors are a by-product of different types of biases in the nature of the respondent such as:

Acquiescence Bias – It might arise from the respondent's inclination to be of the same/opposite mind as that of the interviewer and tend to say a 'yes' or a 'no' respectively to everything that the interviewer says.

Extremity Bias **–** These are individuals who either use extremes to answer questions, or who tend to remain neutral in all answers. But this depends on individual characteristics and differs from person to person.

Interviewer Bias – This occurs due to the interaction between the interviewer and the respondent, where the presence of the interviewer influences the respondent to give untrue or modified answers. The physical characteristics of the interviewer like facial expressions, age, gender, tone, etc. also play a role in inducing interviewer bias into the survey.

Social Desirability Bias **–** Social desirability is the tendency for respondents to give answers that are socially desirable or acceptable, that may not be accurate. A social desirability bias may occur either consciously or unconsciously to gain prestige or build a socially acceptable image. Information about educational qualification and salary might be overstated to gain prestige. Here the respondent tries to create a favorable image or 'save-face' and prefers to give a socially desirable answer rather than the correct information.

16.10 Observation Methods

Unlike the methods discussed earlier, observation methods do not involve any verbal communication with the respondents. Observation methods involve recording the behavioural patterns of respondents without communicating with

them. Some of the most popular observation methods used by researchers are discussed below.

16.10.1 Direct Observation

Direct observation is a method where the observer tries to gain an insight into the behaviour of a shopper in a tactful manner so as not to be noticed. This has applicability in studying merchandising effects in a supermarket and compliance to traffic rules by motorists. In tracking the behaviour of a shopper in a supermarket, the observer can either remain in a passive state as a silent observer (structured) or disguise himself as another shopper and engage in a shopping spree in close association with the subject (unstructured). In both the cases, the observer notes down certain specific behaviours related to the subject. This makes it possible for the observer to find the appealing factors in the buying behaviour and service problems faced by the subject. This is a highly subjective task and requires the observer to record certain noticeable behavioural features useful for the study. It can often be a rapid and economical way of obtaining basic socio-economic information on households or communities.

Be it structured or unstructured, it is imperative for the observer to ensure that he is not identified; else it would lead to an alteration in the behaviour of the subject and introduce subject bias. Various ways that facilitate in direct observation are one-way mirrors and disguised and hidden cameras. However, while using one-way mirrors or hidden cameras, it should be ensured that there is no invasion into the privacy of the subject. Direct observations make it possible to identify the exact timing and length of continuation of an activity. There is instantaneous recording of the observations, which eliminates the necessity of having to recall later. This method is however, prone to observer bias where the observer may wrongly assign a specific demographic characteristic to the subject.

16.10.2 Contrived Observation

An observation in which the subject under study is unaware of being scrutinized for specific behaviour is known as a natural observation. The subjects under study have little knowledge that they are being observed for specific behavioural aspects and demographic characteristics. This method uses more of a disguised observer who inconspicuously records the specific behaviour he has to scrutinize. This method of natural observation has little relevance for researchers who desire to analyze special behaviour, which may be rare among individuals operating in natural circumstances.

Here, comes in the concept of contrived observation. The subjects in this case have some advanced knowledge of being participants in the observation study. Although the subjects are aware of their involvement in the study, they still have

no idea as to which aspects of theirs are being scrutinized and observed. However advantageous it may be, the artificial setting and the awareness of the subject that he is being observed can bring in respondent bias.

A corollary concept to contrived observation is mystery shopping. Here, the main motive of the observer is to analyze the behavioural aspects of participants primarily, in the service sectors. The following are some situations, where this concept is used.

Pizza Hut claims to deliver orders for home-delivery within 30 minutes. The company may authorize any person to pose as a customer and place an order to observe the timeliness in the delivery process. Similar procedures can be applied to analyze the quality of service offered in hotels and banks.

An observer may desire to analyze the variety of responses that can be available to a set of questions. For example, an observer pretending to be an airline passenger throws unnatural questions at an executive at the enquiry counter to notice and analyze the set of responses he gets in return.

16.10.3 Content Analysis

Written materials like advertising copies and news articles, and TV and radio programs have many implicit and explicit meanings. Therefore, their content has to be thoroughly analyzed for any mismatch or misrepresentation in communications. This is where the technique of content analysis comes into play. These written material need to be analyzed, based on words used, themes, characters, and space, to enable the smooth flow of the intended communicational aspects. This helps the management to introduce the required changes in the communication process, as may be deemed necessary to generate a better response rate.

16.10.4 Physical Trace Measures

Physical trace measures refer to exposure to advertisements, computer cookie records, records of credit card usage, and dirt on the floor to determine store traffic patterns. In other words, it is the process of looking systematically into the immediate surroundings for any evidence of human interaction with one another or the environment. This method usually helps in unraveling the space usage patterns of people. Two types of traces are observed and measured. They are:

Erosion traces are shown by deterioration or wear and tear that provides a look at the usage pattern. This refers to the traces of selective wear and tear of certain parts or things in a space that shows evidence of being used.

Accretion traces are a build-up of a residue or an interaction. Traces of lumps of dirt in close proximity reveal the piling up of shoes. Similarly, a number of glasses together reveal their use for drinking purposes.

16.10.5 Participant Observation

A process in which a researcher establishes a many-sided and long-term relationship with individuals and groups in their natural setting, for the purposes of developing a scientific understanding of those individuals and groups is known as participant observation. At the first look, it may seem as a process concerned with looking, listening, experiencing, and recording the same. However, in reality, it is more demanding and analytically difficult. This method of observation requires the researcher to be involved in the day-to-day activities of the subjects or the social settings that are under investigation. This involvement can be categorized into three types depending upon the degree of involvement of the researcher. These are as follows:

Complete participant: The researcher immerses himself fully in the activities of the group or organisation under investigation. It supposedly produces accurate information, as the intensions of the researcher are not disclosed to the subjects or social settings under investigation and is least likely to guide researchers to enforce their own reality on the social world they seek to understand.

Participant as observer: The researcher in this case keeps the group informed about his intensions, but does not actively involve himself in the social settings.

Complete observer: The researcher is uninvolved and detached, and merely, passively records behaviour from a distance.

The presence of the researcher can cause some initial sparks of discomfort. Language and cultural dissimilarities can pose barriers in this method. This requires the researcher to negotiate access into the social settings after a thorough study of the power relations within the setting, the relations of people to their physical environment, as they perceive it, and the social openings and barriers. The compatibility of observation and interviewing in this method makes it highly flexible. Apprehensions about observations pave the road to questions that are later clarified during interviews to understand the significance of the observations. The interview in this case is highly unstructured.

16.10.6 Behaviour Recording Devices

Human observation is prone to deficiencies or errors. To overcome such errors, machine observers in the form of behaviour-recording devices are used. This sort of mechanical observation include on-site cameras in stores and at home for eye-tracking analysis while subjects are shopping or watching advertisements using coulometer to identify what the subject is looking at and pupilmeters to measure how interested the viewer is.

- Electronic checkout scanners that record the universal product codes on the products as those used by A.C. Nielsen and INTAGE. These are used to record purchase behaviour of the subjects under investigation or in general.
- Nielsen People Meter for tracking television station watching.
- Voice pitch meters that serve to measure emotional reactions.

- Psycho galvanometer that measures galvanic skin response.
- It may be easier for these machines to record the behavior of the subjects, but measuring the precise level of arousal and reaction through them is questionable. Therefore, calibration and sensitivity is a limitation with the mechanical devices.

16.11 Data Analysis

The data collected from several scientific explorations and business transactions need different tools for efficient data management, analysis, validation, and visualization. In this unit we will be covering the range of data analysis – logistic regression, factor analysis, Exploratory Factor Analysis (EFA), Principle Factor Analysis (PFA) and Confirmatory Factor Analysis (CFA).

Logistic Regression

Logistic regression is a statistical method for analyzing a data in which there are one or more independent variables that determine an outcome. Following are the characteristics of logistic regression:

- Logistic regression is a predictive model.
- Logistic regression model does not involve decision trees.
- Logistic regression is used only with two types of target variables:
  - A categorical target variable
  - A continuous target variable

Exhibit 16.1 relates to logistic regression parameters.

Exhibit 16.1: Logistic Regression Parameters

Predict: Death Penalty = 1 (Yes)

Number of parameters calculated = 4

Number of data rows used = 147

Wald confidence intervals are computed for 95% probability.

Log likelihood of model = -88.142490

Deviance (-2 * Log likelihood) = 176.284981

Akaike Information Criterion (AIC) = 184.284981

Bayesian Information Criterion (BIC) = 196.246711

The summary statistics begin by showing the name of the target variable and the category of the target whose probability is being predicted by the model. One can select the category on the logistic regression property page for the analysis..

The **log likelihood** of the model is the value that is maximized by the process that computes the maximum likelihood value for the Bi parameters.

The **Deviance** is equal to -2*log-likelihood.

Contd…

Akaike Information Criterion (AIC) is -2*log-likelihood+2*k where k is the number of estimated parameters.

The **Bayesian Information Criterion (BIC)** is -2*log-likelihood + k*log(n) where k is the number of estimated parameters and n is the sample size. The Bayesian Information Criterion is also known as the **Schwartz criterion**.

Source: https://www.dtreg.com/solution/view/29?gclid=CPrY693l2csCFQofaAodh0Y

16.11.1 Factor Analysis

Factor analysis is a tool used to measure the relationship between large numbers of variables. It allows researchers to use psychological scales to measure directly, by collapsing large number of variables.

The main concept of factor analysis is to measure the variables which are associated with a latent (which is not measured directly). For example, people may respond similarly about education, occupation and income which are all associated with socio-economic status which is a latent variable.

In every factor analysis, the number of factors and variables are same, and factors are always listed in the order of variation. Therefore, each factor captures overall variance in the observed variables.

Any factor with an eigenvalue ≥1 can be inferred as having more variance than a single observed variable, because eigenvalue gives the measure of the variance of the observed variables.

Factor Loading

Factor loading means the relationship of each variable under each factor. Here is an example of the output of a simple factor analysis with just six variables and two resulting factors. Table 16.1 presents an example factor analysis.

Table 16.1: Factors Analysis Representation

Variables	Factor 1	Factor 2
Income	0.68	0.13
Education	0.57	0.28
Occupation	0.49	0.21
House value	0.39	0.61
Number of public parks in neighbourhood	0.14	0.55
Number of violent crimes per year in neighbourhood	0.25	0.54

Source: ICFAI Research Center

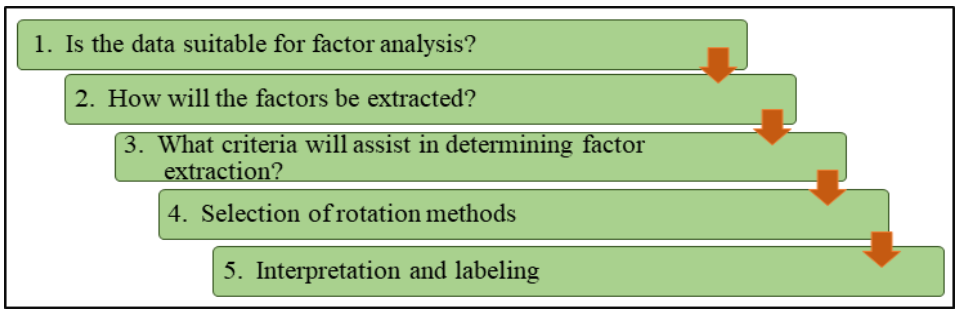
We observe that, the variable with the strongest association (0.68) to the underlying latent variable Factor 1, is income. We can conclude that the variable income has a correlation of 0.68 with Factor 1. For research fields, this would be considered a strong association for a factor analysis.

Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) is a statistical method used to uncover the underlying structure of a relatively large set of variables. Factor analysis uses EFA technique to identify the underlying relationships between measured variables. EFA is a complex statistical approach involving many options. The following are the five steps involved in EFA.

Figure 16.2 presents five step exploratory factor analysis

Figure 16.2: Five Step Exploratory Factor Analysis Protocol



Source: ICFAI Research Center

16.11.2 Principal Factor Analysis (PFA)

Principal factor analysis is used for factor extraction. This is the first phase of EFA (Exploratory Factor Analysis). In this, factor weights are calculated to produce the maximum possible variance until further meaningful variance is left are as follows;

- PFA is computationally quicker and requires a few more resources than factor analysis.
- It can produce smaller results.
- The results of PFA are inaccurate results.
- It computes factor source from factor analysis.

Find below an example of principal factor analysis with promax rotation. Table 16.2 shows factor analysis with promax rotation.

Table 16.2: Principal Factor Analysis with Promax Rotation

The FACTOR Procedure

Initial Factor Method: Principal Factors

Partial Correlations Controlling all other Variables					
	Population	**School**	**Employment**	**Services**	**House Value**
Population	1.00000	-0.54465	0.97083	0.09612	0.15871
School	-0.54465	1.00000	0.54373	0.04996	0.64717
Employment	0.97083	0.54373	1.00000	0.06689	-0.25572
Services	0.09612	0.04996	0.06689	1.00000	0.59415
House Value	0.15871	0.64717	-0.25572	0.59415	1.00000

Kaiser's Measure of Sampling Adequacy: Overall MSA = 0.57536759				
Population	**School**	**Employment**	**Services**	**House Value**
0.47207897	0.55158839	0.48851137	0.80664365	0.61281377
2 factors will be retained by the PROPORTION criterion.				

Source: http://www.okstate.edu/sas/v7/sashtml/books/stat/chap24/sect27.htm

Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) are similar techniques. Confirmatory factor analysis is a tool that is used to confirm or reject the measurement theory. In this, the researchers can specify the number of factors required in the data, and the relationship between a measured variable and a latent variable.

It is a multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs.

The following steps are involved in CFA.

1. **Defining individual construct:**

   First, we have to define the individual construct. This involves a pretest to evaluate the construct items, and a confirmatory test of the measurement.

2. **Developing the overall measurement model theory:**

   We should consider the concept of uni-dimensionality between construct error variance and within-construct error variance.

3. **Designing a study to produce empirical results:**

   The measurement model must be specified. There are two methods, the first is rank condition and the second is order condition.

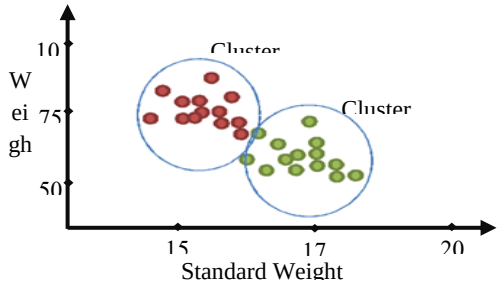
4. **Assessing the measurement model validity:**

   In this, the theoretical measurement model is compared with the reality model to see how well the data fits. Chi-square test and other goodness of fit statistics like RMR, GFI, NFI, RMSEA, SIC, BIC, etc., are some key indicators that help in measuring the model validity.

Cluster Analysis

Cluster means collections of similar objects into a group. The objects in a cluster have similar properties. Cluster analysis means organizing the group of similar objects. Cluster analysis is used for descriptive statistics. The main aim of clustering is to make best criterion which is independent. The following Figure presents cluster approach.

Figure 16.3: Collection of Similar Objects in a Cluster



Source: ICFAI Research Center

Association Analysis

Day-to-day operations in business accumulates large quantities of data. For example, at a grocery store at each counter, huge data of customer purchase is collected every day. The following Table 16.3 illustrates such data.

Table 16.3: Market Basket Items

TID	Items
1.	Bread, milk
2.	Bread, diapers, beer, eggs
3.	Milk, diapers, beer, cola
4.	Bread, milk, diapers, beer
5.	Bread, milk, diapers, cola

Source: ICFAI Research Center

TID is the unique transaction id of each customer. The purchase behavior of the customer can be analyzed by the retailors, and association relationship will be given to the frequent items.

