MODULE ONE: FOUNDATIONS OF BUSINESS ANALYTICS

Introduction – Evolution – Scope – Data for Analytics – Decision models – Descriptive, Predictive, Prescriptive – Introduction to data warehousing – Dashboards and reporting – Master data management(only theory) HR Analytics, Marketing Analytics and Financial Analytics to be taught using Excel.s

Meaning of Business Analytics

- Business Analytics is an investigative approach that seeks to answer the what, why, when and how of business operations.
- Business Analytics is analysing data and deriving insights from it to improve business operations, make better decisions, reduce costs, and increase profits. It involves collecting, cleaning, organising, visualising, and interpreting data to draw meaningful conclusions about the data. Business analytics is used across various industries to identify trends, develop strategies and optimise processes for improved performance.
- The use of business analytics has grown significantly over the past few years as organisations have sought out new ways to gain a competitive advantage. This growth can be seen in the increasing demand for professionals with analytical skills who understand how to interpret data sets into actionable information that can be used to drive better decision-making.

Introduction

- Business analytics is the process of transforming data into insights to improve business decisions. Data management, data visualization, predictive modeling, data mining, forecasting simulation, and optimization are some of the tools used to create insights from data.
- Business analytics (BA) is a set of disciplines and technologies for solving business problems using data analysis, statistical models and other quantitative methods.

Introduction

- The use of business analytics is very popular in some industries such as healthcare, hospitality, and any other business that has to track or closely monitor its customers. Many high-end business analytics software solutions and platforms have been developed to ingest and process large data sets.
- Examples of Business Analytics is working with available data to figure out and assess how and why the tastes and preferences change of customers who visit a particular restaurant regularly.

Introduction

Business Analytics has become an integral part of business operations and performance management. Businesses and corporations who wish to gain a competitive edge in the market during modern times must employ the services of skilled business analysts to do so. Without utilizing data effectively and without a dedicated analytics team, companies will not be able to sustain themselves in this world where the competition employs various analytical tools and techniques to facilitate peak performance. It’s not just about performance, as business analytics can help companies increase revenue by cutting costs and decreasing waste.

Introduction

Companies can now judge their markets better, understand how their products perform against substitute products from other companies and analyze how consumers react to their services or products. With the valuable information and insights gained from data sourced or generated, organizations can make better data-driven decisions that can help them become successful.

Business analytics is also about sustainability and the efficient use of resources. Without skilled business analysts, companies will not effectively conduct their businesses anymore. From finances and marketing to performance or operations analytics, business analytics is being used everywhere to optimize a company’s operational (business) affairs.

Introduction:

Business analytics has existed for a long time, even without the advanced tools and techniques we have at our disposal now. For instance, merchants used to rely on handwritten annotations to contemplate their business's annual performance. Smart business people used to study products based on surveys and reviews and understand what made consumers buy products and recurrently use (buy) them. However, all of this was done manually and took uptime. This completely changed when tools for advanced business analytics were slowly introduced into our society. Along these came the later generations of business analysts that would change the world forever. The evolution of business analytics was welcomed with open arms by corporations around the world.

Evolution OF Business Analytics

In recent times, business analytics has evolved into a much more advanced set of tools and techniques assisted by automation and big data. Initially, business analytics was limited to a few corporate applications used by only the major MNCs. The first adoption of computing for business was noticed in the use of report-building, presentations and data entry using applications such as Microsoft Excel. Later on, more advanced applications that involved multi-dimensional data processing and data analytics were seen using add-ons such as PowerPivot in Excel. This was still a long way from BI or business intelligence, which the highly accredited firm, Gartner.

Evolution of Business Analytics

Once the concept of BI was introduced into the market, corporations around the globe wanted their hands on it. BI used various digital instruments, technologies, and metrics to evaluate business performance and helped companies get valuable insights. This facilitated more informed decision-making and ensured that all the important organizations during that time adopted software such as Tableau, SAS, or Microsoft Power BI to support their business activities and operations. With BI, concepts such as ‘web questions,’ collaboration, data security, and sourcing data from databases and distributed file systems came into mainstream use as well. By now, business analytics was not just used by large MNCs and conglomerates but also medium-level and much smaller enterprises as well. This introduced the world to an era where analytics helped create research models, design models, and simulators that further helped companies use data to forecast and predict future outcomes more accurately than ever.

Scope of Business Analytics

- Business analytics has a wide range of application and usages. It can be used for descriptive analysis in which data is utilized to understand past and present situation. This kind of descriptive analysis is used to asses' current market position of the company and effectiveness of previous business decision.
- It is used for predictive analysis, which is typical used to asses' previous business performance.
- Business analytics is also used for prescriptive analysis, which is utilized to formulate optimization techniques for stronger business performance.
- For example, business analytics is used to determine pricing of various products in a departmental store based past and present set of information.

Data for Analytics

- Data analytics is the process of analyzing raw data in order to draw out meaningful, actionable insights, which are then used to inform and drive smart business decisions.
- A data analyst will extract raw data, organize it, and then analyze it, transforming it from incomprehensible numbers into coherent, intelligible information. Having interpreted the data, the data analyst will then pass on their findings in the form of suggestions or recommendations about what the company's next steps should be.
- Data analytics helps you to make sense of the past and to predict future trends and behaviors; rather than basing your decisions and strategies on guesswork, you're making informed choices based on what the data is telling you.

Decision Models

- ✓Decision model is a structured process that predicts the outcome of certain scenarios, offering valuable insights to business users. Decision models are a forecasting tool that provide an overview of all the potential possibilities of specific actions. Every day, executives make dozens of critical decisions.
- ✓Should we enter a certain market? How should we design our new product? Which partners and distribution channels should we use? These decisions need to happen quickly, and they often determine the business's profitability and overall success.
- ✓Decision model helps teams streamline their decision-making processes so they can prioritize their top business objectives. Even if they don't have a ton of information at their fingertips, managers can still use decision models to lay the groundwork for their decision networks and alter them accordingly.

Descriptive Analysis

- Descriptive analytics is the analysis of historical data using two key methods – data aggregation and data mining - which are used to uncover trends and patterns. Descriptive analytics is not used to draw inferences or make predictions about the future from its findings; rather it is concerned with representing what has happened in the past.
- Descriptive analytics are often displayed using visual data representations like line, bar and pie charts and, although they give useful insights on its own, often act as a foundation for future analysis. Because descriptive analytics uses fairly simple analysis techniques, any findings should be easy for the wider business audience to understand.

Predictive Analysis

- Predictive analytics is a more advanced method of data analysis that uses probabilities to make assessments of what could happen in the future. Like descriptive analytics, prescriptive analytics uses data mining – however it also uses statistical modelling and machine learning techniques to identify the likelihood of future outcomes based on historical data. To make predictions, machine learning algorithms take existing data and attempt to fill in the missing data with the best possible guesses.
- These predictions can then be used to solve problems and identify opportunities for growth. For example, organisations are using predictive analytics to prevent fraud by looking for patterns in criminal behaviour, optimising their marketing campaigns by spotting opportunities for cross selling and reducing risk by using past behaviours to predict which customers are most likely to default on payments.

Prescriptive Analysis

- prescriptive analytics emphasises actionable insights instead of data monitoring. This is achieved through gathering data from a range of descriptive and predictive sources and applying them to the decision-making process. Algorithms then create and re-create possible decision patterns that could affect an organisation in different ways.
- What makes prescriptive analytics especially valuable is their ability to measure the repercussions of a decision based on different future scenarios and then recommend the best course of action to take to achieve a company's goals.
- The business benefit of using prescriptive analytics is huge. It enables teams to view the best course of action before making decisions, saving time and money whilst achieving optimal results.

Introduction to data warehousing

- A Data Warehousing (DW) is a relational database that is designed for query and analysis rather than transaction processing. It includes historical data derived from transaction data from single and multiple sources.
- A Data Warehousing provides integrated, enterprise-wide, historical data and focuses on providing support for decision-makers for data modeling and analysis.
- A Data Warehousing is a group of data specific to the entire organization, not only to a particular group of users.
- It is not used for daily operations and transaction processing but used for making decisions.