For Example:

There is a strong relationship between the sales of diapers and beer, because the customers who purchase diapers also purchase beer.

Diapers --------Association------→ Beer

The retailers can use this association to get opportunities for cross-selling their products to the customer.

Machine learning

What is machine learning?

Arthur Samuel (1959); pioneer in Machine learning, defined these algorithms as those "which enable the computers to learn from data, significantly improve themselves, without being explicitly programmed." Tom Mitchell(1997) gave a definition that "A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E. "

Types of machine learning:

Broadly there are four type of machine learning. (1) Supervised learning (2) Unsupervised learning (3) Semi-supervised learning and (4) Reinforcement learning.

(1) Supervised learning: It is akin to human learning guided by a teacher. The good examples provided by the teacher are utilized by the student, to derive general rules from those examples. The process of the algorithm learning from example data and related target responses (may consist numeric values, string labels, classes or tags) to later predict the correct response for new examples is classified as supervised learning.

(2) Unsupervised learning: The kind of learning resembling the methods how humans figure out by observing the degree of similarity between objects. Unsupervised algorithms learn from plain examples without available associated response, which leaves the algorithm to determine the data patterns by themselves. They restructure the data bringing new features representing new series of un-correlated values.

(3) Semi-supervised learning: Semi-supervised learning involves learning problems those have a small number of labeled (means it is tagged with one or more labels identifying certain properties or characteristics, or classifications or contained objects) examples and a large number of unlabeled examples from which a model must learn and make predictions on new examples.

(4) Reinforcement learning: It can be compared to learning by trial and error. Errors help learn with a penalty say: cost, loss of time, regret, pain, and so on, and teaches you a certain course of action, showing which has less probability to succeed than others. An application presents the algorithm with examples of specific situations, and lets the algorithm know the outcome of actions it takes, and learning occurs while trying to avoid what it discovers to be dangerous and to pursue survival.

The popular machine learning algorithms:

1. Linear Regression

A relationship is established between independent and dependent variables within the data, and a linear relation equation line (regression line) of the form Y= a *X + b is built[Y – Dependent Variable, X – Independent variable, a – Slope, b – Intercept]

2. Logistic Regression

Logistic Regression helps estimate discrete values, (mostly binary values like 0/1), from the given set of independent variables. It helps predict the probability of an event by fitting data to a logit function (logit regression).

3. Decision Tree

Decision Tree algorithms, supervised algorithms are the most used algorithms today are used for classification problems. These can operate on both categorical and continuous dependent variables. The population is split into two or more homogeneous sets dependant on the significant attributes or independent variables.

4. SVM (Support Vector Machine) Algorithm

We plot raw data as points in an n-dimensional space; n being the number of features. The value of each feature is tied to a particular coordinate, making it easy to classify the data. Classifiers (lines) is used to split the data and plot the graph.

5. Naive Bayes Algorithm

A Naive Bayes classifier assumes that the presence of a features in a class is unrelated to each other. Naive Bayes classifier considers all properties to be independent, while calculating the probability of a desired outcome.

6. KNN (K- Nearest Neighbors) Algorithm

This algorithm can be operated on both classification and regression problems. Its stores all available cases. Then classifies the new cases by taking a majority vote of its k neighbors, and assigns to the class with most in common features by performing distance function measurement.

7. K-Means

It is an unsupervised learning algorithm mostly helping to solve clustering problems. Data sets are classified into given number of clusters (k) by putting all the homogenous data points within a cluster, ensuring heterogeneity of the data with other clusters.

8. Random Forest Algorithm

A set of collected decision trees is called a Random Forest. Each tree is classified, and the tree "votes" for that class. The forest chooses the classification having the most votes.

9. Gradient Boosting Algorithm and AdaBoosting Algorithm

These are used when massive loads of data are handled to make highly accurate predictions. It combines multiple weak or average predictors and builds the strong predictor. Boosting algorithm combines the predictive power of various base estimators to improve robustness.

10. Deep Learning

A deep learning architecture is inspired by biological neural networks and consists of multiple layers in an artificial neural network made up of hardware and GPUs (graphics processing unit). Deep learning imitates the human brain,

to process sound and light stimuli into hearing and vision. In deep learning, algorithms can be either supervised - serve to classify data, or unsupervised- perform pattern analysis.

Uses of machine learning:

Machine Learning is used from automating routine tasks to offering deep intelligent insights in business environment.

- Prediction —is used in all the prediction systems.
- Image recognition —is used for face detection in an image.
- Speech Recognition —is used in voice searches (voice dialing, call routing, and appliance control) and more.
- Healthcare — is trained to recognize cancerous tissues.
- Financial industry and trading — is used in fraud investigations, and credit checks.

Check Your Progress - 2

9. In self-administered interviews, questionnaire is filled by _____.
   a. Interviewer
   b. Respondent
   c. Researcher
   d. All of the above
   e. None of the above
10. Possible errors in survey research include _____.
   a. Random Sampling Error
   b. Systematic Error
   c. Administrative Error
   d. All of the above
   e. None of the above
11. _____ is not an observation method of research.
   a. Direct Observation
   b. Contrived Observation
   c. Participant Observation
   d. All of the above
   e. None of the above
12. In participant observer style of research, the researcher can play _____ role(s).
   a. Complete Participant
   b. Participant as Observer

c. Complete Observer
d. All of the above
e. None of the above

13. Factor analysis measures the variables which are associated with _____.
    a. Cluster
    b. Object
    c. Products
    d. Latent
    e. People
14. Which of the following techniques is used to identify the underlying relationships between measured variables?
    a. Exploratory factor analysis (EFA)
    b. Principal factor analysis (PFA)
    c. Confirmatory factor analysis (CFA)
    d. Predictive analysis
    e. Cluster analysis

16.12 Summary

- Research is the back bone to any business or technology organization. Organizations such as Microsoft, GE, ORACLE, IBM and HP spend millions of dollars in research. Similarly organizations such as McKinsey, PricewaterhouseCoopers, Bain & Co, Boston Consulting Group, and Ernst & Young do several different types of business research every year. This research gives the insights and information useful for managerial decision making.
- Current day business research also includes business intelligence, market intelligence and big data analysis using analytical techniques. This unit introduces business research methods. Defines research, explains different types of research and describes the features of good research study. The business research process, different types of research design such as descriptive, elaborative and conclusive research design are discussed. Different survey methods, observation methods and possible errors in survey research are discussed.
- In this unit, we discussed different technologies used for data analytics. We also discussed cluster analysis and different types of clustering technologies that support big data technology. Next Unit 17 discusses the questionnaire design.

16.13 Glossary

Interview - It is the process of asking questions and gathering and noting down the responses from the interviewee. Usually it uses structured or semi-structured questionnaires. Some of the interviews even use open ended questions. Interviewer, Interviewee, Researcher and the environment play a major role in interview process.

Questionnaire - It is the instrument using which data is collected from respondents. Questionnaire consists of questions derived from the research problem. It is administered on the sample population.

Research Design - It consists of deciding which instrument (questionnaire/interview) to use for data collection, questionnaire design, sample size determination, sample frame determination, data collection procedures, questionnaire administration procedure, and decides the statistical techniques to use for data analysis.

Sample - It is the part of population selected for the survey purpose. Sample is selected from the sample frame. Sample is selected using a sampling technique such as random sampling, convenient sampling, stratified sampling, etc. There are different formulae for sample size calculation. Sample is the group of people or organizations on whom the questionnaire/instrument is going to be administered.

Confirmatory Factor Analysis (CFA) - Confirmatory factor analysis (CFA) is a tool that is used to confirm or reject the measurement theory.

Eigenvalue - Eigenvalues are a special set of scalars associated with a linear system of equation (i.e., a matrix equation) that are sometimes also known as characteristic roots or characteristic values.

Exploratory Factor Analysis (EFA) - Exploratory factor analysis (EFA) is a statistical method used to disclose the underlying relational structure of relatively large set of variables.

Latent - Latent means something that is capable of becoming active or at hand but has not yet achieved that state.

Principle Factor Analysis (PFA) - Principal factor analysis is used for factor extraction. In this factor, weights are calculated to produce the maximum possible variance until further meaningful variance is left.

Socio-Economic Status (SES) - SES is an economic and sociologically combined total measure of a person's work experience, and of an individual's or family's economic and social position, in relation to others, based on income, education and occupation.

16.14 Suggested Readings/Reference Material

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16.15 Self-Assessment Questions

1. Define research. What are the different types of research conducted by business organizations?
2. Explain the business research process with a diagram.
3. Describe the features of a good research study.
4. Discuss the differences between explorative, descriptive and causal research design.
5. What are the different survey methods useful for business research?
6. Discuss different observation research methods.
7. What is factor analysis? What are the different factor analyses that support big data analysis?

16.16 Answers to Check Your Progress Questions

1. (a) The objective of research study is to find a solution to the problem.

2. (d) A business research study can be primary research, secondary research or case study based research study.

3. (b) In business research, literature review is conducted before data analysis.

4. (c) Primary research is based on first hand data.

5. (a) Exploratory research is used to find or explore the problems in business organization.

6. (c) Descriptive research proves or disproves the hypotheses and it uses instruments such as questionnaires.

7. (e) Personal interviews, telephonic interviews, self-administered interviews and mail surveys are different survey methods.

8. (d) The disadvantages with personal interviews include cost, disclosure of anonymity, and need for callbacks.

9. (b) In self-administered interviews, questionnaire is filled by the respondents.

10. (d) The possible errors in survey research include random sampling error, systematic error and administrative error, etc.

11. (e) Direct observation, contrived observation and participant observation belong to observation methods.

12. (d) In participant observer style of research, the researcher can play roles such as complete participant, complete observer and participant as observer.

Unit 17

Questionnaire Design

Structure

17.1 Introduction

In the previous unit, we discussed different technologies used for data analytics. We also discussed cluster analysis and different types of clustering technologies that support big data technology.

This Unit discusses the questionnaire design.

In any business research, data plays major role. Research findings and insights drawn based on data analysis are applicable not only to the business organization but also to the industry and society as well. Hence, data collection should be proper and clear for getting accurate results and decision making. The instrument used for data collection is the questionnaire. A questionnaire consists of the questions to be asked to the respondent. If the questions are not clear, the responses also may not be correct or accurate. Hence, designing the questionnaire, framing the questions, and answer formats play a major role in business research study. Unless the questionnaire is clear and unambiguous, the respondents won't be able to give reliable and useful data.

The objective of this chapter is to explain the details of questionnaire design. In this chapter, we discuss the meaning of questionnaire, preliminary decisions, question content, response formats, wording the questions, and sequencing the questions. Questionnaire pre-testing, revision and final draft are also discussed in the unit. The scale and measurement are also discussed in the unit. We have explained the mode of data used in research design and the techniques to collect the data, which would ultimately help the researcher to decide on appropriate analysis techniques.

This unit is designed in such a way that the reader can appreciate these concepts by considering the examples and illustrations, which would better elicit concept understanding. The unit concludes with a mention of statistical techniques which can be used for data analysis purposes.

17.2 Objectives

The objectives of this chapter are:

- Explain the meaning of the questionnaire
- Discuss preliminary decisions to be taken in case of questionnaires
- Discuss the content of the question
- Describe the response formats which can be used in questionnaires
- Discuss the question wording
- Explain how to sequence the questions in a questionnaire
- Explain pre-testing, revision and preparation of final draft of the questionnaire
- Discuss scales and measurement
- Specify the statistical techniques used for data analysis purposes

17.3 The Meaning of Questionnaire

A questionnaire is a set of questions to be asked to respondents in an interview, with appropriate instructions indicating which questions are to be asked, and in what order. Questionnaires are used in various fields of research like survey research and experimental design. A questionnaire serves four functions – enables data collection from respondents, lends a structure to interviews, provides a standard means for writing down answers and help in processing collected data.

A questionnaire will be ineffective if it is not designed in a manner easily understood by both the interviewer and the interviewee. If there is a single, fundamental principle for developing a sound questionnaire design, it is that the respondent defines what you can do: the types of questions you can reasonably

ask; the types of words you can reasonably use; the concepts you can explore; the methodology you can employ. The design is dependent on the researcher's decision to collect qualitative data for better understanding and generation of hypotheses on a subject (exploratory research), or quantitative data to test specific hypotheses.

17.4 Preliminary Decisions

A researcher has to take many decisions before framing the actual questionnaire. These decisions relate to the respondents and the information required, the target choice of interviewing techniques.

17.4.1 Required Information

The researcher is expected to know and understand the survey's objectives before he or she can take further steps. In framing a questionnaire, the researcher must ensure that the questions are designed to draw information that will fulfill research objectives.

Sometimes researchers end up designing questionnaires that study the peripheral issues related to a problem or an opportunity but fail to give insight into the actual problem. Such questionnaires will act as a drain on a company's resources and the data so collected may mislead the top management while making decisions.

To avoid such situations, a researcher should go through the secondary data and research studies that are similar to the current research. This helps in planning current research based on existing research findings related to the topic under study. The researcher can also conduct informal interviews with the prospective target audience to understand the nature of the problem and the information that would help managers in solving a problem.

17.4.2 Target Respondents

Before conducting the actual survey, the researcher must make sure of the target population for the survey. For example, in case of market research, a researcher has to decide whether to include both users and non-users of a product or service. This is a crucial step, as the sampling frame would be drawn after the target respondents are defined.

Defining the target respondents becomes vital as the task of developing a questionnaire that will be suitable to all cross-sectional groups of a diversified population.

17.4.3 Interviewing Technique

In developing a questionnaire, a lot depends on the choice of interviewing technique. The format and type of questions will be different for personal interviews, focus groups, telephonic interviews and mailed questionnaires. A

questionnaire designed for direct interviewing cannot be used for a survey through mail. In personal interviews, the respondent should be clearly told the details and the form of answers the questions require. It is prudent for questionnaires to be brief and to the point in telephonic interviews. Mail survey questionnaires should give clear instructions about the type of details that are desired, as an interviewer does not mediate these interviews.

17.5 Question Content

A clear definition of the problem and the objectives framed thereafter, play a major role in deciding the content of the questions. In other words, the general nature of the questions and the information they are supposed to elicit decide the question content. In this process, things become easier because there are some set standards that can be followed. Irrespective of the type of research, a researcher has to find answers to 5 major questions while deciding the question content. They are:

- What is the utility of the data collected?
- How effective is a question in producing the required data?
- Can the respondent answer the question accurately?
- Is the respondent willing to answer the question accurately?
- What is the chance of the responses being influenced by external events?

17.5.1 The Utility of Data

A researcher should ensure that each question in the questionnaire contributes to the survey. For this, every question needs to be screened before it is added to the questionnaire. This screening test analyses the usefulness of the data that will be gathered by that particular question. Questions like, “Does it significantly contribute towards answering the research question?” “Will its omission affect the analysis of any other data?’ and “Can the same information be gathered through any other question?” have to be asked. If the question does not answer any of these questions positively, or generates just ‘interesting or good to know information’, then it should be dropped. However, in special cases, it becomes necessary to ask unnecessary and disguised questions to avoid any response bias.

17.5.2 Effectiveness in Producing Data

After it is decided to include the question in the questionnaire, it should be assessed whether the question will be able to generate the required information or if it needs to be broken down into two specific questions (double-barrelled questions) to elicit better and accurate answers from respondents. In simple words, the question should be effective enough to extract the required information from the interviewee.

17.5.3 The Participant's Ability to Answer Accurately

It is necessary that respondents understand the question in a way that the researcher wants. This will eliminate the probability of potentially incorrect responses. This can be tackled by using simple words to frame the questions. A respondent's inability to answer a question may arise from three sources – genuine ignorance about the topic, inability to recollect the answer and inability to verbalize the response.

Ignorance: This refers to respondents being unaware or uninformed about the subject of the question. This can lead to respondent bias as respondents will rarely admit to lack of knowledge on a topic. These respondents will participate at the expense of accuracy. To cover up their ignorance, they provide some answers or the other, assuming that the interviewer will be impressed with their knowledge level.

Inability to recollect: This happens when respondents forget an answer because of recall and memory decay. This happens when questions overtax the respondents recall ability. For example, questions like "What was your expenditure on grocery items in the last week?" requires respondents to bank on their memory to answer it. It is a fact that many of us cannot exactly keep track of factual details relating to recent activities. But, while responding to questions on the same we tend to give the best answer that we can recollect. Some aspects of forgetfulness in a respondent that are of concern to researchers are:

Omission – when the interviewee is unable to remember if an incident actually occurred. For instance, while answering the above question, the respondent might not recollect the purchases made in the last week and hence might fail to give the actual data.

Telescoping – when the interviewee thinks that an event that occurred sometime in past occurred more recently. In other words, the respondent may report purchases made a fortnight ago as done in the last week.

Creation – when the interviewee feels that the incident or event did not occur at all. In other words, total forgetfulness.

The above three aspects of forgetting increase with the length of the recall period. The telescoping and creation aspects can be minimized by using short recall periods. This means that the interviewee should be asked questions, which need only recall of incidents and events from the near past. Omission can be dealt with only by aided or unaided recall measures.

Inability to verbalize: This refers to the respondents' inability to verbalize factors influencing their buying motives. It is not quite possible to answer questions like, "Why did you buy that car?", "What made you buy that brand of shoes?" This is because many times people buy things for reasons other than

what they admit to themselves. There might be definite reasons behind the purchase like habit, vanity, taste, etc. but when asked 'Why?' people are generally unable to articulate reasons, as they are not conscious of what is in their subconscious. Researchers can awaken the sub-conscious minds of the respondents through effective projective techniques.

17.5.4 The Respondent's Willingness to Answer Accurately

This refers to the researcher assessing the likelihood of the respondent answering a particular question accurately. A respondent's unwillingness to answer a specific question can result in item non-response (where the respondent completes the rest of the questions other than those he or she is uncomfortable with), refusal to complete the rest of the questionnaire or in deliberate falsification. Questions such as, "Were you involved in any extra-marital relationship in the 10 years of your marriage?" "Would you resort to stealing things in a supermarket if you knew there were no hidden cameras?" are virtually sure to attract stereotyped responses or refusals from participants.

This refusal can be because of the question being offending, too personal and embarrassing, reflecting on prestige, or when the respondents decide the topic is irrelevant to their interests. Hence, researchers should carefully look into the inclusion of such questions. If the information from such questions is essential, the questions can be framed subtly so that the respondent's attention is not attracted. Very often, questions of a personal nature will be answered by respondents in an anonymous survey that is if they do not have to give their real names or identities.

17.5.5 Effect of External Events

Sometimes the respondent's answer to a particular question is exaggerated or understated due to the interference of external events. Example of external events is weather or time. For example, a questionnaire designed to find the potential footfalls for a big apparel showroom that is to come up in a business district investigated the shopping patterns of women by asking them "how many times did you go shopping in the past one week?" The survey was conducted just after a week of heavy rain in the particular city. The shopping frequency reported by respondents was dismaying as most of them had naturally preferred to stay indoors without going shopping in the rains. Though the answers were right for the particular question, it was not truly representative of the shopping frequency of the respondents. Hence, questions should be framed after considering external events. A better way to frame the question would have been to keep it 'situation free' and frame it in a general manner to avoid linkage with external events. The question in the above example could have been, "how many times do you shop in a week?"

Example: Questionnaire Design

Bhatia, M.S. and Awasthi, A. (2014), conducted a research study in Canada to find out the impact of Quality Management System (QMS) on the organizational performance factors such as design performance, product quality, information quality, competitive priorities, operating performance, customer relationships, environmental performance, service quality, and supplier relationships. In this study, they designed a 9 - page questionnaire to collect the data from executives working in manufacturing MNCs.

The questionnaire consisted of two sections. Section-A dealt with demographic information such as experience, organization name, and previous organizations, etc. Section-B consisted of 11 dimensions. Dimension 1 dealt with QMS. Dimension 2 dealt with impact of QMS on information quality. Dimensions 3, 4, 5, 6, 7 found out the effect of information quality improvement on operating performance, design performance, customer relationships, supplier relationships and environmental performance. Dimension 8 dealt with effect of operating, design and environmental performance on product quality. Dimension 9 dealt with effect of customer and supplier relationships improvement on service quality. Dimension 10 deals with product and service quality improvement effect on competitive priorities. Dimension 11 dealt with impact of competitive priorities on business performance.

Reference: Bhatia, M.S. and Awasthi, A. (2014), "Investigating Effectiveness of Quality Management Systems", Proceedings of 2014 Industrial and Systems Engineering Research Conference.

Check Your Progress - 1

1. A questionnaire in a business research survey consists of _____.
   a. A set of questions
   b. A set of statistical techniques
   c. Research problem description
   d. All of the above
   e. None of the above
2. _____ is/are preliminary decision(s) to be taken while designing questionnaire for a business survey.
   a. Type of Information Required
   b. Type of Interviewing Techniques
   c. Type of Target Respondents
   d. All of the above
   e. None of the above

3. _____ is/are important factor(s) while deciding the question content.
   a. Utility of the data
   b. Willingness of the respondent
   c. Both a and b
   d. Interest of the Statistician
   e. None of the above
4. _____ is/are aspects of forgetfulness in a respondent in business research survey.
   a. Omission
   b. Creation
   c. Telescoping
   d. All of the above
   e. None of the above

17.6 Response Format

The response format required by a question depends on the nature of the research. The format usually deals with issues relating to the degree of freedom that should be given to respondents while answering a question. Two popular response formats are

- Open-ended questions
- Close-ended questions

17.6.1 Open-Ended Questions

A type of question that requires participants to respond in his/her own words without being restricted to pre-defined response choices is known as an open-ended question. They are also called infinite response or unsaturated type questions. Open-ended questions are structured in themselves. Although they probe for unstructured responses, there is a definite structure in the arrangement of questions in the questionnaire. They help establish rapport, gather information and increase understanding. Open-ended questions act as memory prompts, as they at times require the respondent to recollect past experiences. Therefore, the interviewer should refrain from making suggestions. He should rather invite the participant to use his/her own choice of words to answer. The interviewer should get the respondent to talk as much as possible and record answers in the same words used by the interviewee.

Open-ended questions are useful when the respondent is able to provide a narrative answer, when the researcher is uncertain what answers are needed or wants to conduct exploratory research. Such questions can be sub-divided into three sub-types -- free response, probing and projective.

A vague question or stimulus used by the researcher to project a person's attitudes from the responses is known as a projective open-ended question. Such questions are primarily used in projective techniques.

For the advantages and disadvantages of open-ended questions, refer Exhibit 17.1

Free response

Free-response questions typically fluctuate in the degree of freedom they give to the interviewee. Look at the following questions.

Q What do you think of the performance of the Indian hockey team in the recent Athens Olympics?

Q How would you evaluate Dhanraj Pillay's performance in the Athens Olympics?

The second question seeks a more directive response about a particular member of the Indian hockey team rather than asking about the whole team.

Probing

Probing open-ended questions are those where the actual open-ended questions are reached a little later in the process. Consider the following example.

Q Which brand of soft drink do you like? Coke or Pepsi?

A Pepsi.

Q Why do you prefer Pepsi to Coke?

A I like the taste.

Q What aspect of its taste do you like? (Probe)

This is where the interviewer starts probing to get to the specific product attributes linked to the interviewee's liking of Pepsi and the role that the sub-conscious mind of the interviewee plays in influencing the buying decisions.

Projective

Exhibit 17.1: Advantages and Disadvantages of Open-Ended and Close-Ended Questions

	Advantages	Disadvantages
Open Ended	• Open-ended questions can discover uncommon but intelligent opinions of which the surveyor would otherwise have remained unaware	• Coding open-ended questions is difficult and time consuming • As the questions require more thought and time on the part of the interviewee, it reduces the number of

	• The respondent has greater freedom of expression There is no bias due to limited response ranges • Respondents have freedom to qualify their answers	questions that can be asked within a specified time span • There are chances that a researcher/interviewer might misinterpret a response as it becomes difficult pooling an opinion across the sample
Close Ended	• Close-ended questions are more specific and easy to answer • They provide a high level of control to the interviewer by obliging the interviewee to answer questions using a particular set of options • The uniformity of the questions makes them easier to code, record and analyse results quantitatively • No difference between articulate and inarticulate respondents • Higher response rate • Less expensive and time consuming	• The options might not reveal the true feelings of the participants • Misleading conclusions can be drawn because of poor questionnaire design and limited range of options • Requires pre-testing prior open-ended research to ensure that choices offered are the relevant ones

17.6.2 Close-ended Questions

Questions, which restrict the interviewee's answers to predefined response options, are called close-ended questions. Close-ended questions give respondents a finite set of specified responses to choose from. Such questions are deemed appropriate when the respondent has a specific answer to give (for example, gender), when the researcher has a pre-defined set of answers in mind, when detailed narrative information is not needed or when there is a finite number of ways to answer a question. These questions are common in survey researches. Four major structures exist for close-ended questions.

They are:

- Binary
- Ranking questions
- Multiple choice
- Checklist

Binary questions

These are also known as dichotomous questions as they permit only two possible answers. The respondent has to choose one of the two permissible answers. Binary questions are helpful in collecting simple, factual data, and they should be used to record classification data about the interviewee (demographic data). These questions have the response options "'Yes' or 'No'" or "'True' or 'False'" or "'Agree' or 'Disagree'". Such questions should generally not be included in a questionnaire because these choices may not cover the whole range of possible responses. The respondent might be compelled to give answers whether or not they represent their true feelings. This tends to affect the survey's accuracy.

Ranking questions

These questions require the participant to rank the response options listed on a continuum basis in order of preference. Ranking questions are used to get information that reveals participants' attitudes and opinions. These questions list several alternatives that might influence an individual's decision-making. The participant assigns a rank to each option listed as per the scale mentioned. Consider the following example:

The factors that influence your decision to buy from a particular supermarket are listed below. Please rank them from the most important (1) to the least important (7).

Conveniently located	-------
Helpful sales staff	-------
Owner is a known person	-------
Recommended by a friend or relative	-------
Regular discounts offered	-------
Instant home delivery	-------
Availability of everything I need	-------

Such questions make it easy to compare different alternatives at the same time.

Multiple-choice questions

These questions cover all significant degrees of response. The respondent has to select an option that best describes their feelings. These are mostly a variation of

binary questions with more responses provided. These are also known as 'cafeteria' questions. Three issues that should be considered while framing such questions are -- the response options should be collectively exhaustive to qualify it as a valid question; the position of the responses should be varied to avoid the selection of any particular response due to position bias and the response options offered should be distinct from one another. The reasons behind the popularity of multiple-choice questions are their simplicity and applicability.

Checklist questions

These are questions where the participant has the freedom to choose one or more of the response options available. This is different from multiple choice questions in that it gives freedom to the respondents to choose one or more of the options available. Consider the following question.

Q Which premium brand of shirts do you possess? (Tick as many of the following as apply)

Allen Solly ☐

Louis Phillippe ☐

Van Heusen ☐

Color Plus ☐

Zodiac ☐

It should be ensured that options are placed in a random sequence rather than in any preferential order. Apart from the options selected by the researcher, an option called 'others' should be provided so that the respondent can fill it in if he wants to. With all significant categories present, this method facilitates replies from the respondent and subsequent tabulations. For the advantages and disadvantages of close-ended questions, refer Exhibit 17.1.

17.7 Question Wording

Designing questionnaires can be an exercise in effective cross-communication, as it tests the communication abilities of the person framing them. The effective translation of the desired question content into appropriate words does the trick in gathering responses. Questions tend to get longer to be explicit, present alternatives and explain meanings. In such cases, lack of appropriate words can result in the respondent misunderstanding the question and giving inappropriate answers or even refusing to answer. A slight mistake in questionnaire wording can be annoying and cause potential problems in data analysis, resulting in incorrect results. Although the importance of wording has been recognized, the search for a set of basic rules for questionnaire wording still remains elusive. However, guidelines developed from previous research experiences tell us that the following factors should be looked into while framing a questionnaire.

Exhibit 17.2: Examples of Common Problems with Question Wording

Avoid objectionable questions	**Objectionable:** How often do you travel in and sensitive bus without a ticket? **Unobjectionable:** How often do you forget to take a ticket while travelling by bus? (Disguised)
Avoid biased questions	**Biased:** Do you think that TV has a negative effect on children? **Unbiased:** What are your views about the effects of TV on children?
Avoid vague questions	**Vague:** How satisfied are you with Celebrity Resorts? **Better:** How would you describe the hospitality in Celebrity Resorts in your own words?
Avoid unwarranted Presumptions	**Presumptive:** How satisfied are you with the speed of response for on-site technical support? (assumes that customers are satisfied) **Better:** How satisfied or dissatisfied are you with the speed of response for on-site technical support?
Avoid the use of leading questions that prompt the respondent to a particular answer	**Leading:** Would you prefer a supermarket nearer your home? **Better:** How often would you shop from a supermarket based on its distance from your house?
Avoid asking negative Questions	**Negative:** Sales persons should not be allowed to make visits in the evening. Agree/ Disagree **Positive:** Sales persons should be allowed to make visits at any time. Agree/ Disagree
Ensure that the wording is completely unambiguous	**Ambiguous:** How seldom, occasionally and frequently do you purchase stock? **Unambiguous:** How often do you purchase stock? a) Seldom b) Occasionally c) Frequently
Avoid double-barrelled questions	**Double-barrelled:** Do you drive or take the bus everyday to office? Yes/No **Better:** How do you go to your office everyday? Drive or take a bus?
Have as narrow a reference range as possible	**Too broad a time period:** How many times have sales promotions influenced you to switch brands over the last one year? **Better:** How many times in the last month have sales promotions influenced you to switch brands?

- Shared vocabulary
- Unsupported assumptions
- Frame of reference

- Biased wording
- Adequate alternatives
- Double-barrelled questions
- Generalizations and Estimates

17.7.1 Shared Vocabulary

An interview of any kind is mostly an exchange of ideas between the interviewer and the interviewee. This exchange takes place mostly through words. This makes it imperative for the interactive language to be kept simple and easily understood by both parties. A couple of things are worth ensuring in this respect. First, the involvement and usage of technical language has to be dealt with carefully. This is necessary as using highly technical language in the questions may create understanding problems for both the interviewer and the interviewee. The second issue is the appropriate choice of words. It is not enough to ensure that the words are simple. It also has to be seen that the words are not ambiguous or vague.

17.7.2 Unsupported Assumptions

Questionnaires should avoid the use of implicit assumptions for better response rates. A questionnaire should not contain questions framed on assumptions that are not explained in the questions. A question should not leave anything for the respondents and the audience to interpret. The question should be supported with valid assumptions that would make it clearer to the audience. Unsupported, implied assumptions tend to produce exaggerated estimates from respondents. Consider the following question to a lady. “How often does your man accompany you to…?” This will elicit varied responses and may even be misinterpreted. The question assumes that every lady has a spouse or a boyfriend, which is obviously not the case. Consider another question. “Would you favour a ban on overcrowding of buses?” This is sure to provide an inflated estimate of the public’s demand, unless the assumption “even if it means an increase in bus fares?” is added. When the assumption is explicit in the question itself, it tends to produce the right estimates of the demand for products.

17.7.3 Frame of Reference

A single word can have several connotations under different situations. Words such as 'often' and 'regularly' can mean different time frames for different individuals. The word 'capacity', for example can mean very different things to an industrialist and an educator. But, the framework of social desirability makes the interviewer extend a common frame of reference to the participants. The interviewer assumes that the interviewee has understood the question in its denotative terms and qualifies the answer as valid. This is a mistake as the respondent might have answered the question using an individual frame of reference rather than from the interviewer’s point of view.