Dashboards and Reporting

- Dashboard reporting is a graphical depiction of an organization's key performance indicators (KPIs). Reports are created by pulling together data from existing reports available, giving the user a graphical snapshot of a company's operations.
- Viewing any form of information using graphics makes data easier to understand, analyze, and process into actionable insights. Adding the functionality of dashboard reporting provides a comprehensive and clear view of all business insights at a glance. A dashboard can be created by linking it to Excel databases or other software that data and reporting is produced on. It can be automated so that as data is uploaded to the database or reporting system, the charts and graphs are automatically updated. Dashboard reporting becomes critical in a dynamic business environment, providing real-time insights that can be acted upon to steer organizations toward their goals.

MODULE TWO: INTRODUCTION TO MANAGEMENT RESEARCH

Definition, Nature and scope of Management Research, Types of Research , roles , Process, Outcome, Nature, Action and Logic, Research concepts, constructs, propositions and hypotheses, Features of a good Research Study, Research Process, and Ethical issues.

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Management Research Definition

Management research refers to the act of study of various dimensions of organizational problems and finding out the managerial tools of techniques so that problems can be solved with the use of such ideas.

Management research is the application of information which has been gathered and analysed to the resolution of a given problem or question. It should contribute, whether directly or indirectly, to the decision-making processes in an organization.

Management research can also be defined as “a systematic process of variables which contributes to acquiring management information of any organization.”

Nature of Management Research

1. **Transdisplinary**: Management research draws knowledge combining the information of various subjects. It means management research should consider the varied nature of information and data from a large area of subjects like strategy, structure, environment, sociology, anthropology etc.
2. **Commercial Advantages**: Management research is conducted to solve particular problems of individual organizations. Thus management research focuses on the commercial advantages of a business organizations.

Nature of Management Research

3. **Practical**: The findings found from the management research must respond to the issue or problem of the business organizations. Thus it must be practically applicable.

4. **Double hurdle**: Management research has the problem of theory and practice. Knowledge creation is made by academia and research is governed by the world of practice. Thus there is always a hurdle of balancing them.

Scope of Management Research

Research facilitates the managerial decision process for all aspects of a business. By lowering the uncertainty of decisions, it cuts down on the risk of making incorrect decisions. Research should be an aid to managerial judgment but not a replacement for it.

Scope of Management Research

Research is also necessary for collecting information on the social and economic structure of an economy to understand the process of change occurring in the country. Collection of statistical information, though not a routine task, involves various research problems. Therefore, large staff of research technicians or experts is engaged by the government these days to undertake this work.

Scope of Management Research

Research also assumes significance in solving various operational and planning problems associated with business and industry. In several ways, operations research, market research and motivational research are vital and their results assist in taking business decisions. Market research refers to the investigation of the structure and development of a market for the formulation of efficient policies relating to purchases, production and sales. Operational research relates to the application of logical, mathematical, and analytical techniques to find solution to business problems, such as cost minimization or profit maximization, or the optimization problems. Motivational research helps to determine why people behave in the manner they do with respect to market characteristics. More specifically, it is concerned with the analysis of the motivations underlying consumer behaviour. All these researches are very useful for business and industry, and are responsible for business decision-making.

Scope of Management Research

Research is equally important to social scientists for analyzing the social relationships and seeking explanations to various social problems. It gives intellectual satisfaction of knowing things for the sake of knowledge. It also possesses the practical utility for the social scientist to gain knowledge so as to be able to do something better or in a more efficient manner. The research in social sciences is concerned with both knowledge for its own sake, and knowledge for what it can contribute to solve practical problems.

Types of Research

- Applied Research
- Basic Research
- Correlational Research
- Descriptive Research
- Ethnographic Research
- Experimental Research
- Exploratory Research
- Grounded Theory
- Historical Research
- Phenomenological Research
- Qualitative Research
- Quantitative Research

Types of Research

- Developmental research
- Case study research
- Field survey research
- Action research
- Evaluation research

Types of Research

Applied research

It is a type of research that attempts to find practical solutions to existing problems. These can include a variety of challenges, such as infrastructure and conservation. This type of research employs empirical methodologies, such as experiments, to develop an understanding of new knowledge.

Types of Research

- It is a scientific study that seek to solve various practical problems in the day to day life. It find answers or solutions to everyday problems, cure illness, develop innovative technologies etc.
- For example-

1.Improve agricultural crop production

2.Treat or cure specific disease

3.Improve energy efficiency of homes, offices, modes of transportation

Types of Research

Basic Research

It is called as Fundamental or Pure research. It Expands the person's knowledge. This type of research is not going to create or invent anything new. Instead, it is based on Basic science investigation.

For example-

1.How did universe begin?

2.What are protons?

Types of Research

Correlational Research

The relationship among 2 or more variables without necessarily determining the cause and effect is known as correlational research.

For example-

1.Correlation between obesity and diabetes mellitus

2.Correlation between smoking and cancer

Types of Research

Descriptive Research

This type of research provides accurate portrayal of characteristics of a particular individual, situation or group. Also known as statistical research. It deals with everything that can be counted and studied which have an impact on the lives of people.

- Advantages-

1.Less expensive, time consuming

2.Collect a large amount of notes for detailed studying.

- Disadvantages-

1.Require more skills

2.Does not identify cause behind the research

Types of Research

Ethnographic Research

This type of research involves investigation of a culture through an in-depth study of members of culture. It involves systematic collection, description, analysis of data for development of theories of cultural behavior. There are anthropological studies that studies people, ethnic group, ethnic formations and social welfare characteristics. It is done on the basis of observations, interviews, questionnaire and data collection.

Types of Research

Experimental Research

- This study involves objective, systematic, controlled investigation for purpose of predicting and controlling the phenomena. It also includes examining the probability and causality among variables.
- Advantages-

1.Best in establishing the cause and effect relationships

- Disadvantages-

1.Artificiality

2.Feasibility

3.Unethical

- Variables-
- There will be two variables- Dependent and Independent

Types of Research

Exploratory Research

This type of research will be conducted for a problem that has not been clearly defined. It helps to determine the best research design, data collection method and selection of subjects. It is quite informal relying on the secondary research.

For Example-

- Online marketing and exploring through different sites

Types of Research

Ground Theory Research

It studies about the problems existing in a given social environment and how people involved handles them. It operates almost in a reverse fashion from traditional research and involves 4 stages- Codes, Concepts, Categories and Theory

For Example-

- Creating a situation and looking at how people react to it

Types of Research

Historical Research

Research involving analysis of events that occurred in the remote or recent past.

Application- Understanding this can add perspective on how we can examine the current situation.

Types of Research

Phenomenological Research

It aim to describe an experience that has been actually lived by a person.

For example-

- A person suffering from cancer, quality of life of the patient at that point of time

Types of Research

Quantitative Research

Involving numbers and quantifying the results mathematically in numbers.

Qualitative Research

Difficult or impossible to quantify mathematically such as beliefs, meanings, attributes and symbols. It aim to gather an in-depth understanding of human behavior.

Types of Research

Developmental research

A developmental research is conducted mainly to predict the future. This is where facts are known by gathering variables and finding out their interrelated factors, sequences, directions, their rates of change, and other measurable variables. The three main variations of these types of management research are trend study, cross-sectional growth, and longitudinal growth study.

Types of Research

Case study research

These types of management research are very popular among research institutions. Here, the researcher takes a deep and thorough examination of a company, a group of people, or a single individual.

In these types of management research, the researcher looks for variables that are related to the item under study and examines them to draw conclusions from the understudied variables.

Types of Research

Field survey research

These types of management research are usually performed to find out interactions and relations among the studied variables. In this study, the independent variables cannot be manipulated to draw conclusions. Rather, the researcher makes use of the dependent variables collected from the understudied subjects and draw conclusions based on the result obtained from these subjects. Here, hypothesis is usually tested to find correlation between the variables taken from the field study and the independent variables.

Types of Research

Action research

This is one of the most popular types of management research. This kind of research is focused on finding new approaches to decision making processes or acquiring new skills to solve a problem. It takes a more practical approach and is directly linked to the main concerned problem. It can also be called applied research and has been helpful in solving a lot of management problems in business organizations.

Types of Research

Evaluation research

It is a research that is undertaken to evaluate the extent of implementation of a project in order to find out the level of recorded success. These types of management research are usually carried out to ascertain whether objectives are well followed. Evaluation research and action research are very vital in management control and execution.

Roles of Research

The main roles of research are to inform action, gather evidence for theories, and contribute to developing knowledge in a field of study.