17.7.4 Biased Wording

Questionnaires should avoid the use of biased wording. This tends to influence the responses of the participants in predetermined ways. Biased and loaded words tend to be emotionally coloured, eliciting automatic feelings of approval or disapproval. They make participants aware of the desired response, thereby taking the focus away from the actual response.

For example, a question to a factory employee, "Would you favour the replacement of manual labour by machinery?" is sure to receive a negative response. A way of asking the question to read the sub-conscious mind of the employee would be, "How do you think the introduction of machines would affect labourers in a factory?"

Similarly, a question in a customer feedback form, "How satisfied are you with the service provided at our restaurant?" is biased as the question implies that the customer is already satisfied and asks them to grade the service.

The question should rather be phrased, "How satisfied or dissatisfied are you with the service provided at our restaurant?" thereby avoiding bias.

17.7.5 Adequate Alternatives

Questionnaires should give an ample number of alternative answers to each question. This too helps avoiding bias in responses. Alternatives should be explicit rather than implicit. This gives respondents the freedom to choose among alternatives rather than delve into their own mind to recollect responses. It is a faster way to gather responses. For example, consider the following question:

"How often do you purchase stock?

a) Seldom
b) Occasionally
c) Frequently

17.7.6 Double-barrelled Questions

Questionnaires should avoid asking double-barrelled questions like, "Do you like fuel-efficient cars with comfortable seats?" This is actually a combination of two questions. It does not distinguish between people who prefer cars due to their fuel-efficiency and people who prefer a car for its comfortable seats or other competing reasons. Such questions can be easily divided into two different questions. Answers to double-barrelled questions will be ambiguous because two or more ideas are included.

17.7.7 Generalizations and Estimates

Questionnaires should be structured to avoid generalizations and estimates. It is seen that when respondents are asked for the frequency of a particular activity

over a longer period, they tend to provide generalizations and estimates rather than the actual figures. This trend can be reduced by changing the time reference point to a more specific base. Answers that require calculations by the respondent should also be avoided. Minimal necessary information can be gathered and then the calculations should be done by the interviewer.

17.8 Questionnaire Sequence

The structure of a questionnaire is an important aspect in questionnaire design. The questionnaire structure is framed depending upon whether it is self-administered or the administration is facilitated by an interviewer. Questionnaire structure pertains to the proper sequencing for better and effective responses. The sequencing tends to drive the interview through a 'funnel-shaped' process, starting with general questions and progressing to more specific ones. The interviewer, before moving to sequential steps, gives a brief introduction about the survey's basic purpose survey and client confidentiality. This sequencing is explained through the following steps:

- Lead-in questions
- Qualifying questions
- Warm-up questions
- Specifics questions
- Demographics questions

17.8.1 Lead-in Questions

This is the introductory phase of the interview and consists of tactfully designed ice-breakers. These can prove crucial in gaining the participant's confidence and co-operation. The questions should be simple, non-threatening and not too personal at this stage. A good way to start the session is by asking a 'ringer or throw away' question or a dichotomous question with two responses. These questions measure the respondent's interest and willingness to respond. The questions can be about hot topics of the day, where responses are of little importance to the survey. A typical lead-in question is given below.

Q It is often said that the economic condition in India is a byproduct of the political situation. Do you agree with this?

A YES /NO

17.8.2 Qualifying Questions

These are questions that slowly lead to the survey's objective. This stage is characterized by questions that evaluate the respondent and qualify him/her for further questioning. Depending on the responses, the interviewer directs the interview towards a relevant set of questions. Prior to this, it should be ensured that the interviewees are related to the survey in some meaningful terms. A

survey for estimating market potential for a new fluoride- based toothpaste brand should ask qualifying questions like the following.

Q Which type of toothpaste do you like?

A Fluoride Herbal Calcium

Depending upon the interviewee's response, the interviewer can further give directions to the next questions.

17.8.3 Warm-up Questions

This stage plays on the respondent's mind by making him/her think of certain facts related to the survey questions. Questions like, "When was the last time you bought toothpaste?"; "Was it fluoride content or herbal?"; "Looking back, can you recollect how many times you might have used fluoride toothpastes over the last one year?" tend to make the respondent think and recollect past experiences. A person who is straightaway asked such questions may not be interested in answering or providing details, but after a series of lead-in and qualifying questions, the resistance slowly decreases and gives way to co-operation.

17.8.4 Specific Questions

This stage consists of questions that are specific to the research objectives. As such, they are asked of participants who show a favourable response or are end users of the product, in this case, fluoride toothpastes. These questions tend to estimate the usage pattern and influential factors in using fluoride content toothpaste. These specific questions play a major role in data collection and analysis. After ensuring that enough rapport has been established, this section can probe to gain insight into sensitive issues.

17.8.5 Demographic Questions

These are a necessary part of every survey. Responses to survey questions cannot be analyzed until they are sorted out according to the different characteristics pertaining to the study. This is especially true for surveys that analyze responses based on the demographic characteristics of respondents. These usually consist of a set of questions related to age, sex, location, occupation, etc. These questions are kept to the end to avoid interviewee resistance and to prevent the interviewee's attention from being diverted.

17.9 Questionnaire Pre-Testing, Revision And Final Draft

Pre-testing refers to testing the questionnaire on a small sample of respondents selected on a convenient basis that is not too divergent from the actual respondents. The aim is to identify and eliminate flaws and problems. Pre-testing includes testing all aspects of the questionnaire starting from the question content to question sequence. This helps reveal incomprehensible meanings, wrong order of questions, leading questions and awkward responses.

No matter what the final mode of administration is, pre-testing should be done by personal interviews. This will facilitate interviewers to observe respondents' reactions and attitudes, giving them a first-hand experience of the potential problems and the data that can be expected from a questionnaire.

The responses gathered from pre-testing are coded to facilitate analysis. Pre-testing enables the researcher to revise the questionnaire by identifying flaws and eliminating any ambiguous questions. It also helps researchers to verify if interviewers resort to proper sample selection procedures.

After the revision, the research instrument is ready for its final draft, which is to be used for the actual survey.

Check Your Progress - 2

5. Open-ended questions are also known as _____.
   a. Infinite response questions
   b. Unsaturated type questions
   c. Both a and b
   d. Close-ended questions
   e. None of the above
6. _____questions are easier to record, code and analyze results quantitatively.
   a. Close-ended questions
   b. Open-ended questions
   c. Both a and b
   d. Not possible at All
   e. Irrelevant questions
7. _____ as factor(s) should be taken into consideration while framing a questionnaire.
   a. Biased wording
   b. Adequate alternatives
   c. Double-barreled questions
   d. All of the above
   e. None of the above
8. Questionnaire structure includes sequencing questions.
   [TRUE/FALSE]

17.10 Scales and Measurement

Once the research problem has been clearly established, the most important part of the research, namely data collection, begins. A proper measurement system

has to be developed before actually venturing into the field to collect data. At this stage a researcher has to address some fundamental issues relating to the variables that need to be measured, and the different measurement scales that have to be used for measuring the characteristic that are relevant to the research study.

The process of assigning numbers or labels to different objects under study to represent them quantitatively or qualitatively is called measurement. Measurement thus can be understood as a means to denote the amount of a particular attribute that a particular object possesses. An important aspect of measurement is that there are certain rules that will define the process of measurement; for instance, a rule might be developed which says that number 1 should be assigned to people who are from South India and number 2 should be assigned to people who are from North India. It is however important to note that measurement is done for the attributes of the units under study but not the units themselves. For example the height, weight, age or other such attributes of a person are measured but not the person himself.

In this section we discuss some of these issues involved in measurement, such as determining the variables that have to be measured in a business research process, the different types of measurement scales available and their uses. The criteria for good measurement are also covered,

17.10.1 Identifying And Deciding On The Variables To Be Measured

The primary step in the measurement process is to identify the area or the concept that is of interest for the study. A *concept* can be understood as a general idea derived or inferred from specific instances or occurrences. Once a concept has been identified, e.g. studying the motivational levels of employees in an organization, the researcher can focus on developing a construct. A *construct* is a general idea or an abstract inferred or derived from specific instances. Constructs can also be considered as certain types of concepts which exist at different levels of thought that are developed to simplify complex situations concerning the area of study. They are developed for theoretical usage as well as for explaining the concepts themselves.

After developing a construct the subsequent process in the research is to define the concept constitutively and then operationally. A constitutive definition of the concept will specify the research boundaries, and also will define the central theme of the study. The most important use of defining the concept (under study) constitutively is to clearly demarcate it from other concepts. The primary purpose of defining the concept constitutively is that it will help the researchers in framing and addressing the research question in an appropriate manner. For instance, if we just say that we want to study the education system in India, this will not help at all in developing a research question, since it has to be clearly defined as to what education system needs to be studied - is it primary education or secondary or higher education, or is it related to an adult

education programme, and so on. So the constitutive definition in this example would be, say, 'Primary education covering state government aided schools (classes I to V)'.

Once the constitutive definition is clearly defined, it becomes easier to develop an operational definition. The operational definition defines precisely what attributes and features of the concept are to be measured. It also specifies the process of assigning a value to the concept. Although operational definitions can be developed for defining the characteristics that need to be measured, it is sometimes impossible to measure certain features which may nevertheless be crucial for the study. For instance if we want to study the behavior of employees towards the senior management, then it is very difficult to measure the behavior of these employees; however by defining behavior as the action or reaction of an individual in response to external stimuli we can develop some scales for measuring behavior e.g. by asking respondents some indirect questions about how they would react to certain decisions of the top management and so on. An operational definition therefore acts as an interface between the theoretical concepts and the live environment. We can analyze the constitutive and operational definitions along with the measurement scales in Exhibit 17.3. In this exhibit, the operational definition of role ambiguity has been developed for studying salespeople and customer service people, on the assumption that role ambiguity increases the stress factor leading to job dissatisfaction.

Exhibit 17.3: Studying Role Ambiguity

The constitutive definition of role ambiguity can be framed in the following manner. Role ambiguity is a direct function of the discrepancy between the information available to the person and that which is required for adequate performance of his role. Subjectively, it is the difference between his actual state of knowledge and that which provides adequate satisfaction of his personal needs and values.

On the other hand, the operational definition can be framed as the state of uncertainty (measured on a five point scale ranging from highly uncertain to highly certain) an employee feels regarding the duties and responsibilities of his job relating to his co-employees and customers.

The measurement scale that has been developed consists of a 45-item scale. Each of these 45 items is analyzed on a five point scale. The five points in the scale represent

1 = highly certain, 2 = certain, 3 = neither certain nor uncertain, 4 = uncertain, 5 = highly uncertain.

Some of the items that have been measured are given below:

- What is the amount of work that I am expected to do?
- What should I do to improve my chances of getting a promotion?

Contd….

- How vulnerable is my position in the organization?
- How far will my boss go to back me?
- What methods would my boss use to evaluate my performance?
- What is the level of service that I should provide to my customers?
- Which specific company strengths should I present to the customers?
- How the top management expects me to handle ethical situations in my job?
- How much information should I provide to managers from other departments?
- About how much time does my family feel I should spend on the job?

Adapted from Jagdip Singh and Gary K Rhoads, "Boundary Role Ambiguity in Marketing-Oriented Positions: A Multidimensional Mulitfaceted Operationalization," Journal of Marketing Research, Vol 28, Issue 3, p 328, 10 p.

Determining the variables that need to be measured is very important in business research. In normal measurement applications, scales are usually comparable; for instance, if we want to measure the height of a person, we measure it in centimeters or in inches, where both scales are comparable. But in business research, we rarely find such comparable scales of measurement. While conducting research regarding business issues, a researcher has to initially define what is to be measured, how it will be measured, and also the concept that needs to be measured. The concept can be measured using several factors, but the appropriateness of the variable that has to be measured is very important. For example if we want to measure the profitability of a particular product, then measuring the sales of the product would be more appropriate than measuring the productivity of the organization. A research study has even been conducted to measure the fear of COVID 19 in human beings. It is discussed in Exhibit 17.4.

Exhibit 17.4: Measurement Scales for Measuring the Fear of COVID 19

A research study has been conducted to study a The study developed the Fear of COVID-19 Scale (FCV-19S) to complement the clinical efforts in preventing the spread and treating of COVID-19. First, an extensive literature review was conducted to assess all general scales on fear. Thirty measures on fear were identified that assess fear on different populations and diseases (available on request from the corresponding authors). Relevant and possible items were pooled by two researchers (i.e., the third and last authors). After removing those items with similar content or expressions, 28 items were retained for further evaluation. Second, an expert panel (comprising a psychologist, virologist, health psychologist, psychiatrist, general physician, and nurse) evaluated the 28 items, and 11 items were deleted based on the suggestion from the expert panel.

Contd….

Third, the retained 17 items were sent out to a different expert panel (comprising a health education specialist, pulmonologist, social psychologist, and sociologist in Iran) to review. Seven items were further omitted based on the comments from the second expert panel. Finally, the 10-item scale was piloted on 46 individuals (26 males and 20 females, mean age 39.63 years, number of years in education = 9.38 years) to obtain initial assessment of the scale. A four-point Likert scale was used to test whether the individuals understand the item descriptions. The results showed that all respondents fully understood the item descriptions (mean 3.81, SD = 1.04). Additionally, an individual telephone-based cognitive interview was implemented on the same pilot participants to explore their thoughts about each scale item and their responses. No further changes were made because the pilot participants indicated no changes were needed. cases

The sample comprised 717 Iranian participants. The items of the FCV-19S were constructed based on extensive review of existing scales on fears, expert evaluations, and participant interviews. Several psychometric tests were conducted to ascertain its reliability and validity properties.

In conclusion, this study demonstrated that the Fear of COVID-19 Scale is a seven-item unidimensional scale with robust psychometric properties. Moreover, total scores on the FCV19S are comparable across both genders and all ages which suggest that it is a good psychometric instrument to be used in assessing and allaying fears of COVID-19 among individuals.

Fear of Coronavirus-19 Scale

1. I am most afraid of coronavirus-19.
2. It makes me uncomfortable to think about coronavirus-19.
3. My hands become clammy when I think about coronavirus-19.
4. I am afraid of losing my life because of coronavirus-19.
5. When watching news and stories about coronavirus-19 on social media, I become nervous or anxious.
6. I cannot sleep because I'm worrying about getting coronavirus-19.
7. My heart races or palpitates when I think about getting coronavirus-19.

The participants indicate their level of agreement with the statements using a five-item Likerttype scale. Answers included "strongly disagree," "disagree," "neither agree nor disagree," "agree," and "strongly agree". The minimum score possible for each question is 1, and the maximum is 5. A total score is calculated by adding up each item score (ranging from 7 to 35). The higher the score, the greater the fear of cororonavirus-19.

Adapted from Daniel Kwasi Ahorsu et al.,, "The Fear of COVID-19 Scale: Development and Initial Validation," International Journal of Mental Health and Addiction, March 27th 2020 https://link.springer.com/article/10.1007/s11469-020-00270-8

While developing measurement variables, researchers often face the problem of construct equivalence. This refers to the perceptions and beliefs of the measurement variables of different people that are related to the study. Different perceptions based on the customs, religious aspects, culture and socioeconomic factors of different societies will affect the development of constructs for the research study. For instance, consuming beef is not accepted in Hindu dominant India, but in the western countries it is a common phenomenon. As a result common questionnaires cannot be developed for both these areas if a study on beef consumption patterns is carried out across the world.

17.10.2 Development of Measurement Scales

Developing measurement scales is a critical dimension of business research. A scale can be defined as a set of numbers or symbols developed in a manner so as to facilitate the assigning of these numbers or symbols to the units under research following certain rules. Generally, it is very easy to measure certain parameters such as sales of a particular product or the profitability of a firm, or the productivity of the employees in an organization, and so on. These are relatively easier because they can be measured quantitatively by applying different scales for measurement. On the other hand it is relatively difficult to measure some aspects like the motivational levels of employees in an organization, the attitude of customers towards a particular product, or the customer acceptance levels of a new design of a product, and so on. Measurement of such concepts is very difficult because the respondents may be unable to put their feelings across exactly in words, and sometimes the scales may not be capable of drawing the right response from the respondent.

At times, the respondents might not be willing to reveal their opinions to the researcher. To overcome such difficulties, a researcher's primary objective is to seek the cooperation of the respondent and create an environment of trust and mutual understanding. The interviewer should try to reduce all the negative feelings of the respondent and develop a situation wherein the respondent feels free to share all his feelings relevant to the research with the interviewer. It is also important for the researcher to clearly specify what information he needs and why, if the research design permits. Companies generally develop scaling techniques to measure certain critical aspects of business, such as measuring customer retention, as discussed in Exhibit 17.5.

Exhibit 17.5: Measuring Customer Retention

Customer retention has become a vital ingredient in business success. Researchers adopt different approaches for measuring the customer retention rates. One such method is the crude retention rate, which represents the absolute percentage of customers retained. For instance if 80 out of 100 customers are retained then the retained percentage is 80.

Contd…

However, researchers try to adopt better methods of measuring the customer retention rate such as weighted retention rates, where the customers are weighted according to the volume of purchases made by them. Another useful approach in measuring customer retention rate is the 'lifetime value' (LTV). Here the net present value of the customer is analyzed by the seller. In LTV analysis, costs such as the selling and servicing costs are considered, while costs involved in developing new customers are recorded as a sunk cost. The LTV of a customer is calculated by considering the net value of cash flows assuming a sustainable relationship with the customer in the future.

Although it is a better approach, LTV has some inherent disadvantages. Researchers are unsure about which attribute to consider for measuring the LTV- should it be the age of the customer, the working life of the product, product life cycle, or some other factor. Moreover, calculating the LTV for each and every individual customer is a very difficult process, therefore LTV of customers is normally carried out at an aggregate group level.

Adapted from K. Ramakrishan, (Strategic Marketing Research Team), "Customer Retention: The Key to Business Performance,"
< http:// www.etstrategicmarketing.com/smNov-Dec2/art11 .html >

17.10.3 Types of Measurement Scales

The design of a measurement scale depends on the objective of the research study, and the mathematical or statistical calculations that a researcher expects to perform on the data collected using the scales. The objective of the research study may be as simple as classifying the population into various categories, or as complex as ranking the units under study and comparing them to predict some trends. Different types of measurement scales are given below.

- Nominal scale
- Ordinal scale
- Interval scale
- Ratio scale

Nominal Scale

A nominal scale uses numbers or letters so as to identify different objects. The scale helps segregate data into categories that are mutually exclusive and collectively exhaustive. This scale assigns numbers to each of these categories and these numbers do not stand for any quantitative value, and hence they cannot be added subtracted or divided. For example, a nominal scale designed to measure the nature of occupation (employment status) may be given as below:

Occupation: [1] Public sector [2] Private sector [3] Self employed [4] Unemployed [5] Others

In the above example, the numbers 1, 2, 3, 4 and 5 only serve as labels to the various categories of employment status, and hence a researcher cannot use those numbers to perform any type of mathematical or statistical operations on those numbers. A nominal scale does not give any relationship between the variables, and the only quantitative measure is the frequency of items appearing under each category i.e. the number of people in public sector jobs, etc. One can only calculate the mode for the data collected using nominal scale.

Ordinal Scale

An ordinal scale is used to arrange objects according to some particular order. Thus, the variables in the ordinal scale can be ranked. For instance, if someone says that a person came second in the exam, then we can understand that there was another person who came first and some others were there who were ranked after him. This type of scale that gives ranks is called an ordinal measurement scale. Ordinal variables can only give us the information regarding relative position of the participants in the observation, but they do not give any information regarding the absolute magnitude of the difference between the first and the second position, or second and third position and so on.

For example, an ordinal scale used to measure the preference of customers (in Andhra Pradesh) for various mobile telephone service providers would ask a question like

Please rank the following mobile telephone service providers from 1 to 5 with 1 representing the most preferred and 5 the least preferred.

Airtel _____

Hutch _____

Idea _____

BSNL _____

Reliance _____

A respondent may rank these players depending on his experience/perception of them. If a respondent ranks Airtel as 1 and Idea as 2, a researcher can know that the respondent prefers Airtel. However, the limitation is that the researcher cannot be sure as to how strong the respondents' liking is for Airtel when compared to Idea.

Interval Scale

Interval scales are similar to ordinal scales to the extent that they also arrange objects in a particular order .However, in an interval scale the intervals between the points on the scale are equal. This is the scale where there is equal distance between the two points on the scale. Examples of interval scales are Fahrenheit and Celsius scales used to measure temperature. In these scale the difference between the intervals is the same i.e. the difference between 40^0 and 60^0 is the same as the difference between 25^0 and 45^0. But the base point, freezing of

water is represented by 32^0F and 0^0C. Thus there is no natural zero (base) for these scales. Similarly we can design an interval scale with points placed at an interval of 1 point

[10] [9] [8] [7] [6] [5] [4] [3] [2] [1] and ask the respondents to place the mobile telephone service providers on this scale of 10 to 1. If Idea is assigned 8 and BSNL 4 we can say that the value of difference in preference is 4. But we cannot say that the liking for Idea is twice that for BSNL because we did not define a point of no liking i.e. 0. The only statement we can make about a respondents preference for Idea and BSNL is 'he likes Idea more than BSNL' but we can't give a ratio of the likings as there is no base zero.

Interval scales are suitable for the calculation of an arithmetic mean, standard deviation, and correlation coefficient.

Ratio Scale

Ratio scales have a fixed zero point and also have equal intervals. Unlike the ordinal scale the ratio scale allows for the comparison of two variables measured on the scale. This is possible because the numbers or units on the scale are equal at all levels of the scale. A very good example of ratio scale is distance; for instance, not only can we say that the difference between four miles and six miles is the same as the difference between six miles and eight miles but we can also say that eight miles is twice as long as four miles. In other words a ratio scale can be defined as a scale that measures in terms of equal intervals and an absolute zero point of origin exists. This zero is common to a distance scale using yards, meters, etc. Age, height, weight, money scales are other common examples of ratio scales. Since their exist an absolute zero on the ratio scale the data collected can be subjected to any type of mathematical operation say, addition, subtraction, multiplication, and division.

17.10.4 Criteria for Good Measurement

Researchers normally develop their own scales for measuring variables for different attributes as it is very difficult to find readily available scales. It is in this process of developing scales that researchers have to be very careful, since the scales that they develop should primarily stand the tests of reliability, validity, sensitivity and so on. In the following sections, we will discuss the criteria for good measurement. There are five major criteria for analyzing the goodness of a measurement, namely, reliability, validity, sensitivity, generalizability and relevance.

Reliability

It is considered that, when the outcome of a measuring process is reproducible, then the measuring instrument is reliable. Reliable measuring scales provide stable measures at different times under different conditions. For example, if a coffee vending machine gives the same quantity of coffee every time, then it can

be concluded that the measurement of the coffee vending machine is reliable. Thus reliability can be defined as the degree to which the measurements of a particular instrument are free from errors and as a result produce consistent results. However in certain situations, poor data collection methods give rise to low reliability. The quality of the data collected can become poor if the respondents do not understand the questions properly and give irrelevant answers to them. There are three methods that can be used to evaluate the reliability of a measure. They are test-retest reliability, equivalent forms and internal consistency.

Test-retest reliability

If the result of a research is the same, even when it is conducted for the second or third time, it confirms the repeatability aspect.

For example if 40 percent of a sample say that they do not watch movies, and when the research is repeated after sometime and the result is same (or almost the same) again, then the measurement process is said to be reliable. However there are certain problems regarding the test-retest method of testing reliability, the first and foremost issue is that it is very difficult to obtain the cooperation and locate all the respondents for a second round of research. Apart from this, the responses of these people may have changed on the second occasion, and sometimes environmental factors may also influence the responses.

Equivalent form reliability

Some of the shortcomings of test-retest reliability can be overcome in this method. In equivalent form reliability, two measurement scales of a similar nature are to be developed. For instance, if the researcher is interested in finding out the perceptions of consumers on recent technologically advanced products, then he can develop two questionnaires. Each questionnaire contains different questions to measure their perceptions, but both the questionnaires should have an approximately equal number of questions. The two questionnaires can be administered with a time gap of about two weeks. The reliability in this method is tested by measuring the correlation of the scores generated by the two instruments. The major problem with equivalent form reliability is that it is almost impossible to frame two totally equivalent questionnaires.

Internal consistency

Internal consistency of data can be established when the data give the same results even after some manipulation. For example, after a research result is obtained for a particular study, the result can be split into two parts and the result of one part can be tested against the result of the other; if they are consistent, then the measure is said to be reliable. The problem with internal consistency is that the reliability of this method is completely dependent on the way the data is divided up or manipulated. Sometimes it so happens that different splits give different results. To overcome such problems with split

halves, many researchers adopt a technique called as Cronbach Alpha which needs the scale items to be at equal intervals. In case of difficulty in obtaining the data at equal intervals of time then an alternate method called KR-20 (Kuder Richardson Formula 20) is used to calculate how consistent subject responses are among the questions on an instrument. Items on the instrument must be dichotomously scored (0 for incorrect and 1 for correct). All items are compared with each other, rather than half of the items with the other half of the items. It can be shown mathematically that the Kuder-Richardson reliability coefficient is actually the mean of all split-half coefficients.

The following example shows the content validity and reliability of a questionnaire

Example: Content Validity and Test-Retest Reliability of a Questionnaire

A study was planned by Samaneh Torkian and others on Iranian university students to measure virtual social network (VSN) addiction among students. This study aimed to assess the validity and reliability of a questionnaire on VSN addiction among Iranian university students. The initial questionnaire was designed based on extensive literature review and consulting with experts.

To measure the item and content validity indexes and to measure the content validity ratio, a panel of 24 experts psychologists, psychiatrists, epidemiologists and health education and promotion specialists, reviewed the questionnaire and rated the appropriateness of each question using a three point scale: “essential,” “useful but not essential,” or “not necessary.” To measure the test-retest reliability, the questionnaire was administered on 30 students within the interval of 14 - 21 days and the intra-class correlation coefficient was calculated. The test-retest reliability of the questionnaire was almost perfect. The study provides a valid and reliable questionnaire to measure VSN addiction among university students. The designed instrument could be used in addiction evaluation studies.

Adopted from Samaneh Torkian, Content Validity and Test-Retest Reliability of a Questionnaire to Measure Virtual Social Network Addiction Among Students, International Journal of High Risk Behaviors and Addiction, https://sites.kowsarpub.com/ijhrba/articles/92353.html, March 4th 2020 (Accessed on September 30th 2021)

Validity

The ability of a scale or a measuring instrument to measure what it is intended to measure can be termed as the validity of the measurement. For instance, students may complain about the validity of an exam, stating that it did not measure their understanding of the topic, but only their memorizing ability. Another example may be of a researcher who tries to measure the morale of employees based on their absenteeism alone; in this case too, the validity of the research may be questioned, as absenteeism cannot be purely attributed to low

morale, but also to other conditions like prolonged illness, family reasons and so on. Validity can be measured through several methods like face validity, content validity, criterion-related validity and construct validity.

Face validity

Face validity refers to the collective agreement of the experts and researchers on the validity of the measurement scale. However, this form of validity is considered the weakest form of validity. Here, experts determine whether the scale is measuring what it is expected to measure or not.

Content validity

Content validity refers to the adequacy in the selection of relevant variables for measurement. The scale that is selected should have the required number of variables for measurement. For instance, if the state education department wants to measure whether all the schools in the city have adequate facilities, and for measuring this, it develops a scale to measure the attributes like the attractiveness of schools names, the frequency of old students meets, the different varieties of eatables that are prepared in the school canteen and so on. Here, it is clear that these variables considered for measurement do not possess any content validity as they will not serve the purpose of the research. The scale should instead be developed to measure aspects such as the number of classrooms, the number of qualified teachers on roll, the capacity of the playground and so on. It is often difficult to identify and include all the relevant variables that need to be studied for any research process.

Criterion-related validity

The criterion related validity refers to the degree to which a measurement instrument can analyze a variable that is said to have a criterion. If a new measure is developed, one has to ensure that it correlates with other measures of the same construct. For instance, length of an object can be measured with the help of tape measure, calipers, odometers and also with a ruler and if a new technique of measure is developed then one has to ensure that this new measure correlates with other measures of length. If a researcher wants to establish criterion validity for a new measure for payment of wages, then he may want to ensure that this measure correlates with other traditional measures of wage payment such as total number of days worked.

Criterion validity may be categorized as predictive validity and concurrent validity. *Predictive validity* is the extent to which a future level of a criterion variable can be predicted by a current measurement on a scale. A scale for measuring the future occupancy of an apartment complex for example may use this scale. A builder may give preference to only those repairs that may attract new tenants in the future rather than focusing on all the areas that need repair. *Concurrent validity* is related with the relationship between the predictor variable and the criterion variable. Both the predictor variable and the criterion variable are evaluated at the same point in time.

Construct validity

Construct validity refers to the degree to which a measurement instrument represents and logically connects through the underlying theory. Construct validity, although it is not directly addressed by the researcher, is extremely important. It assesses the underlying aspects relating to behavior; it measures why a person behaved in a certain way rather than how he has behaved. For instance, whether a particular product was purchased by a consumer, is not the consideration, but why he has/has not purchased the product is taken into account to judge construct validity. This helps to remove any extraneous factors that may lead to incorrect research conclusions. For example, for a particular product, price may not be the factor that affects a person deciding whether to buy it. If this product is used in the measurement of a general relationship of price and quantity demanded, it does not have construct validity, as it does not connect with the underlying theory.

There are two statistical methods for analyzing construct validity - convergent validity and discriminant validity. Convergent validity is the extent of correlation among different measures that are intended to measure the same concept. Discriminant validity denotes the lack of or low correlation among the constructs that are supposed to be different. Consider a multi-item scale that is being developed to measure the tendency to stay in low cost hotels. This tendency has four personality variables; high level of self-confidence, low need for status, low need for distinctiveness, and high level of adaptability. Additionally, this tendency to stay in low cost hotels is not related to brand loyalty or high level aggressiveness. The scale can be said to have construct, if it correlates highly with other measures of tendency to stay in low cost hotels such as reported hotels patronized and social class (convergent validity). Has a low correlation with the unrelated constructs of brand loyalty and a high level of aggressiveness (discriminant validity).

Sensitivity

Sensitivity refers to an instrument's ability to accurately measure variability in stimuli or responses. Sensitivity is not high in instrument's involving 'Agree' or 'disagree' types of response. When there is a need to be more sensitive to subtle changes, the instrument is altered appropriately. For example strongly agree, mildly agree, mildly disagree, strongly disagree, none of the above, are categories whose inclusion increases the scale's sensitivity.

Generalizability

Generalizability refers to the amount of flexibility in interpreting the data in different research designs. The generalizability of a multiple item scale can be analyzed by its ability to collect data from a wide variety of respondents and with a reasonable flexibility to interpret such data.

Relevance

Relevance, as the name itself suggests, refers to the appropriateness of using a particular scale for measuring a variable. It can be represented as,

Relevance = reliability x validity

If correlation coefficient is used to analyze both reliability and validity, then the scale can have relevance from 0 to 1, where 0 is the low or no relevance level to 1 which is the high relevance level. Here if either of reliability or validity is low then the scale will have little relevance.

17.11 Data Analysis using Statistical Techniques

Data is to be analyzed to test the hypotheses. Statistical techniques such as correlation, regression, multiple regressions, t-test, ANOVA (Analysis of Variance), MANOVA (Multiple Analysis of Variance), Chi-Square test, F-test and Z-test are used. For example, correlation is used to find the relationship between two variables. Regression is used to find the impact of one variable on other variable in the research model. ANOVA and t-test are used to find the significant differences in the mean values of the variables. Chi-Square test and degrees of freedom are used to find the goodness of fitment of the model with data. F-test is used to find the significant values in variables. Z-test is also used for hypotheses testing.