Conducting Research can help firms avoid failure in the future. Businesses may utilize research to determine whether now is the best time to expand into a new city or whether they require a loan. It could also help small businesses figure out whether or not a procedure needs to be changed.

For any organization to remain competitive, research is vital. Its essential capacity is to supply a business with an approach to accurately decide its clients. In order to identify a business's customers correctly, it requires research. Surveys can help an organization analyze the preferences of its target customers.

Process of Research

Step 1: Identify the Problem

- Finding an issue or formulating a research question is the first step. A well-defined research problem will guide the researcher through all stages of the research process, from setting objectives to choosing a technique. There are a number of approaches to get insight into a topic and gain a better understanding of it. Such as:

- A preliminary survey
- Case studies
- Interviews with a small group of people
- Observational survey

Process of Research

Step 2: Evaluate the Literature

- A thorough examination of the relevant studies is essential to the research process. It enables the researcher to identify the precise aspects of the problem. Once a problem has been found, the investigator or researcher needs to find out more about it.
- This stage gives problem-zone background. It teaches the investigator about previous research, how they were conducted, and its conclusions. The researcher can build consistency between his work and others through a literature review. Such a review exposes the researcher to a more significant body of knowledge and helps him follow the research process efficiently.

Process of Research

Step 3: Create Hypotheses

- Formulating an original hypothesis is the next logical step after narrowing down the research topic and defining it. A belief solves logical relationships between variables. In order to establish a hypothesis, a researcher must have a certain amount of expertise in the field.
- It is important for researchers to keep in mind while formulating a hypothesis that it must be based on the research topic. Researchers are able to concentrate their efforts and stay committed to their objectives when they develop theories to guide their work.

Process of Research

Step 4: The Research Design

- Research design is the plan for achieving objectives and answering research questions. It outlines how to get the relevant information. Its goal is to design research to test hypotheses, address the research questions, and provide decision-making insights.
- The research design aims to minimize the time, money, and effort required to acquire meaningful evidence. This plan fits into four categories:
- Exploration and Surveys
- Experiment
- Data Analysis
- Observation

Process of Research

Step 5: Describe Population

- Research projects usually look at a specific group of people, facilities, or how technology is used in the business. In research, the term population refers to this study group. The research topic and purpose help determine the study group.
- Suppose a researcher wishes to investigate a certain group of people in the community. In that case, the research could target a specific age group, males or females, a geographic location, or an ethnic group. A final step in a study’s design is to specify its sample or population so that the results may be generalized.

Process of Research

Step 6: Data Collection

- Data collection is important in obtaining the knowledge or information required to answer the research issue. Every research collected data, either from the literature or the people being studied. Data must be collected from the two categories of researchers. These sources may provide primary data.
- Experiment
- Questionnaire
- Observation
- Interview
- Secondary data categories are:
- Literature survey
- Official, unofficial reports
- An approach based on library resources

Process of Research

Step 7: Data Analysis

- During research design, the researcher plans data analysis. After collecting data, the researcher analyzes it. The data is examined based on the approach in this step. The research findings are reviewed and reported.
- Data analysis involves a number of closely related stages, such as setting up categories, applying these categories to raw data through coding and tabulation, and then drawing statistical conclusions. The researcher can examine the acquired data using a variety of statistical methods.

Process of Research

Step 8: The Report-writing

The Layout: On the first page, the title, date, acknowledgments, and preface should be on the report. A table of contents should be followed by a list of tables, graphs, and charts if any.

- **Introduction:** It should state the research's purpose and methods. This section should include the study's scope and limits.
  - **Summary of Findings:** A non-technical summary of findings and recommendations will follow the introduction. The findings should be summarized if they're lengthy.
- **Principal Report:** The main body of the report should make sense and be broken up into sections that are easy to understand.

Outcome of Research

Research outcome means the results and conclusions arrived at as the result of particular research activities and includes products, processes, experimental methods and supporting data.

Outcomes are important because if each different research study measures a different outcome, we are not able to compare the results or findings from each study.

An easy way to think of this is that outcomes are the results, and outputs are the activities that support the desired results. For example, a business outcome could be 'increased customer satisfaction'

Outcome of Research

Scientists can develop new theories, ideas and products that shape our society and our everyday lives. The purpose of research is to further understand the world and to learn how this knowledge can be applied to better everyday life. It is an integral part of problem solving.

Nature, Action and Logic

Research, is systematic and critical investigation of a phenomena. It identifies the variables, collects and analyses data on such variables to find answers to certain crucial questions.

Good research follows a systematic approach to capture accurate data. Researchers need to practice ethics and a code of conduct while making observations or drawing conclusions. The analysis is based on logical reasoning and involves both inductive and deductive methods.

Research involves re-examining the data till correct findings are arrived. This is possible only if the research approach is flexible in nature. There should always be scope to add in significant data or change the existing data as per the requirement.

Nature

1. Generalized.
2. Controlled.
3. Rigorous.
4. Empirical.
5. Systematic
6. Reliability.
7. Validity.
8. Employs hypothesis
9. Analytical & Accuracy
10. Credibility.
11. Critical

Nature

1. Generalised: The researcher usually divides the identified population into smaller samples depending on the resource availability at the time of research being conducted.
2. Controlled: The concept of control implies that, in exploring causality in relation to two variables (factors), you set up your study in a way that minimizes the effects of other factors affecting the relationship.

Nature

3. Rigorous: One must be careful in ensuring that the procedures followed to find answers to questions are relevant, appropriate and justified.

4. Empirical: The processes adopted should be tested for the accuracy and each step should be coherent in progression. Empirical nature of research means that the research has been conducted following rigorous scientific methods and procedures. Quantitative research is easier to prove scientifically than qualitative research. In qualitative research biases and prejudice are easy to occur.

5. Systematic: The procedure or process being developed to undertake a study should be carefully drafted to ensure that resources utilization is optimized. Disorganized procedures would never yield expected outcomes.

Nature

6. Reliability: This is a the degree to which the result of a measurement, calculation, or specification can be depended on to be accurate.It is difficult to be measured accurately, but now there are instruments which can estimate the reliability of a research.

7. Validity & Verifiability: This should not be confused with notions of certainty nor necessity. The validity of a measurement tool (for example, a test in education) is considered to be the degree to which the tool measures what it claims to measure. Validity is based on the strength of a collection of different types of evidence.

Nature

8. Employs Hypothesis: Any research definitely begins with formulation of a hypothesis. A hypothesis can be defined as an educated guess about the relationship between two or more variables. A hypothesis is an idea around which one starts working before it is actually converted to research.

9. Analytical & Accurate : A research should be focused not only about what is happening but also on how and why a particular phenomenon, process draws certain conclusions. Data collected should be reasonable and free of errors to be easily analyzed. Accuracy is also the degree to which each research process, instrument, and tool is related to each other.

Accuracy also measures whether research tools have been selected in best possible manner and research procedures suits the research problem or not. Selection of appropriate data collection tools is essential for a research.

Nature

10. Credibility: research study conducted based on primary data is always reliable and carries more credibility. A certain percentage of secondary data can be used if the primary source is not available but basing a research completely on secondary data when primary data can be gathered is least credible. When researcher gives accurate references in the research the credibility of the research increases but fake references also decrease the credibility of the research.

11. Critical: Critical scrutiny of the procedures used and the methods employed is crucial to a research enquiry. The process of investigation must be free from drawbacks. The process adopted and the procedures used must be able to withstand critical scrutiny.

Action and Logic

Research is logical if ideas are presented in a rational manner without jumping to unfounded conclusions. Logic involves giving valid reasons before reaching a conclusion, so is essentially about the order in which ideas are presented.

The application of Logic in research is imperative as it gives validity to conclusions or inferences drawn from a research study.

Logic allows in research that to anticipate and think about situations and objects that we are not observing at the moment.

Action and Logic

a. Deductive

b. Inductive

Deductive logic Deductive, is derived from the root word deduction which the defines as the process of drawing a conclusion from available information, in other words, the forming of conclusions by applying the rules of logic to a premise. Deductive logic is about the validity of arguments.

Inductive logic as opposed to deductive, is the process of drawing a conclusion about an object or event that has yet to be observed or occur, on the basis of previous observations of similar

.

Research concepts

Reliability, validity, statistical significance, experimental validity, and correlations—the main factors that affect the quality of finding.