Based on the statistical indices values, the hypotheses are proved or disproved. These are to be documented as findings of the research in research report. The findings also require sufficient discussion. Many useful insights and conclusions can be drawn from the research findings. Some organizations publish the research findings as reports, journal articles, or white papers. For example, Accenture, McKinsey, PricewaterhouseCoopers, and Bain & Co publish many management and business related research reports and insights. Universities such as The ICFAI University publish their research in national and international scholarly journals.

Check Your Progress - 1

9. Proper measurement scale has to be prepared _____ data collection.
   a. Before
   b. After
   c. Parallel to
   d. All of the above
   e. None of the above

10. _____ is not a type of measurement scale.
    a. Nominal Scale
    b. Ordinal Scale
    c. Ratio Scale
    d. Interval Scale
    e. None of the above
11. _____ can be used to check the internal consistency of an instrument/questionnaire.
    a. Cronbach Alpha
    b. KR-20 (Kuder Richardson Formula-20)
    c. Both a and b
    d. Pearson Correlation Coefficient
    e. None of the above
12. _____ is/are statistical technique(s) used in data analysis in business research.
    a. Correlation
    b. Regression
    c. ANOVA
    d. All of the above
    e. None of the above

17.12 Summary

- Business research has strong background in statistics and mathematics. The questionnaire plays vital role in any business survey. Interviewing techniques use structured and semi-structured questionnaires. The sequencing of the questions, question content, response format and wording in each question are important to get accurate, usable and reliable data from respondents. In the unit, aspects of questionnaire design such as meaning of questionnaire, preliminary decisions to be taken, content of the question, response formats, question wording, question sequencing are discussed. Questionnaire pre-testing, revision and final draft are discussed. The scales and measurement are explained. Different statistical techniques used in data analysis are also mentioned in the unit. Next Unit-22, explains the report writing.

17.13 Glossary

Construct - A research conceptual model consists of the constructs and the relationships between the constructs. Each construct represent a concept from management discipline. Organizational productivity, job satisfaction, team performance, and employee productivity are examples of constructs from different management streams.

Data Analysis - It is done to test the defined hypotheses. It uses statistical techniques. Based on the values of statistical coefficients, hypothesis is either proved or disproved. Data analysis starts after data collection and data cleansing.

Instrument - It is the synonym used for questionnaire. It consists of the questions or the items. Each item will have a scale of measurement. It is based on the constructs defined in the research model.

Research Model - It is also known as a conceptual model. It is derived from literature review. It consists of constructs and their relationships. Each construct consists of items which are represented as individual questions in questionnaire. Each construct is drawn from the literature.

17.14 Suggested Readings/Reference Material

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6. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, James J. Cochran. Statistics for Business and Economics. 13th Edition, Cengage Learning India Pvt. Ltd., 2019.
7. S D Sharma. Operations Research. Kedar Nath Ram Nath, 2018.
8. Hamdy A. Taha. Operations Research: An Introduction. 10th ed., Pearson, 2016.
9. Malhotra, N. (2012), Marketing Research: An Applied Orientation, 7th ed., Pearson, 2019.
10. Cooper, D.R. and Schindler, P.S. and J. K. Sharma (2018), Business Research Methods, 12th edition, McGraw-Hill Education.

17.15 Self-Assessment Questions

1. What are the preliminary decisions to be taken while designing a questionnaire?
2. Discuss popular response formats used in a questionnaire.
3. How the questions are to be sequenced in a questionnaire?
4. What are the different types of scales used for an item in a questionnaire?
5. How do you check the reliability and validity of a questionnaire?

17.16 Answers to Check Your Progress Questions

1. (a) A questionnaire used in business research should consists of set of questions.

2. (d) The preliminary decisions to be taken while designing a questionnaire include information required, interviewing techniques and target respondents.

3. (c) While deciding the question content, factors such as willingness of the respondents and the utility of the data are to be considered.

4. (d) The factors of forgetfulness of a respondent in business research survey include creation, omission and telescoping.

5. (c) Open-ended questions are also known as infinite response questions or unsaturated type questions.

6. (a) Close-ended questions are easier to record, code and analyze quantitatively in business research.

7. (d) While framing a questionnaire, factors such as biased wording, adequate alternatives and double-barrelled questions are to be taken into consideration.

8. TRUE - Questionnaire structure includes sequencing the questions.

9. (a) Proper measurement scale needs to be prepared before data collection.

10. (e) Measurement scales include ordinal scale, nominal scale, ration scale and interval scale.

11. (c) Cronbach Alpha and KR-20 can be used to check the internal consistency of a questionnaire.

12. (d) Statistical techniques such as correlation, regression, ANOVA, MANOVA and t-test, etc. are used for data analysis in business research studies.

Unit 18

Report Writing

Structure

18.1 Introduction

In the previous unit, aspects of questionnaire design such as meaning of questionnaire, preliminary decisions to be taken, content of the question, response formats, question wording, question sequencing are discussed.

This unit discusses on how to write a report.

Formal report writing is an academic skill. Reports are written and presented in academic circles and in corporate for various purposes. After completing the research it is necessary to write a formal report. An executive uses it to communicate a business decision or a proposal. The quality of the report usually reflects the concerned executive and can form the basis of his/her perception amongst subordinates/peers/and superiors. Ability to write a good business report is an essential skill to become a successful business executive.

It is also a necessary skill for an academic career. The most important statistic for a university is the rank it gets. The better the rank, the higher is its image, better students apply, they are able to attract and retain better members of the faculty and provide a better placement for its students. Amongst the best known rating publications in the world are the QS World University rankings, the Shanghai ARWU (Academic Ranking of World Universities) and the Times Higher Education World University Rankings. All the three assign heavy weight to citations. The QS assigns a 20% weight to citations per faculty, Shanghai assigns a 40% weight and Times assigns 30%.

A citation occurs when the research paper of a faculty member is acknowledged by another faculty in his/her research paper. If universities are rated for cited research then it naturally implies that their hiring policies would give priority to those academics with the ability to research and write better quality academic papers.

Thus irrespective of the career path that one chooses (business or academics), ability to write quality reports is one of the key career skills for a business student.

18.2 Objectives

Study of this chapter will enable the student to –

- List the difference between various types of research reports.
- Outline the structure of a report in a business context.
- Recall the structure of a research report in an academic context.

18.3 Types of research reports

Although the report written after the research describes the research and the findings, the format of the report differs based on the usage. As in all creative writings, one has to keep in mind the audience while making the textual document.

Some of the reports a business student is expected to be able to generate (in their career) are –

1. Case Study Analysis
2. Industry or Firm based research reports
3. Report recommending a particular business decision
4. Article explaining business concepts.

18.4 Case Study report

Case studies often form a part of the curriculum component of a business program. The student is given a business situation and is asked to make a decision about problems facing an organization. A written form of this analysis can be termed as a research report.

Example A

An appliance manufacturer Two Brothers Ltd, has its manufacturing plant located in Mumbai. The founder of the firm acquired the land for the factory 150 years ago when it was not as expensive as it is today. The firm owns vast amount of land. This land is currently highly valued and thus the firm is sitting on a very high value asset.

Contd…

The firm is successful in its business and is now producing appliances at the peak capacity. In order to meet future demand, it is necessary to build an additional factory.

The problem facing this firm is: Where to locate the new plant?

In example A, a decision has to be made on where (geographic) to locate the new plant. The student is expected to understand the business consequences of factory location and make the best choice he/she thinks is most apt. The student is also expected to write a report of research process, the decision and the action plan. The audience for the report is a Professor or other Academic Staff.

18.5 Industry / Firm report

An industry analysis looks at all the firms in a particular sector. The report analyzes their respective business strategy, their market shares, their strengths, weakness, growth plans etc.

Example B

The Government of India announces a new policy according to which foreign universities can establish their campuses in India.

How will this affect the current players? Will the affect be differential for Central universities, state universities, deemed universities, private universities?

Example C

United States of America (USA) announces a change in their visa policy for H1B and L1 categories.

How will this affect the Indian IT firms?

The audience for such reports can be varied. They can be academic, business, press or exploratory reports for the firm.

18.6 Business Decision Report

A business decision report can be very similar to the business case report except for the fact that the audience is different. Instead of Professors or Academic Staff, business executives and consultants would be reading it.

Example D

The research and development department of Two Brothers has informed the Marketing department that it has successfully developed the capacity to design and manufacture a Dehumidifier Machine.

Should the firm expand its product range and market this appliance?

Example E

The Human Resources Department recruits Management Trainees annually from Business School campuses across India.

How many should it recruit this year?

How many offers should be given?

Which Campuses should be visited?

How to attract the best students from the best campuses?

18.7 Business Concepts or Academic Research

Business studies draws mostly from other social sciences. Hence sizable numbers of business research papers delve on concepts from social sciences such as Psychology, Sociology, Anthropology and Economics.

These researches are usually done in academic settings by academics.

Example F

An observant student notes other students' remark on their perception of quality of sauce in the canteen. She has made the observation that students tend to associate sauce thickness (viscosity) with quality of the sauce.

Does the perception of thickness influence perception of quality?

What conditions are necessary for such an association?

What happens in a blind tasting exercise?

In these researches, relationships between concepts are tested in certain contexts. The readers are typically other academicians, researchers and consultants.

Example G

A Professor of Finance reads a research article that states that SBUs of conglomerates show lower profitability than stand-alone units in the same business. He reads that this is due to Head Office overload in terms of time and energy spent in reporting by SBU executives. It is also due to Head Office taking inefficient decisions since they are not 'grounded' to market condition. It is also due to cross-subsidization by successful SBUs of inefficient ones. This phenomenon is called the group discount effect.

He wonders if this is true in Indian conditions. Would a unit of TATA, Birla or Reliance perform inefficiently than a standalone unit in the same business? Is the Group-Discount effect valid in India?

Check Your Progress - 1

Q1. Name the type of report against each listed below: (Case study / Industry study / Business decision / Business concept research)

1. Report content: Recruitment decision between 3 candidates. Report Audience: Company executives
2. Report content: Impact of new patent regime on the pharmaceutical industry. Report Audience: Professor and academic staff
3. Report content: Do profits increase after a merger? Audience: Researchers
4. Report content: Decision on type of machinery to be purchased. Report Audience: Professor

Q2. State True or False –

1. Business executives need not worry about report writing skills.
2. Professors are concerned about teaching and hence they are not required to write research reports.
3. First find out who is going to read your report, then proceed to write it.
4. A research by Professor Guha reads as follows – "according to Professor Jensen (1986) free cash flows occur when a firm has excess of cash over and above current profitable projects". This is an instance of citation for Prof Jensen's research.
5. A research by Professor Guha reads as follows – "according to Professor Jensen (1986) free cash flows occur when a firm has excess of cash over and above current profitable projects". This is an instance of citation for Prof Guha's research.

18.8 Business and Academic Writing

The reports can be classified as 'Business' and 'Academic' depending on end use. There are differences between the two although the objective of communicating research remains the same.

The following table summarizes the key differences between a research report for business and an academic research report.

	Aspect	Industry	Academic
1	Readers	Supervisors, Subordinates, Peers and other business executives	Professors, fellow students, researchers
2	Content	Decisions and usually course of action.	Thought pieces, your understanding based on existing literature; your ideas based on existing literature and usually some hypothesis testing

	Aspect	Industry	Academic
3	Context	Often one can assume that a large portion of the context is known to the reader; field jargon usage is acceptable; shared (between the author and the reader) meanings of words and phrases are very high.	Shared meanings are not to be assumed. Definitions need to be explicitly stated. Field jargons are seldom used.
4	Visual components	High. Usage of plots, graphs, diagrams, flow charts etc.	Low. Primarily textual material.
5	Drafts	Do not have the luxury of time for multiple drafts.	Usually involves a number of drafts before final version.
6	Guidance	Rarely available for grammar and error correction.	Guidance from seniors and colleagues usually available
7	Report Length	Condensed and concise. Often shared meanings and contexts are completely removed. Short is best as very few read a long business report.	Usually longer due to literature surveys, logical formation of models from existing concepts and models.
8	Condense	Almost everyone reads the Executive Summary. Very few will read the full report. This highlights the importance of the Executive Summary	Abstract is used as a "teaser" to entice readers to the full report. Abstract may not contain important findings. Full report will be scanned and reviewed often word-by-word by other academics.
9	Citations	Relatively not important.	Extremely important. If you do not cite properly, then you run the risk of your report getting rejected. In extreme cases (plagiarism) you may lose your job or suffer severe career limitations.
10.	Format	Flexible.	High rigidity. Journals often have rules on even how to write names of authors. Usually a fixed order of content assumed (detailed later on).

18.9 Business and Academic report style guide

Since almost all the research in business falls under the 'social sciences' category, it is suggested to use a standard style as specified by APA or the American Psychological Association. This is commonly known as the APA style guide. It provides rigorous style and format guidelines which can be used for both the type of reports. APA has wide acceptance in Academics and Business.

18.10 A research report for a business audience.

The suggested format for a business audience is –

1. Title Page
2. Executive Summary
3. Situation Analysis
4. Problem Definition
5. Alternative Solutions
6. Criteria for evaluation
7. Evaluation
8. Recommended Solution
9. Suggested Action plan
10. Research Limitations
11. References
12. Appendices and Supplementary Material

18.10.1 Title Page

A title should be one line summary of the report. It should not be more than 12 words in most cases. The title should be in both cases (Large and Small: Proper case and not completely in large case). The title is usually mentioned in the top half of the page and is centered between the page margins.

Titles are also normally indexed in databases and hence they should be concise and avoid superfluous words like "A Study of.", "An investigation into..." etc. APA suggests the use of main variables and relationships (mainly used in academic writing) for example – Effect of media language on message effectiveness".

Below the title page, Author's name and the name of affiliated Institution or department is also mentioned. APA recommends that full name should be used (no initials).

If there are multiple authors then the order of the mention should denote the order of contribution. The first named author should have provided a higher order of contribution than the second named author.

Names should be mentioned first and the Institute / Department mentioned in the next line. APA style offer guidelines when Institute / Department names are common amongst the authors. Names and Institute / Department names are mentioned in separate lines and are centered.

Example H

De-Humidifiers: Market Analysis and Recommendations

Madhavi Inamdar

Manager - Product Planning

Example I

Campus Recruitment Plan for Management Trainees (2014)

Pramod Goel and Archana Jain

Human Resources Department

Example J

Proposed Vendor Evaluation System

Pramod Jain

Materials Department

Archana Goel

Supply Chain Center

18.10.2 Executive Summary

Executive summary is usually a one page summary of the entire report. It should contain the problem statement (or definition) and the summary of results. The executive summary is a condensed version of the full report. This is written for readers to become acquainted with the problem without going through voluminous material. It is intended as an aid to decision-making by managers and has been described as possibly the most important part of a business report.

Although Executive Summary appears early in the report, it should be written only AFTER the entire report is written. This is because it is a summary of the report.

The key points for an executive summary therefore are –

1. It is a condensed version of the report.
2. In a single short paragraph, explain why the problem has come about (situational analysis).
3. Ensure that the problem definition, solutions and recommendations are mentioned.
4. Recommended length of an executive summary is a single page.

5. Read it aloud to yourself to see if the logical flow is present. Since it is such an important part of the Business report many have recommended that it should be taped while read out. The tape could then be listened to for smooth and logical flow of ideas.

Additional readings for executive summary are in the Bibliography section.

18.10.3 Situation Analysis

This is the first part of the textual report. The content in this section should ideally be detailed and lead the reader to the Business Problem for which this research is being carried out. For example consider the problem mentioned in Example A. The problem was regarding the choice of location for the new plant.

1. A detailed situation analysis would have included.
2. The current industry, players, and firm volumes (Number of units).
3. Volume trends for both the industry and the firm. Typically this would involve at least 3-5 previous years.
4. Projection of industry volume usually for at least 5- 10 years.
5. Market share targets for the projected years.
6. Possible production from the current factory at Mumbai.
7. Shortfall in production vs demand.
8. New plant capacity (there could be alternatives on this and it could be part of the problem decision).
9. Site requirements for the new plant (Depending on the capacity). The site requirements could be Land Area, Built up area, nearby population centers (for employee housing and living) etc.
10. Criteria used for creating a shortlist of potential locations for the new factory.
11. Listing and justification for the short listed location sites.

At this point the natural flow leads the reader to the problem definition regarding choice of location from the shortlisted sites for the new plant.

Once again, it becomes pertinent to consider the reader of the report. In case the reader belongs to the Academic category, one should not assume shared knowledge. All arguments should be detailed and included. In case the readers are Business Executives and if they are already abreast of all these facts then the Situational Analysis can be short. A mention of the previous reports / deliberations and discussions in a concise manner leading to problem definition should be sufficient. Detailed analysis could be left out of the main report and be part of the Supplementary.

Example K

Campus Recruitment Plan for Management Trainees (2021)

Situation Analysis

1. Management Trainee / Executive manpower required forecasted by departments for business growth and expansion activities.
2. Manpower required based on attrition rates of existing employee strength.
3. Positions filled by promotion.
4. Positions generated by promotions..
5. Total MT/Executive manpower required for next year.
6. Analysis of last year's MT recruitment. Offers made, joined and attrition analysis campus-wise.
7. Feedback from Departments.
8. Campus rankings by reputed rating agencies.
9. Criteria for making a shortlist of campuses.
10. Shortlist

Tables and charts should be used to convey the information. Text matter could be restricted to bullet points.

18.10.4 Problem Definition

The situational analysis should lead to the problem definition. The problem definition should be short and to the point. This section will probably be the shortest part of the report. There can be multiple problems in this section. It is preferred to number them. This will enable easier reference in later sections.

Example L

Problem Definition

Where should we locate the new factory for appliances?

Example M

Problem Definitions

Which campuses should we visit to recruit Management Trainees for the next year?

What should be the target for recruitment from each of the campuses?

Example N

Problem Definition

Should Two Brothers Ltd add De-humidifiers to the product range?

The problem definition may sound very simple and obvious. However it is necessary to state it explicitly and in the form of a question. The problem definition gives the clarity that the author will answer THAT question in his/her report. There can exist several problems in Business which are in the same domain and hence it is possible that the reader may implicitly assume that the report will answer some problems other than the one intended. This section ensures that such assumptions are put to rest.

18.10.5 Alternative Solutions

The solutions which are listed in the short list mentioned in the Situation Analysis section should be explicitly mentioned in this section. This ensures clarity and removes any incorrect assumptions made by the reader. The alternative solutions hold the universe of possible solutions and hence ensure that the researcher and the reader focus on them. It negates the possibility of 'wandering around' in a research report. The report is restricted to analyzing only these solutions for the problem defined.

Example O

Problem Definition

Where should we locate the new factory for appliances?

Alternative Solutions

1. Maharashtra Near Nagpur
2. Mohali near Chandigarh
3. Jaipur
4. Mysore

For some problem definition (Example N) the alternative solutions may be trivial and can be ignored. However if there is a conditional "Yes" then the same can be mentioned.

Example P

Problem Definition

Should Two Brothers Ltd add De-humidifiers to the product range?

Alternative Solutions

1. Unconditional Yes
2. Yes subject to supplier credit of over one year
3. Yes subject to 200% gross margin
4. Yes subject to 200% Gross margin and supplier credit of a year
5. Unconditional No

18.10.6 Criteria of evaluation

In this section, the author mentions and justifies the criteria which will be used to evaluate the solutions. Business acumen and expertise will be demonstrated in this section since the criteria can be generated only after knowing the context of the business and the relevant concepts.

The researcher must spend time, energy and effort in this section to arrive at a good set of criteria. The researcher must meet and talk to people who can shed light on this matter. These criteria would be difficult to generate from relying exclusively on secondary material.

For instance – a firm located its unit in a place "CM" after considering transport costs to its customers. The overall distances seemed to be minimized and thus it was assumed that the transportation costs would also be minimized. The firm failed to notice that the transporters were organized almost 'mafia like' in that location. It was they who decided the transportation fares. The firm had no say in the decision. The transport cost that was to be reduced and minimized was actually found to be increased by a substantial percentage. If the firm had met executives of other firms already located in CM they would have become aware of this issue.

Example Q

Problem Definition

Where should we locate the new factory for appliances?

Alternative Solutions

.....

Criteria for evaluation

1. Logistic Costs
    a. Location should be near to the customers in order to minimize outward freight.
    b. Location should be near to vendors to minimize inward freight.
    c. Location should be near to a port to minimize freight of imported materials.
2. Location should be a fit to the product range planned for manufacture.
3. Marketing advantage for a location (for example if the firm can get marketing advantage in Gujarat because the manufacturing is in that state).
4. Tax concessions offered for the location.
5. Subsidy offered by the Local Government
6. Labour availability and cost
7. Labour environment
8. Law and Order situation
9. Distance from nearest Airport
10. Availability of school suitable for children of Managerial Employees
11. Ease of getting environmental clearances

Often in business decisions, authors of research reports will be called on to present their reports. In such presentations, researchers should be ready to be examined critically on the criteria of evaluation they had generated.

A word of caution: there is a temptation to ignore criteria which places ones final decision in a poor light. However this temptation should be overtly overcome to avoid taking a bad decision.

18.10.7 Evaluation

It is in this section that the quantitative and qualitative research methods would be applied. Each alternative solution has to be evaluated by each criteria of evaluation. After the evaluation is over, one should be able to select the best solution from the alternative solutions for the defined problem.

Use tables to summarize your arguments so that readers can understand the information at a glance.

Example R

Problem Definition

Where should we locate the new factory for appliances?

Alternative Solutions

.....

Evaluation Summary	Nagpur	Mohali	Jaipur	Mysore
1. Logistic Costs	Low	High	Medium	High
2. Location Fit	Medium	Low	Low	High
3. Marketing advantage	Low	High	Low	High
4. Tax concessions	Low	Low	Medium	Low
5. Subsidy offered	High	Low	Medium	Low
6. Labour availability	High	High	Low	High
7. Labour Cost	Low	High	Low	Medium
8. Labour environment	Good	Fair	Good	Fair
9. Law and Order situation	Fair	Fair	Good	Good
10. Airport Distance	Distant	Nearby	Nearby	Distant
11. School	Distant	Distant	Nearby	Nearby
12. Environmental clearances	Easy	Not very easy	Easy	Not easy

Example R shows a summary of the evaluation. This in itself is not sufficient. The researcher will have to explain in the report the basis of the evaluation. For instance: Why did he rate the Marketing Advantage as High in Mohali but Low in Nagpur?

Obtaining the data to do the evaluation defines the scope of data collection of the research.

Important points to be considered in Evaluation –

1. Usually each alternative will have a mixture of advantageous and disadvantageous evaluations. The ability of a good business executive is to select the best considering the alternatives, the advantages and the disadvantages. Do not expect a mathematical solution where one alternative will be superior to others in all the criteria. Researchers will be called upon to use their acumen in selection after evaluation. It is also possible that different researchers may pick different solutions as the best ones.
2. The evaluation section usually is the most voluminous part of the report.
3. The data collection should be driven by the following sequence –
    a. What method would be used to evaluate the alternative solutions on each of the criteria?
    b. For each method, what data would be required to complete the analysis?
    c. Collect THAT data
    d. Do not collect data that would be "nice to have" but does not help you in any evaluation. It is just a waste of time and effort.
    e. There has to be a clear relationship between evaluation-method-data
    f. Each evaluation should have the necessary and required data
    g. Each piece of data would be used in at-least one evaluation

18.10.8 Recommended Solution

After the evaluation is over, the recommended solution has to be clearly communicated in this section. Researchers would need to justify the same. The recommended solutions would have been rated poorly in some of the criteria. The researcher should justify why he picked out this solution despite the poor ratings on these criteria.

Example S

Problem Definition

Where should we locate the new factory for appliances?

Alternative Solutions

.....

Criteria for evaluation

.....

Evaluation

.....

Recommended Solution

It is our recommendation that the new plant be located near Jaipur.

18.10.9 Suggested Action Plan

The suggested action plan has two components –

1. How to manage the low ratings in some of the criteria? For example the evaluation for Jaipur mentions the labour availability to be 'Low'. What should the firm do to negate this disadvantage?
2. A road map mentioning the steps and the timeline for implementing the decision. However this should be a very broad and a 'helicopter view' of the project. In some cases, once a decision is taken, it is assumed that a project team will be formed. The project team would do the detailed planning exercise.

18.10.10 Research Limitations

The research limitation is a section which is often misunderstood by students. The limitations to be mentioned have to pertain to the research and not the researcher. For example - The researcher wanted to get 1000 responses but could get only 500 responses. This is not a research limitation. However if the researcher assumed a statistic to arrive at the sample size then the validity of that assumption is a research limitation.

A research limitation should address assumptions used in the research. The conditions (boundary conditions) inside which the research is valid form the set of research limitations. The research is not valid if any of conditions are violated.

For example a project could assume a GDP growth rate, a tax rate, a forex range, etc. There would be a range of values for these assumptions where the research is valid. Outside the range the evaluation and the suggested recommendation may not hold good. For this project an explicit section where the valid ranges are mentioned is required. Results of sensitivity analysis could also be mentioned here.

18.10.11 References

Many a time, students confuse references with bibliography. Under references one should mention only those secondary materials which have been explicitly used in the research. For example assume that a report has the following –

"According to Professor Jensen (1986) free cash flows occur when a firm has excess of cash over and above current profitable projects."

The research is explicitly mentioning Professor Jensen's report. The citation in the text is called inline reference. Therefore the reference section should have the following entry –

Jensen, Michael C. (1986). Agency Cost Of Free Cash Flow, Corporate Finance, and Takeovers, *American Economic Review, Vol. 76, No. 2, May 1986*.

All reference material mentioned should have been explicitly used and all explicitly mentioned sources should have a detailed reference mention.

The reference should be mentioned in a way that a reader should be able to identify and locate the source. It is assumed that the reader has access to electronic or physical databases. It is not the researcher's duty to make the referenced material available to the reader.

There are strict rules on referencing. This will be covered in detail in the Academic Research report. A business report (limited circulation – for use inside the firm) need not be very strict on following the reference rules but it is advisable. A report by a consultant or a research report for public release should follow the referencing guidelines.

A bibliography consists of recommended material for further or detailed reading. These texts may not have been explicitly used in the research but they are listed in case a reader wants to broaden his horizon on subjects similar to the content of this research report. Bibliographies are seldom mentioned in a research report in either form.

18.10.12 Appendices and Supplementary material

In this section, one can include any material that may be of use to the reader but is not necessary for the logical flow in the report. Questionnaires, Maps, Statistical Modelling, Software output, photographs etc are found in this section. It is an optional section and is not considered to be part of the report.

Tables in the report should be created in the section where they are used or mentioned in the report. Do not put tables in the Appendices when you refer to them in the report.

Check Your Progress - 2

Q3. Name the type of report (Business or Academic)

1. The most important section in this report is the "Executive Summary"
2. This report has guidelines on how to write the names of Authors.
3. This report has a section called "Action Plan".
4. You have been told that the report should have at least 7000 words.
5. You have been told that the report will need multiple drafts before acceptance.
6. The report has a section called "Hypotheses".
7. When you asked for a format, you were told that there weren't any.
8. It is acceptable to use jargons. Many facts of the report are already known to all the readers.
9. There was no one to guide you on content or to proof read your report.
10. It is expected that other researchers will read this report.

11. Citations and references are extremely important and you need to get the style right.
12. You have been explicitly told to use a lot of graphs and charts.

Q4. State True or False

1. Situational Analysis includes mention of Data collection.
2. Problem is defined or stated after Alternative Solutions.
3. Executive Summary is before the Situational Analysis.
4. Multiple problems can be mentioned in the Problem statement section.
5. Alternative Solutions can be left open and unstated solutions can be worked out later.
6. Criteria for evaluation examines if the problem is genuine or not.
7. The evaluation section can be the shortest section in the report.
8. There is usually a solution that is the best in all the evaluation criteria.
9. One can always collect the data and then decide on the research method to be used.
10. The recommended solution is always one of the solutions from the Alternative solution set.
11. An action plan may contain timelines.
12. References list the material that the author would like the reader to read but is not cited in the report.
13. A table mentioning the summary of the evaluation can be included in the Appendix.
14. A researcher can mention “there was public unrest on the day and hence my data collection suffered” in the section Research Limitations.

18.11 Academic Research Report

An Academic Research report will usually have the following sections –

1. Title Page
2. Abstract
3. Literature Review
4. Research Problem or Model
5. Research Design and Data collection
6. Data Analysis
7. Results
8. Discussion and implications of Findings
9. Future Research
10. References

18.11.1 Title Page

The title page is the same as in section 18.10.1 pertaining to the title page of a Business Report.

18.11.2 Abstract

An abstract is a summary of the report. However the abstract may not cover all the aspects of the research report. The purpose of the abstract is to lead the reader to the full report. Hence it is different from the executive summary. The executive summary reader is unlikely to read the full report. The executive summary is an alternative to reading the full report. An abstract on the other hand is used as a 'teaser' to motivate the reader for reading the full report.

Example A1

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

Abstract

"Although the effects of shapes on area perceptions have been widely investigated, we replicate, extend, and generalize one of the few studies to relate the effects of shapes to consumption volumes (Raghubir and Krishna 1999). While Raghubir and Krishna demonstrate the effect of the elongation of prepared drinks on consumption volume, we have people pour their own drinks in a series of controlled field experiments. Two experiments in cafeterias show that both children and adults pour and consume more juice when given a short, wide glass compared to those given a tall, slender glass, but they perceive the opposite to be true. We conclude that the elongation of glasses negatively influences consumption volume in a single serving context. A third potentially policy-relevant field experiment conducted with Philadelphia bartenders and liquor shows that the effect of elongation is moderated but not eliminated with pouring experience."

18.11.3 Literature Review

All researches are conducted on the shoulders of other research. The literature review is the link between your research and other previous research in the area. A literature review demonstrates the following about your research –

1. You have understood and analyzed background research.
2. You have selected a context for your research.
3. How your research is linked to previous research.
4. It is the evidence that validates your research because a literature review will expose the gap in current research that is the reason for your research.

Example A2 (Literature Review)

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

"For instance, it has been shown that triangles are perceived to be larger than squares (Anastasia 1936; Fisher and Foster 1968), squares larger than circles (Pfeiffer 1932), elongated objects are larger than less elongated objects (Anderson and Cuneo 1978; Holmberg 1975; Holmberg and Holmberg 1969; Verge and Bogartz 1978)

Raghubir and Krishna (1999) found the effect of shapes to consumption volume. Raghubir and Krishna (1999) pre poured the drinks for the respondents; their research effectively demonstrated the importance of the effects of elongation on consumption volume in situations where a parent or a waiter serves a drink. What remains unknown however is how elongation influences consumption volume when people pour for themselves.

In the example A2, the authors establish that they have studied previous research (perception difference in two dimensions, and perception difference in volume (three dimensions) using pre poured drinks). The authors then go on to state the research gap – what happens when respondents pour the drinks themselves? One can clearly see that the authors have examined previous research and have established a research gap (an area not researched before) that they will answer by their research.

A question that is often asked is how many previous research papers should be read and mentioned. The answer to that is - as many required. Some research papers can have over a hundred papers in their review and some may have just one!

The research in example A2, for instance, relies extensively on just one paper: *Raghubir and Krishna (1999)*

18.11.4 Research Problem / Model

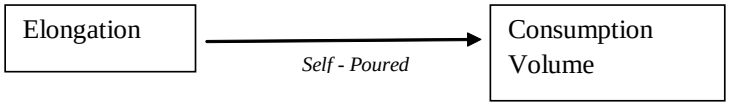
The research problem flows from the research gap identified.