- Reliability refers to how consistently a method measures something. If the same result can be consistently achieved by using the same methods under the same circumstances, the measurement is considered reliable.

A doctor uses a symptom questionnaire to diagnose a patient with a long-term medical condition. Several different doctors use the same questionnaire with the same patient but give different diagnoses. This indicates that the questionnaire has low reliability as a measure of the condition.

Research concepts

- Validity refers to how accurately a method measures what it is intended to measure. If research has high validity, that means it produces results that correspond to real properties, characteristics, and variations in the physical or social world.
- A validity study will help you ensure this data is accurate.
- If a symptom questionnaire results in a reliable diagnosis when answered at different times and with different doctors, this indicates that it has high validity as a measurement of the medical condition.

Research concepts

The validity of a research study refers to how well the results among the study participants represent true findings among similar individuals outside the study.

Validity refers to how accurately a method measures what it is intended to measure

Reliability is important because it measures the quality of the research. Findings that are true or accurate from a research study are often reliable

Research concepts

A statistically significant result has a very low chance of occurring if there were no true effect in a research study.

A high degree of statistical significance indicates that an observed relationship is unlikely to be due to chance.

Statistical significance is important because it allows researchers to hold a degree of confidence that their findings are real, reliable, and not due to chance. But statistical significance is not equally important to all researchers in all situations.

Research concepts

In scientific research design and experimentation, validity refers to whether a study can scientifically answer the questions it intends to solve. The validity of an experimental result is the degree to which it measures what it is supposed to measure.

In management research design and experimentation, validity refers to whether a study can scientifically answer the questions it intends to solve. The validity of an experimental result is the degree to which it measures what it is supposed to measure.

Research concepts

Internal validity addresses the ‘true’ causes of outcomes that we observe in our study.

Good experimental techniques, in which the effect of an independent variable on a dependent variable is studied under highly controlled conditions, usually allow for higher degrees of internal validity than, for example, single-case designs.

Research concepts

- External validity concerns the extent to which the results of a study can be held to be true for other cases, for example, to different people, settings, places, or times.
- In other words, it is about whether findings can be validly generalized.
- It seeks to answer the question: if the same research study was conducted in those other cases, would it get the same results?
- To what populations, settings, treatment variables, and measurement variables can these results be generalized?
- A study of fifth-graders, for example, in a rural school that found one method of teaching superior to another, may not be applicable with the students of a similar grade or of a different grade in an urban school.

Research concepts

A correlational research design investigates relationships between variables without the researcher controlling or manipulating any of them. A correlation reflects the strength and/or direction of the relationship between two (or more) variables. The direction of a correlation can be either positive or negative.

The correlation coefficient helps in measuring the extent of the relationship between two variables in one figure.

Correlation analysis facilitates the understanding of economic behaviour and helps in locating the critically important variables on which others depend.

Research concepts

- **1. Positive correlation:** A positive relationship between two variables is when an increase in one variable leads to a rise in the other variable. A decrease in one variable will see a reduction in the other variable. For example, the amount of money a person has might positively correlate with the number of cars the person owns.
- **2. Negative correlation:** A negative correlation is quite literally the opposite of a positive relationship. If there is an increase in one variable, the second variable will show a decrease and vice versa.
- For example, being educated might negatively correlate with the crime rate when an increase in one variable leads to a decrease in another and vice versa. If a country's education level is improved, it can lower crime rates. Please note that this doesn't mean that lack of education leads to crimes. It only means that a lack of education and crime is believed to have a common reason – poverty.
- **3. No correlation:** There is no correlation between the two variables in this third type. A change in one variable may not necessarily see a difference in the other variable. For example, being a millionaire and happiness are not correlated. An increase in money doesn't lead to happiness.

Research concepts

- **Non-experimental**: The researcher only measures and observes the relationship between the variables without altering them or subjecting them to external conditioning.
- **Backward-looking**: Correlational research only looks back at historical data and observes events in the past. Researchers use it to measure and spot historical patterns between two variables. A correlational study may show a positive relationship between two variables, but this can change in the future.
- **Dynamic**: The patterns between two variables from correlational research are never constant and are always changing. Two variables having negative correlation research in the past can have a positive correlation relationship in the future due to various factors.

Constructs

A construct is a theoretical concept, theme, or idea based on empirical observations. It's a variable that's usually not directly measurable. Example: Constructs Psychologists develop and research constructs to understand individual and group differences. Some common constructs include: Self-esteem.

Constructs are the building blocks of theories, helping to explain how and why certain phenomena behave the way that they do.

Constructs are considered latent variable because they cannot be directly observable or measured. Typical constructs in marketing research include Brand Loyalty, Purchase Intent, and Customer Satisfaction.

Constructs

A construct is an abstract concept that is specifically chosen to explain a given phenomenon.

A construct is an image or abstract idea specifi cally invented for a given research and/or theory-building purpose.

Constructs are broad concepts or topics for a study. Constructs can be conceptually defined in that they have meaning in theoretical terms. They can be abstract and do not necessarily need to be directly observable. Examples of constructs include intelligence or life satisfaction.

Constructs

A construct is an abstract idea inferred from specific instances that are thought to be related. Typical marketing constructs are brand loyalty, satisfaction, preference, awareness, knowledge.

Research objectives typically call for the measurement of constructs.

There are customary methods for defining and measuring constructs.

Propositions and Hypotheses

A proposition deals with the connection between two existing concepts. The main difference between the two is that a hypothesis must be testable and measurable, while a proposition deals with pure concepts for which no laboratory test is currently available.

Propositions and Hypotheses

Hypotheses and the Scientific Method Forming a hypothesis is the initial step in developing a theory under the scientific method. It is an educated guess based on research and working knowledge. For a hypothesis to be considered valid, it must make a prediction that scientists can test using a repeatable experiment. If a hypothesis cannot be falsified through experimentation, it cannot be considered part of a valid scientific theory.

Propositions and Hypotheses

Scientific Propositions A proposition is similar to a hypothesis, but its main purpose is to suggest a link between two concepts in a situation where the link cannot be verified by experiment. As a result, it relies heavily on prior research, reasonable assumptions and existing correlative evidence. A scientist can use a proposition to spur further research on a question or pose one in hopes that further evidence or experimental methods.

Propositions and Hypotheses

Propositions can serve an important role in the scientific process. By suggesting a link between two concepts, a scientific proposition can suggest promising areas of inquiry for researchers.

In areas of study where valid hypotheses can rarely be made, a proposition may serve as a common assumption that can support further speculation. This can occur in extremely complex systems, such as those dealt with by sociology and economics, where an experimental test would be prohibitively expensive or difficult. Propositions are also valuable in areas of study in which little hard evidence remains, such as archeological and paleontological studies in which only fragments of evidence have been discovered.

Propositions and Hypotheses

Drawbacks of Propositions Because a proposition does not rely on testable data, it is more difficult to disprove in a scientific context. It only needs to be convincing and internally consistent to appear valid. Propositions that satisfy both of these conditions have nevertheless been found to be wrong or inaccurate when new testable data becomes available. Belief in propositions that have been commonly accepted for long periods of time may be extremely difficult to overcome, even if other researchers put more likely propositions forward.

Features of a good Research Study

Good research uses relevant, empirical data and proper data analysis methods.

One of the most important qualities of a good research study is that it deals with empirical data.

Empirical data is data that has been collected by researchers themselves through observation, experience, or experimentation.

Good research follows a systematic, appropriate research methodology.

Good research acknowledges previous research on the topic.

Features of a good Research Study

Good research uses relevant, empirical data and proper data analysis methods.

Good research is representative and generalizable.

Good research is guided by logic.

Good research has external validity.

Good research is replicable, reproducible, and transparent.

Good research acknowledges its limitations and provides suggestions for future research.

Good research is ethical.

Ethical issues

- The goals of human research often include understanding real-life phenomena, studying effective treatments, investigating behaviours, and improving lives in other ways.

  Ethical considerations are

- Protect the rights of research participants
- Enhance research validity
- Maintain scientific integrity

Ethical issues

Honesty and Integrity

This means that you need to report your research honestly, and that this applies to your methods your data, your results, and whether you have previously published any of it. You should not make up any data, including extrapolating unreasonably from some of your results, or do anything which could be construed as trying to mislead anyone. It is better to undersell than over-exaggerate your findings.