Example A3

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

Research Gap Identified - how elongation influences consumption volume when people pour for themselves.



Often the research gap or the research problem is represented by a visual flow diagram.

It is possible that there are multiple variables and multiple relationships and thus the graphical representation will be more complex flow.

The research problem comprising of variables and the relationships between them are often called a model. Thus after a literature review, one should be able to arrive at a research model. There can be many models in a research paper.

18.11.5 Research Design and Data collection

The next stage is to test the model. There can be multiple ways in designing a research. A model can be tested with different research designs. The key factors that influence a research design are –

1. The variable categories (Nominal / Ordinal / Interval / Ratio)
2. The number of dependent variables
3. The number of independent variables
4. Causality (Cause and Effect) in the Model

In addition to these quantitative methods, there are qualitative methods too (not covered here as they require a completely different approach).

In addition to the research method, the author will detail how the variables are made operational and measured. It is always advisable to mention a brief description of the sample from which the data was collected. For instance – "The *main study involved 97 children (44 male) who were involved in a six week health and fitness camp in Northern Hampshire"*

Example A4

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

Research Gap Identified - how elongation influences consumption volume.

There is causality to be established because the problem definition implies - elongation **causes** consumption, the researchers selected the experimental method. At a summer camp, "upon entering the cafeteria line for breakfast on the ninth day of the camp, the children were randomly given a 22.3 oz juice glass that was either relatively short or relatively tall.

Contd….

The height of the former was 10.6 cm and the latter 18.9 cm... On their way out of the line the glasses were measured. Since all the campers finished their drinks, the consumption volume is equal to the poured volume."

Thus the variable elongation was operationalized as a Nominal variable (Categorical variable) having two groups – Short or Tall. The variable consumption was operationalized as a ratio variable (since weight or volume is a ratio quantity).

18.11.6 Data Analysis

In this section, the authors mention how the data was analyzed and the conclusions were reached on the correctness of the research problem / models.

In the specific case of the elongation leads to consumption, the researchers had to prove that the volume of juice consumed by the campers with the short glasses were more than the campers with the long glasses. Statistically this amounts to comparison of mean between two groups. This statistical test is achieved by a t-test.

Example A5

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

Research Model - Elongation influences consumption volume.

"campers who had been given short, wide glasses poured and consumed 74.37% more juice than those given tall, slender glasses (9.66 vs 5.554 oz; $p<0.05$)"

The T-Test shows that indeed those with short glasses consume more (9.66 oz) than those with long, slender glasses (5.44 oz). This difference is also statistically significant with a probability value less than 5%.

Therefore elongation indeed leads to perception of increased volume. The argument is that the campers with long, slender glasses overestimate the volume poured and consequently have only smaller portions than those with short wider glasses.

It is important to state the key statistic number (mean in this case) if the model has statistical significance. Usually in social sciences a probability value of less than 5% is taken as significant. As a reminder, it is stated that the probability value denotes the probability of getting this data distribution if the groups were equal. Since the probability is less than 5%, the groups are unequal.

18.11.7 Results

Normally the results are explicitly stated. It is explicitly stated if the relationship between the variables is statistically significant or not.

Example A6

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

Research Model - Elongation influences consumption volume.

"This supports the well-documented notion that elongation positively influences perceived volume...."

An explicit mention helps the reader in making it easy for the reader. Instead of trawling through data analysis and trying to locate the results of the analysis, it is conveniently available in a separate section.

18.11.8 Discussions and Findings

After the results are explicitly stated, it is followed by discussions on it. The discussions are often centered on why a relationship was found if the results were statistically significant or why the relationships were not significant otherwise.

The other point of discussion could be the implications of the findings. The answer to the "so what?" question. What are the implications for a practising manager? How can the findings be used in day to day life?

Example A7A

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

Research Model - Elongation influences consumption volume.

Discussion

"*The results were consistent with Rahgubir and Krishna's (1999) research. Campers poured more and consumed more juice when they poured into short, wide glasses than into tall, slender glasses. Second, campers tended to believe they poured less into short, wide glasses than into tall, slender glasses*"

Example A7

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption

(Wansink B, Van Ittersum K. 2003)

Research Model - Elongation influences consumption volume.

Contd….

Implications

"If short, wide glasses encourage bartenders to pour more alcohol than tall glasses, the selection of glasses has an impact on costs and safety"

"The other area of concern is with medications and over the counter drugs. In these cases, the inefficiency that can result from under pouring can be as dangerous as the overdosing that can result from over pouring."

"There is a desire to stimulate an increased consumption of healthy beverages. This has been long a concern in outdoor contexts where dehydration presents a health risk..."

"A parent may want to encourage a child to pour and drink more milk at home"

"A dietician may want nursing home patients to consume more juice..."

18.11.9 Future Research

In this section, the author may mention areas where further research can be done.

Example A8

Research Paper – Bottoms Up! The Influence of Elongation on Pouring and Consumption.

(Wansink B, Van Ittersum K. 2003)

Research Model - Elongation influences consumption volume.

Further Research:

In the first experiment the relationships were tested amongst student campers. In further research the same relationship can be tested –

1. Amongst Adults
2. Amongst Professionals such as Bartenders who have a long experience of pouring liquids.

The future research section is a pointer and an invitation for others to join and work in the area. When a large number of researchers are working in a particular area, the chances of citations increase thereby benefiting the researchers.

18.11.10 References

As mentioned earlier, citation and proving a proper reference is extremely important in academic papers. The following rules should be observed –

1. Citation has to be given if you are using the ideas and creativity of others. Even if you write them in your words, the work has to be cited since the idea was not yours.

2. Word by Word usage of other's material has to be minimized. It should be used only when absolute necessary and paraphrasing leads to poor quality of argument. A word by word usage should be in italics and inside quote marks.
3. Citation has to be given in the text (inline reference) and full details of the reference provided in the reference section. See Example in 18.10.11
4. Every inline citation will have a mention in the reference section and every document mentioned in reference section would have been used as an inline citation.

APA manual provides style for referencing multiple types of media. Please refer to APA manual for guidelines on references. For example – reference from Internet.

Example A9 (based on APA guidelines)

Journal Article

Koslow, S., Shamdasani, P., and Touchstone E.E. (1994). Exploring Language Effects in Ethnic Advertising: A Sociolinguistic Perspective. *Journal of Consumer Research, Vol 20, March.*

Explanation

Koslow, S., Shamdasani, P., and Touchstone E.E.	Authors
(1994) Year of Publication	
Exploring Language Effects in Ethnic Advertising	Research Paper Title
Journal of Consumer Research	Journal
Vol 20 March	Journal number

Book

Blumenfield, H. (2002). Neuroanatomy though Clinical Cases. Sinauer Associates, Sunderland U.S.A.

Explanation

Blumenfield, H.	Author
(2002) Year of publication	
Neuroanatomy though Clinical Cases	Book Title
Sinauer Associates, Sunderland U.S.A.	Publisher details

Check Your Progress - 3

Q5. State **True** or **False**

1. An abstract is written so that the reader can get updated without reading the full report.
2. In Literature Review, the author summarizes all the reports, journals, articles s/he has read.
3. The research model is derived from Literature Review.
4. The research model is what the research is all about.
5. There are multiple methods of testing a research model.
6. The sample size determines the type of research design.

7. There is no need to write in the research paper about the constituents of your sample.
8. The statistical significance value (usually a probability) should be mentioned in the research report.
9. Results need not be mentioned separately and can be restricted to the data analysis section.
10. Once the model is tested, there is no need to speculate on the practical use of it.
11. If you mention "suggested further research" then you are giving your competitors an edge.
12. If you use someone else's model but write it in your words (not used word by word from original), there is no need to give a reference.
13. You can give as reference – www.google.com.
14. You can shorten the Literature Review by assuming the readers would have read some of the famous research papers you are going to use in the model.
15. A Research model can be pictorially depicted.

Q6. State which section the statements refer to.

1. Hypotheses (variables with relationships between them) are mentioned here.
2. Practical implications of the research may be discussed.
3. How this research area can be enlarged or can be researched in greater depth by others?.
4. Previous research papers used for developing this model.
5. The relationship between supervisor affect and job retention was found to be positive and statistically significant ($p<0.001$).
6. 150 employees of a firm responded to our survey. In the survey we asked questions which enabled us to measure their employer affect, supervisor affect, peer affect, and salary satisfaction.
7. Our Hypotheses is that caste affects consumption practices.
8. Sanjay and Smita (2001) had found a relationship between language and message acceptance. However the language used for research was Advertisement language. They did not use the Newspaper Language (which can be different from the Advertisement Language) as a variable.
9. Krishnan. R (2012). Arousal. Free Press Mumbai (India)
10. Since our dependent variable was of Nominal category and the independent variables were of Interval categories, we had to choose between Logistic Regression and Discriminant Analysis for testing our hypothesis.

18.12 Summary

- Some of the reports a business student is expected to be able to generate (in their career) are: Case Study Analysis, Industry or Firm based research reports, Report recommending a particular business decision, and Article explaining business concepts.
- Case studies often form a part of the curriculum component of a business program. The audience for the report is a Professor or other Academic Staff.
- An industry analysis looks at all the firms in a particular sector and analyzes their respective business strategy, their market shares, their strengths, weakness, growth plans etc.
- A business decision report is similar to the business case and audience is business executives and consultants
- Almost all the research in business falls under the 'social sciences' category, and a standard style as specified American Psychological Association is suggested to be used.
- The suggested format for a business audience is :, Title Page, Executive Summary, Situation Analysis, Problem Definition, Alternative Solutions, Criteria for evaluation, Evaluation, Recommended Solution, Suggested Action plan, Research Limitations, References and Appendices and Supplementary Material.
- An Academic Research report will usually have the following sections: Title Page, Abstract, Literature Review, Research Problem or Model, Research Design and Data collection, Data Analysis, Results, Discussion and implications of Findings, Future Research, and References.

18.13 Glossary

Abstract: An abstract is a summary of the report. However the abstract may not cover all the aspects of the research report

Academic research: Careful study of a given subject, field, or problem, undertaken to discover facts or principles.

Bibliography: It is a list often with descriptive or critical notes of writings relating to a particular subject, period, or author

Business Decision Report: A business decision report can be very similar to the business case report except for the fact that the audience is different. Instead of Professors or Academic Staff, business executives and consultants would be reading it.

Case study report: Case studies often form a part of the curriculum component of a business program. A write from of report of the business analysis can be termed as case study report

Causality in the model: It is referred as the cause and effect within the model

Citations: These are words or piece of writing taken from a written work:

Data collection: Data collection is a process of collecting information from all the relevant sources to find answers to the research problem, test the hypothesis and evaluate the outcomes

Data analysis: Data analysis is how the data was analyzed and the conclusions were reached on the correctness of the research or problem models

Database: A database is an organized collection of structured information, or data, typically stored electronically in a computer system or stored physically

Evaluation: Evaluation provides conclusions reached on the correctness of the research problem / models

Executive Summary: Executive summary is usually a one page summary of the entire report. It should contain the problem statement (or definition) and the summary of results. The executive summary is a condensed version of the full report.

Format: An outline for a research paper is a visual reminder to include all of the pertinent details of your research into your essay or paper

Industry/Firm report: An industry analysis looks at all the firms in a particular sector. The report analyzes their respective business strategy, their market shares, their strengths, weakness, growth plans etc.

Literature review: The literature review is the link between research and other previous research in this area

Problem definition: The problem definition should be short and to the point. This section will probably be the shortest part of the report. It will have all the shortest problem cited and numbered

Report writing: Report writing is an academic skill. Reports are written and presented in academic circles and in corporate for various purposes. After completing the research it is necessary to write a formal report.

Research design: A research design is a basic plan that guides the data collection and analysis phases of the research project.

Situation Analysis: This is the first part of the textual report. The content in this section should ideally be detailed and lead the reader to the Business Problem for which this research is being carried out.

Statistical modeling: Statistical modeling is a simplified, mathematically-formalized way to approximate reality (i.e. what generates your data) and optionally to make predictions from this approximation.

Style guide: APA style is a writing style and format for academic documents such as scholarly journal articles and books. It is commonly used for citing sources within the field of behavioral and social sciences

Supplementary: Supplementary means supplying what is lacking; or adding additional material to make it complete for understanding

18.14 Suggested Readings/Reference Material

1. W. Joel Schneider, et al. Essentials of Assessment Report Writing. Wiley; 2nd edition, 2018
2. Differences between Academic and Business Writing, https://darkwing.uoregon.edu/~ddusseau/101/199/199differences.htm (Accessed on 20th September 2021)
3. Differences between Business and Academic Writing, Claremont, Graduate University, http://www.cgu.edu/PDFFiles/Writing Center/Writing Center Resources/Business vs Academic Writing.pdf (Accessed on 20th September 2021)
4. Crafting a Powerful Executive Summary, Harvard Business School, http://hbswk.hbs.edu/archive/3660.html (Accessed on 20th September 2021)
5. Dena Taylor, The Literature Review: A Few Tips On Conducting It, https://advice.writing.utoronto.ca/types-of-writing/literature-review/ (Accessed on 20th September 2021)
6. Helen, M R. Guidelines for writing a literature review, University of Minnesota, http://www.duluth.umn.edu/~hrallis/guides/researching/litreview.html, April 2018 (Accesses on September 30th 2021)
7. Journal Article Guidelines, MIT, http://web.mit.edu/2.tha/www/JournalArticleGuidelines.htm (Accessed on September 30th 2021)
8. How to write an abstract, Emerald Group Publications, http://www.emeraldgrouppublishing.com/authors/guides/write/abstracts.htm?part=1 (Accessed on September 30th 2021)
9. Lancaster G (2005). Research Methods in Management. Elsevier Publications
10. Cooper, D.R. and Schindler, P.S. and J. K. Sharma (2018), Business Research Methods, 12th edition, McGraw-Hill Education

18.15 Self-Assessment Questions

1. What are different types of research reports? Explain each one.
2. Distinguish between business writing and academic writing.
3. List the parts of a business report.
4. State the structure of an academic report.

18.16 Answers to Check Your Progress Questions

Q1

1. Business Decision
2. Industry Study
3. Business Concept Research (Academic research)
4. Case Study

Q2

1. False
2. False
3. True
4. True
5. False

Q3

1. Business
2. Academic
3. Business
4. Academic
5. Academic
6. Academic
7. Business
8. Business
9. Business
10. Academic
11. Academic
12. Business

Q4

1. False
2. False
3. True
4. True
5. False
6. False
7. False
8. False
9. False
10. True

11. True
12. False
13. False
14. False

Q5

1. False
2. False
3. True
4. True
5. True
6. False
7. False
8. True
9. False
10. False
11. False
12. False
13. False
14. False
15. True

Q6

1. Literature Review or Research Model
2. Implications
3. Future Research
4. Literature Review
5. Results
6. Data Collection
7. Literature Review or Research Model
8. Literature Review
9. Reference
10. Research Design or Research Method or Data Analysis

Quantitative Methods

Course Structure

Block	Unit Nos.	Unit Title
I Introduction to Statistics and Probability		
	1.	Arranging Data
	2.	Central Tendency and Dispersion
	3.	Probability
	4.	Probability Distribution and Decision Theory
II Statistical Relations and Hypothesis Testing		
	5.	Statistical Inference and Hypothesis Testing
	6.	Correlation and Linear Regression
III Statistical Regression and Quality Control		
	7.	Multiple Regression
	8.	Time Series Analysis
	9.	Quality Control
IV Statistical Distributions, Variations and IT		
	10.	Chi-Square Test and Analysis of Variance
	11.	Role of IT in Modern Business Enterprise
	12.	Statistical Software Tools
V Advanced Statistics		
	13.	Index Numbers
	14.	Simulation
	15.	Linear Programming
VI Business Research		
	16.	Introduction to Business Research Methods
	17.	Questionnaire Design
	18.	Report Writing