When working with others, you should always keep to any agreements, and act sincerely.

Objectivity

You should aim to avoid bias in any aspect of your research, including design, data analysis, interpretation, and peer review. For example, you should never recommend as a peer reviewer someone you know, or who you have worked with, and you should try to ensure that no groups are inadvertently excluded from your research. This also means that you need to disclose any personal or financial interests that may affect your research.

Ethical issues

Carefulness

Take care in carrying out your research to avoid careless mistakes. You should also review your work carefully and critically to ensure that your results are credible. It is also important to keep full records of your research. If you are asked to act as a peer reviewer, you should take the time to do the job effectively and fully.

Ethical issues

Openness

You should always be prepared to share your data and results, along with any new tools that you have developed, when you publish your findings, as this helps to further knowledge and advance science. You should also be open to criticism and new ideas.

Respect for Intellectual Property

You should never plagiarise, or copy, other people's work and try to pass it off as your own. You should always ask for permission before using other people's tools or methods, unpublished data or results. **Not doing so is plagiarism.** Obviously, you need to respect copyrights and patents, together with other forms of intellectual property, and always acknowledge contributions to your research. If in doubt, acknowledge, to avoid any risk of plagiarism.

Confidentiality

You should respect anything that has been provided in confidence. You should also follow guidelines on protection of sensitive information such as patient records.

Responsible Publication

You should publish to advance to state of research and knowledge, and not just to advance your career. This means, in essence, that you should not publish anything that is not new, or that duplicates someone else’s work.

Ethical issues

Legality

You should always be aware of laws and regulations that govern your work, and be sure that you conform to them.

Animal Care

If you are using animals in your research, you should always be sure that your experiments are both necessary and well-designed. You should also show respect for the animals you are using, and make sure that they are properly cared for.

Ethical issues

Human Subjects Protection

If your research involves people, you should make sure that you reduce any possible harm to the minimum, and maximise the benefits both to participants and other people.

This means, for example, that you should not expose people to more tests than are strictly necessary to fulfil your research aims. You should always respect human rights, including the right to privacy and autonomy. You may need to take particular care with vulnerable groups, which include, but are not limited to, children, older people, and those with learning difficulties.

MODULE THREE: RESEARCH PROBLEM, RESEARCH HYPOTHESIS AND RESEARCH DESIGN12 HOURS

Identification and Selection of the Problem, Definition and Statement of the Problem, Evaluation of the Problem, Criteria and sources for identifying the problem, process of defining the problem. Nature, Definition and Characteristics of Good Hypothesis, types of hypothesis. Formulation and testing of hypothesis, Research Design, Meaning, Need, dimensions and process, types of research design, Application in Business Research methods.

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DR.DAKSHAYINI E

Identification and Selection of the Problem

Identification of research problem refers to the sense of awareness of a prevalent social problem, a social phenomenon or a concept that is worth study – as it requires to be investigated to understand it. The researcher identifies such a research problem through his observation, knowledge, wisdom and skills.

Identification and Selection of the Problem

Research problem is clear and definite statement about an area of concern where an investigation has to be done for improvement or for innovation and is proved by evidence. It is a statement that addresses challenges in a field.

Research problems essential to identify aim and analysis of the study.

Identification and Selection of the Problem

Examining research problems helps to identify the key concepts and terms of research. A research problem should be clear, concise, and specific enough to guide the process and contribute to the definition of research project objectives, methods, and outcomes.

Identification and Selection of the Problem

The process of problem identification involves the development of clear, straightforward problem statements that can be linked directly with the specific goals and objectives.These statements should clarify how the problem might prevent the achievement of these goals and objectives.

Identification and Selection of the Problem

A problem Identification is a crucial component of a Ph. D. project. It provides a clear and concise description of the study aims to address and outlines the study question. A well-formulated statement sets the foundation for the entire project and helps ensure that the study stays focused and on track.

Selection of the Problem

The topic picked for research must be familiar and feasible so that the relevant research material or sources of research are within one's reach. Even then it is extremely challenging to provide definitive ideas regarding how a professional should obtain ideas for his research.

To do a researcher can make contact with an expert or a lecturer in the University who is already involved in research. He cans also read articles or blog posts published in current literature available on the topic and may think the way the methods and concepts talked about therein could be applied to the solution of other problems.

Selection of the Problem

A preliminary study should be done before picking a research problem. This isn’t always required when the problem demands the conduct of a research closely comparable to one that was already done. However when the field of investigation is pretty new and doesn’t have available a set of well developed methods, a quick feasibility study should always be carried out.

Selection of the Problem

Identify the major factors to be considered in selecting a research problem. The topic should be selected appropriately by paying attention to the above stated key points. The problem selected should involve the researcher and should have an upper most place in his mind so that he could tackle all pains required for the research study.

Definition and Statement of the Problem

- A research problem is not just answerable by yes or no. It should imply that explanations and justifications regarding the true situation or observation are required.
- A research problem implies relationship between the variables of the study.
- The problem should be stated in clear, unambiguous manner.
- A researchable problem must imply interpretation and analysis of data.

Definition and Statement of the Problem

1. **Novel**. A good research problem should be something that is new. It may be a new process, product, or principle.
2. **Interesting**. A good research problem should draw attention and interest from other people.
3. **Practical**. The aim of research is to improve people's quality of living. A good research problem then should be useful and beneficial to its target population.
4. **Innovative**. A good research problem should improve the current state of existing technology.
5. **Cost-effective**. A good research problem should provide a good value for money, time, resources, and manpower while conducting the study. It should be economical in addressing the problems of the community.

Definition and Statement of the Problem

The problem statement identifies the current state, the desired future state and any gaps between the two. A problem statement is an important communication tool that can help ensure everyone working on a project knows what the problem they need to address is and why the project is important.

Definition and Statement of the Problem

A problem statement is important to a process improvement project because it helps clearly identify the goals of the project and outline the scope of a project. It also helps guide the activities and decisions of the people who are working on the project. The problem statement can help a business or organization gain support and buy-in for a process improvement project.

Definition and Statement of the Problem

- **1. Ideal situation**
- The first thing your problem statement should describe is what the ideal situation would be if there wasn't a problem you needed to address. This section identifies the goals and scope of the project are. This section should create a clear understanding of what the ideal environment will be once the issue has been resolved.
- **2. Reality**
- The next section of your problem statement should describe what the current reality is for your company or organization. This section will identify what the problem is, state why it is a problem and identify who the problem is impacting. It will also describe when and where the problem was identified.

Definition and Statement of the Problem

- **3. Consequences**
- The next section of your problem statement should identify what the consequences of the problem are. This section describes the effects of the problem by describing how the people affected by the problem are being impacted and quantifying how much the problem is impacting them. Common consequences can include the loss of time, money, resources, competitive advantage, productivity and more.
- **4. Proposal**
- The proposal section of a problem statement may contain several possible solutions to the problem, but it is important to remember that it does not need to identify a specific solution. The purpose of the proposal section should be to guide the project team on how they can research, investigate and resolve the problem.

Definition and Statement of the Problem

- **1. Identify the problem**
- Before you can begin writing your problem statement, you first need to identify what the problem is.
- **2. Begin your statement with your ideal situation**
- Next, you can begin writing your problem statement by describing what the ideal environment would look like if your problem didn't exist. This section should try to describe what your company hopes to accomplish as a result of the process improvement project.

Definition and Statement of the Problem

- **3. Describe current gaps**
- Next, write the reality section of your problem statement. Your goal in this section should be to clearly identify what the current environment looks like. In this section, you should identify what the problem is, what is causing the problem and why it is an issue. You should also describe when, where and how you were able to identify the problem.
- **4. State the consequences of the problem**
- Next, write the consequences section of your problem statement. This section is used to quantify and support the claim of what the problem is. You can use this section to identify specific numbers such as the amount of time or revenue being lost or the number of resources being wasted. It is important to include concrete numbers that support your claims in this section.

Definition and Statement of the Problem

- **5. Propose addressing the problem**
- Finally, end your statement with a proposal section. In this section, you should try to identify how your company will make progress toward reaching your goals and accomplishing your ideal environment. While you may choose to identify several possible solutions in this section, it is more important to focus on identifying how your company will find those solutions than it is to identify the specific solution that will be used.

Evaluation of the Problem

After choosing the research topic, the problem needs to be evaluated and seen that it is appropriate for doing the research. Evaluation will help in doing systematic and organized research.

Evaluating research problems helps to identify the key concepts and terms of research. A research problem should be clear, concise, and specific enough to guide the process and contribute to the definition of research project objectives, methods, and outcomes.

Evaluation of the Problem

Evaluation of research allows you to test a solution and collect valuable feedback that can help you refine and improve the user experience. Findings from evaluative research are key to assessing what works and what doesn't and identifying areas of improvement.

Evaluation of the Problem

1.Has the study been reviewed by other experts?

2.Do other experts agree?

3.Are there reasons to doubt the findings?

4.How do the conclusions fit with other studies?

5.How big was the study?

6.Are there any major flaws in the study's design?

Criteria and sources for identifying the problem

- Research really begins when some difficulty or problem demanding a solution is perceived by the researcher within the area covered by the general topic selected by him.
- The general area of a study is suggested either by some practical concerns or by some scientific or intellectual interest. The research topic may be based on a number of considerations such as practical consideration, theoretical consideration and intellectual interest.

Criteria and sources for identifying the problem

- A research problem may very well be selected from the burning problems of the time. It may be based on the interest and convenience of the researcher.
- Sometimes a research problem is undertaken to suggest an alternative and a better theory or analysis. Intellectual and scientific interest of the researcher may lead to the exploration of a variety of topics for research. He may also test the validity of some existing theory on the basis of new facts and data.
- Personal values play an important role in the selection of a research topic. Social conditions also shape the preferences of investigators in a subtle and imperceptible way. The selection of a topic for research is only half a step forward.

Criteria and sources for identifying the problem

The general topic does not help a researcher in selecting the data, techniques and organization needed. Before he can consider these aspects, he needs to formulate a specific problem. The problem defines the goal of the researcher in clear terms. Research, like any other human activity, is goal-oriented.

Criteria and sources for identifying the problem

- Thus without a problem research cannot proceed because there is nothing to proceed from and proceed toward. There is nothing but wisdom in the saying. “If you start from nowhere, you will generally reach there.”
- In selecting a research topic, a researcher has to consider a number of things such as his ability, the time at his disposal, the available resources, the availability of data and so on. It is an area in which ‘vision’ plays an important role. It should be remembered that research is primarily a function of an objective valued by an individual, institution or country.

Process of defining the problem

If you are doing theoretical research, you can identify a research problem by reading existing research, theory, and debates on your topic to find a gap in what is currently known about it.

Defining a research problem is crucial in defining the quality of the answers, and determines the exact research method used.

Process of defining the problem

- Formulating the research problem begins during the first steps of the scientific process.
- As an example, a literature review and a study of previous experiments, and research, might throw up some vague areas of interest.
- Many scientific researchers look at an area where a previous researcher generated some interesting results, but never followed up. It could be an interesting area of research, which nobody else has fully explored.
- A scientist may even review a successful experiment, disagree with the results, the tests used, or the methodology, and decide to refine the research process, retesting the hypothesis.

Process of defining the problem

Defining a problem is the first and most crucial step in the research process. It involves identifying a research problem, formulating research questions, and setting research objectives.

- some techniques involved in defining a problem
- **1. Brainstorming**
- Brainstorming is a technique that involves generating a large number of ideas about a topic without censoring them. It is an effective technique for defining a problem because it allows the researcher to explore different perspectives and generate a broad range of potential research questions.
- **2. Mind Mapping**
- Mind mapping is a technique that involves visually organizing ideas and information around a central theme or concept. It is an effective technique for defining a problem because it allows the researcher to identify key concepts and relationships among them.

Process of defining the problem

- **3. Problem Tree Analysis**

Problem tree analysis is a technique that involves identifying the causes and effects of a problem and organizing them in a hierarchical structure. It is an effective technique for defining a problem because it helps the researcher to understand the underlying factors that contribute to the problem and identify potential research questions.

- **4. SWOT Analysis**
- SWOT analysis is a technique that involves identifying the strengths, weaknesses, opportunities, and threats associated with a particular issue or problem. It is an effective technique for defining a problem because it allows the researcher to identify potential research questions based on the strengths, weaknesses, opportunities, and threats associated with the problem.
- **5. Literature Review**
- Literature review is a technique that involves reviewing existing literature and research on the topic of interest. It is an effective technique for defining a problem because it helps the researcher to identify knowledge gaps and determine the most appropriate research methodology and design.

Nature of Hypothesis

- Its conceptual in nature.
- It is a verbal statement in a declarative form.
- It has the empirical referent.
- It Indicates the tentative relationship between two or more variables.
- It is a powerful tool of advancement of knowledge, consistent with existing knowledge and conducive to further enquiry.
- It Can be tested, verifiable or falsifiable.
- It is not moral or ethical questions.
- It is neither too specific nor to general.
- It is a prediction of consequences.
- It is considered valuable even if proven false.

Definition of Good Hypothesis

A Hypothesis is a tentative statement about the relationship between two or more variables. A hypothesis is a specific, testable prediction about what you expect to happen in your study.

Characteristics of Good Hypothesis

- ❖It is never formulated in the form of a question.
- ❖It should be empirically testable, whether it is right or wrong.
- ❖It should be specific and precise.
- ❖It should specify variables between which the relationship is to be established.
- ❖It should describe one issue only. A hypothesis can be formed either in descriptive or relational form.

Characteristics of Good Hypothesis

- It should not conflict with any law of nature which is known to be true. guarantees that available tools and techniques will be effectively used for the purpose of verification.
- It should be stated as far as possible in most simple terms so that the same is easily understandable by all concerned.
- It must explain the facts that gave rise to the need for explanation.
- It should be amenable to testing within a reasonable time.
- It should not be contradictory.

Types of hypothesis

Simple Hypothesis

A simple hypothesis is a hypothesis that there exists a relationship between two variables. One is called a dependent variable, and the other is called an independent variable.

Complex Hypothesis

A complex hypothesis is used when there is a relationship between the existing variables. In this hypothesis, the dependent and independent variables are more than two.

Null Hypothesis

In the null hypothesis, there is no significant difference between the populations specified in the experiments, due to any experimental or sampling error. The null hypothesis is denoted by H_0.

Types of hypothesis

Alternative Hypothesis

In an alternative hypothesis, the simple observations are easily influenced by some random cause. It is denoted by the H_a or H_1.

Empirical Hypothesis

An empirical hypothesis is formed by the experiments and based on the evidence.

Statistical Hypothesis

In a statistical hypothesis, the statement should be logical or illogical, and the hypothesis is verified statistically.

Types of hypothesis

Directional Hypothesis:

A hypothesis that is built upon a certain directional relationship between two variables and constructed upon an already existing theory, is called a directional hypothesis. To understand more about what is directional hypothesis here is an example, Girls perform better than boys (‘better than’ shows the direction predicted)

Non-directional Hypothesis:

It involves an open-ended non-directional hypothesis that predicts that the independent variable will influence the dependent variable; however, the nature or direction of a relationship between two subject variables is not defined or clear.

For Example, there will be a difference in the performance of girls & boys (Not defining what kind of difference)

Types of hypothesis

Associative hypothesis occurs when there is a change in one variable resulting in a change in the other variable.

The causal hypothesis proposes a cause and effect interaction between two or more variables.

Formulation and testing of hypothesis

- Investigating background research in the area of interest.
- Formulating or investigating a theory.
- Identify how the theory will be tested and what the researcher expects to find based on relevant, previously published scientific works.
- The hypothesis is important in research as it indicates what and how a variable will be investigated.
- The hypothesis essentially summarises what and how something will be investigated. This is important as it ensures that the researcher has carefully planned how the research will be done, as the researchers have to follow a set procedure to conduct research.

Formulation and testing of hypothesis

Science proceeds with observation, hypothesis formulation and hypothesis testing. After testing the hypothesis, through various statistical tests, researcher can accept or reject the hypothesis. If the hypothesis is accepted then researcher can replicate the results, if hypothesis is rejected then researcher can refined or modify the results.

Formulation and testing of hypothesis

By stating a specific hypothesis, the researcher narrows the focus of the data collection effort and is able to design a data collection procedure which is aimed at testing the plausibility of the hypothesis as a possible statement of the relationship between the terms of the research problem. It is, therefore, always useful to have a clear idea and vision about the hypothesis. It is essential for the research question as the researcher intents to verify, as it will direct and greatly help to interpretation of the results.

Formulation and testing of hypothesis

The hypothesis should be formulated in a positive and substantive form before data are collected.

In some cases additional hypothesis may be formulated after collection of data, but they should be tested on a new set of data and not on the old set which has suggested it.

Testing of hypothesis

- Embodies major part of research process.
- Consists of operationalization of concepts
- Construction of data gathering tools
- Collection of data
- Statistical analysis of data and drawing inferences from the results.
- Tests of significance are applied
- Facts may confirm the hypothesis or reject

Meaning of Research Design

Research design refers to the plan or strategy that is developed to guide the research project. It is a blueprint that outlines the steps that will be taken to collect, analyze, and interpret the data. The research design is developed based on the research problem, research questions, and the type of data that will be collected.

Research design is the framework of research methods and techniques chosen by a researcher to conduct a study. The design allows researchers to sharpen the research methods suitable for the subject matter and set up their studies for success.

A research design can be defined as the preparation of conditions, for the collection and analysis of data in such a manner, which aims at combining relevance to the research purpose with economy in procedure. In other words, the design arrangement of a research project is commonly known as the "research design".

Need of Research Design

A well-planned research design helps ensure that your methods match your research aims, that you collect high-quality data, and that you use the right kind of analysis to answer your questions, utilizing credible sources. This allows you to draw valid, trustworthy conclusions.

Need of Research Design

- **Ensuring Validity and Reliability**

A well-designed research project ensures the validity and reliability of the research findings. The research design helps to ensure that the research is conducted in a rigorous and systematic manner, and the data collected is accurate and reliable.

- **Minimizing Bias**

Research design helps to minimize bias in the research study. It ensures that the research is conducted in an objective and neutral manner, and the data collected is not influenced by personal, political, or ideological biases.

- **Providing a Framework for Analysis**

Research design provides a framework for the analysis of the collected data. It outlines the data analysis techniques that will be used and ensures that the data is analyzed in a systematic and rigorous manner.

- **Maximizing Efficiency**

Research design helps to maximize the efficiency of the research project. It ensures that the research is conducted in a structured and organized manner, and the resources are used effectively and efficiently.

Research Design Dimensions

Methods: quantitative vs qualitative. Using quantitative methods, you gather data with an instrument, such as a stopwatch or a structured questionnaire, then quantify relationships between variables derived from the data. With qualitative methods you gather information or themes from texts, conversations or loosely structured interviews, then tell a coherent story.

Ideological stance: objective vs subjective. Most researchers assume they can make and share observations about objects, then identify and solve problems related to those objects without disagreement about the nature of meaning or reality. Other researchers place more importance on the subjective nature of meaning and truth. This dimension helps characterize some of the so-called research paradigms, from the objectivity of positivism through the enigmatic ambivalence of post-structuralism to the subjectivity of interpretivism and grounded theory.

Research Design Dimensions

Political stance: While most researchers aim to present all sides of an issue impartially, some adopt a partisan or adversarial stance by overtly or covertly selecting evidence and biasing arguments towards a particular point of view, invariably their own. Such value-laden research is the basis of the critical or radical paradigm in social sciences, but it also occurs in the physical and biological sciences.

Research Design Process

- Identification of a research problem.
- Formulation of Hypothesis.
- Review of Related Literature.
- Preparation of Research Design.
- Actual experimentation.
- Results and Discussion.
- Formulation of Conclusions and Recommendations.

Research Design Process

1. Identification of a research problem

A good research always starts with a good problem. You can observe people or things, visit places, read print materials, or consult experts to find the research problem that is right for you. The research problem guides you in formulating the hypothesis and interpretation of your findings so that you can formulate the right conclusion. A good research problem is important because it is the basis of all subsequent research activities you are going to undertake. Factors like area of interest, availability of fund, socio-economic significance of the study, and the safety measures to be undertaken should be considered in finding a good research problem.

2. Formulation of Hypothesis

After finding your research problem, the next step is to formulate your own hypothesis. A hypothesis is a theoretical statement in solving a logical relationship between variables. Do not be afraid if your hypothesis proves to be incorrect after the experimentation because it is only considered as an educated guess. Always remember that when you formulate a hypothesis, it should be based on the research problem being solved.

Research Design Process

3. Review of Related Literature

A research problem is vague at first. To give you a vivid picture of the whole research, you shall read various publications or surf the internet to become aware of the previous works already done. In doing so, it could spur an idea that can be the subject of your investigation. The review of related literature can be taken from science books, magazines, journals, newspapers, or even in the internet.

4. Preparation of Research Design

A research design is the blueprint of the research you are going to undertake. It serves as the work plan of the whole study not only because it entails the resources needed in conducting the research but also the ways these resources are utilized.

Research Design Process

5. Actual experimentation

Actual experimentation is an implementation of the research design. In actual experimentation, you have to conduct an experiment to prove the validity of the hypothesis you have formulated. Actual experimentation includes the methodology that you have followed in doing your research. The methodology should be carefully planned prior to the actual experimentation to ensure the validity and accuracy of the result.

6. Results and Discussion

This is the heart of the research process because this is part where the findings of the research can be found. You can use table (not the table in your kitchen) and graph to interpret the results of your research.

Research Design Process

7. Formulation of Conclusions and Recommendations

Conclusion is a statement where you will present the solution to the proposed problem based on the findings of the investigation. They are tied up to the questions investigated. Your conclusion will show whether or not your experiment worked. It should answer your hypothesis and research problem. In your concluding statement you can also infer on the possible benefits to society that your results might present. You can state any plans you might have to continue working on other aspects related to your area of study. We must remember that recommendations are based on conclusions and conclusions are based on findings.

Types of research design

Qualitative research

It determines relationships between collected data and observations based on mathematical calculations. Statistical methods can prove or disprove theories related to a naturally existing phenomenon.

Quantitative research

It is for cases where statistical conclusions to collect actionable insights are essential. Numbers provide a better perspective for making critical business decisions. Quantitative research methods are necessary for the growth of any organization. Insights drawn from complex numerical data and analysis prove to be highly effective when making decisions about the business’s future.

Types of research design

Qualitative Research	Quantitative Research
Focus on explaining and understanding experiences and perspectives.	Focus on quantifying and measuring phenomena.
Use of non-numerical data, such as words, images, and observations.	Use of numerical data, such as statistics and surveys.
Usually uses small sample sizes.	Usually uses larger sample sizes.
Typically emphasizes in-depth exploration and interpretation.	Typically emphasizes precision and objectivity.
Data analysis involves interpretation and narrative analysis.	Data analysis involves statistical analysis and hypothesis testing.
Results are presented descriptively.	Results are presented numerically and statistically.

Types of research design

Qualitative research is more exploratory and focuses on understanding the subjective experiences of individuals, while quantitative research is more focused on objective data and statistical analysis.

Application in Business Research methods.

Application in Business Research methods

Market Research:

The purpose of market research is to gather and analyze information about customer needs, preferences, purchasing behavior, and market trends.

A survey, focus group, and data analysis can provide businesses with insight into consumer preferences, identify gaps in the market, and validate potential business ideas.

Product Development and Innovation:

Organizations can identify unmet needs and pain points by conducting market research and gathering feedback from customers. Research is an integral part of product development and innovation. A product's design and development are based on this information.

Application in Business Research methods

- **Competitive Analysis:**

Business research allows companies to conduct competitive analyses and gain insights into their competitors' strengths, weaknesses, strategies, and market positioning.By utilizing this information, businesses can identify opportunities for differentiation, improve their value proposition, and develop strategies that outperform competitors.

Customer Satisfaction and Loyalty:

A business's success and sustainability depend on customer satisfaction and loyalty. Customer satisfaction levels can be measured, areas for improvement identified, and factors influencing customer loyalty can all be analyzed with business research. Businesses can address customer concerns, enhance the customer experience, and build lasting relationships with customers by collecting feedback through surveys, customer reviews, and social media monitoring.

Application in Business Research methods

- **Marketing and Advertising Effectiveness:**

- A marketing and advertising campaign that is effective is essential to reaching and engaging the target audience. Through the analysis of campaign reach, engagement, conversion rates, and return on investment (ROI), business research helps measure the effectiveness of marketing efforts.Marketing strategies can be optimized, resources allocated more effectively, and channels identified as most effective through these insights.

- **Supply Chain Optimization:**

- Business research is applied to supply chain optimization to improve efficiency and reduce costs. Organizations can identify bottlenecks, streamline processes, and optimize inventory management by analyzing supply chain data.

Application in Business Research methods

- **Human Resources Management:**

Surveys, exit interviews, and performance evaluations can be used to collect data-driven insights. By gaining these insights, businesses can create a positive work environment, retain top talent, and identify skill development and training opportunities for employees.

- **Financial Analysis and Decision-making:**

A key component of business research is financial analysis. Organizations use it to assess profitability, forecast revenue, and forecast expenses. As a result, financial decisions, budgeting, and financial planning are based on these insights, contributing to the financial health and sustainability of the organization.

Application in Business Research methods

- **Risk Assessment and Management:**

- In order to identify potential threats and opportunities, business research is used in risk assessment and management. By conducting risk analysis and gathering relevant data, businesses can formulate risk mitigation strategies and make informed decisions to protect the organization from uncertainties and potential threats.

- **Strategic Planning:**

- Business research is an integral part of strategic planning. Organizations can create robust strategic plans based on market trends, customer behavior, and industry developments. Business research provides businesses with insights that enable them to set clear objectives, identify growth opportunities, and make data-driven strategic decisions.

Application in Business Research methods

- **Pricing Strategy and Revenue Management:**

- Business research, prices can be adjusted based on real-time market demand, customer behavior, and other relevant factors. As a result of data analysis, revenue management techniques such as yield management in the hospitality industry also benefit from business research.

Application in Business Research methods

- **Customer Segmentation and Personalization:**
- Business research assists in segmenting customers based on shared characteristics, preferences, and behaviors. Businesses can identify distinct customer segments and tailor their marketing efforts to their needs and preferences by analyzing customer data and conducting market research.
- As a result, businesses are able to create personalized marketing messages and product offerings, resulting in higher customer loyalty and satisfaction. Data analytics enable businesses to deliver targeted and relevant content to customers, improving engagement and conversion rates in the digital age, making personalization particularly relevant.
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MODULE NO 4

Scales of Measurement, Scaling techniques- Single Item v/s Multi Item Scales, Comparative v/s Non-Comparative scales, Continuous Rating Scales; Criteria for Good Measurement Criteria for Questionnaire Designing; Types of Questionnaire; Questionnaire Design Procedure, Pilot test, validity and reliability of Questionnaire, Cronbachs alpha, interview schedule Primary Data Collection, Classification of Survey methods, Evaluation Criteria for Survey Methods; Observation Techniques, Classification of Observation Methods, Advantages and Limitations of Observation Techniques Secondary Data Collection, Classification of Secondary Data Sources, Evaluation of Secondary Data, Roadmap to use Secondary Data, Benefits and Drawbacks of Secondary data Qualitative methods, Methods, Focus Group Method, Personal Interview Method and Projective Techniques

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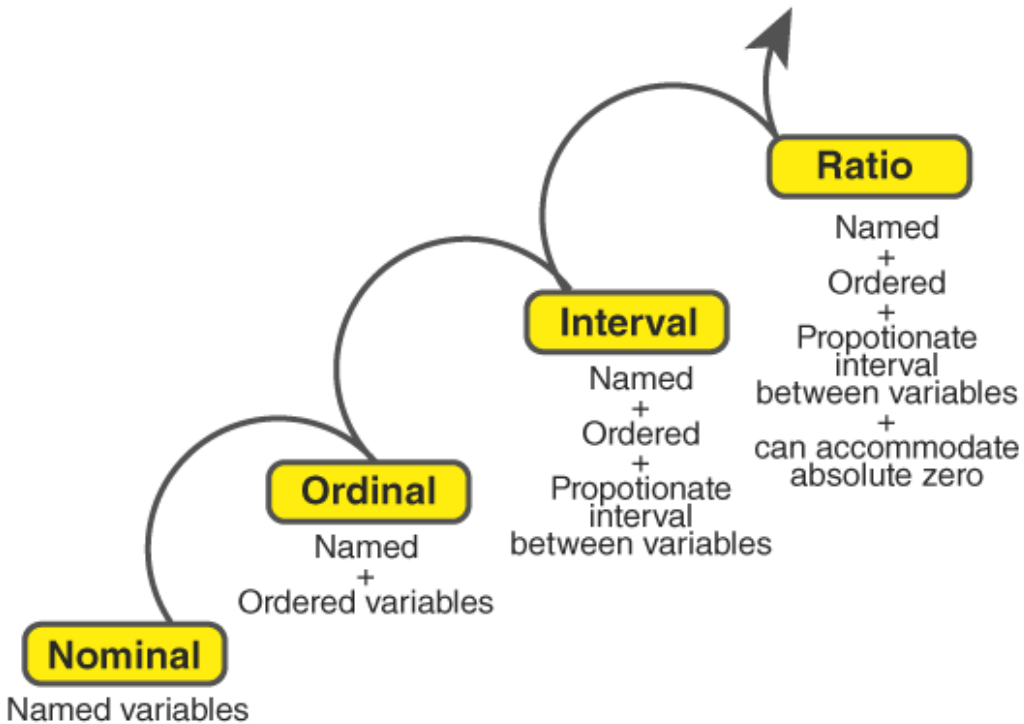
Scales of Measurement

There are four different scales of measurement. The data can be defined as being one of the four scales. The four types of scales are:

- Nominal Scale
- Ordinal Scale
- Interval Scale
- Ratio Scale

LEVELS OF MEASUREMENT



Scales of Measurement

- **Nominal Scale**
- A nominal scale is the 1st level of measurement scale in which the numbers serve as “tags” or “labels” to classify or identify the objects. A nominal scale usually deals with the non-numeric variables or the numbers that do not have any value.
- **Characteristics of Nominal Scale**
- A nominal scale variable is classified into two or more categories. In this measurement mechanism, the answer should fall into either of the classes.
- It is qualitative. The numbers are used here to identify the objects.
- The numbers don’t define the object characteristics. The only permissible aspect of numbers in the nominal scale is “counting.”

Scales of Measurement

- **Example:**
- An example of a nominal scale measurement is given below:
- What is your gender?
- M- Male
- F- Female
- Here, the variables are used as tags, and the answer to this question should be either M or F.

Scales of Measurement

- **Ordinal Scale**
- The ordinal scale is the 2nd level of measurement that reports the ordering and ranking of data without establishing the degree of variation between them. Ordinal represents the “order.” Ordinal data is known as qualitative data or categorical data. It can be grouped, named and also ranked.
- **Characteristics of the Ordinal Scale**
- The ordinal scale shows the relative ranking of the variables
- It identifies and describes the magnitude of a variable
- Along with the information provided by the nominal scale, ordinal scales give the rankings of those variables
- The interval properties are not known
- The surveyors can quickly analyse the degree of agreement concerning the identified order of variables

Scales of Measurement

- **Example:**
- Ranking of school students – 1st, 2nd, 3rd, etc.
- Ratings in restaurants
- Evaluating the frequency of occurrences
  - Very often
  - Often
  - Not often
  - Not at all
- Assessing the degree of agreement
  - Totally agree
  - Agree
  - Neutral
  - Disagree
  - Totally disagree

Scales of Measurement

- **Interval Scale**
- The interval scale is the 3rd level of measurement scale. It is defined as a quantitative measurement scale in which the difference between the two variables is meaningful. In other words, the variables are measured in an exact manner, not as in a relative way in which the presence of zero is arbitrary.
- **Characteristics of Interval Scale:**
- The interval scale is quantitative as it can quantify the difference between the values
- It allows calculating the mean and median of the variables
- To understand the difference between the variables, you can subtract the values between the variables
- The interval scale is the preferred scale in Statistics as it helps to assign any numerical values to arbitrary assessment such as feelings, calendar types, etc.

Scales of Measurement

- **Example:**
- Likert Scale
- Net Promoter Score (NPS)
- Bipolar Matrix Table

Scales of Measurement

- **Ratio Scale**
- The ratio scale is the 4th level of measurement scale, which is quantitative. It is a type of variable measurement scale. It allows researchers to compare the differences or intervals. The ratio scale has a unique feature. It possesses the character of the origin or zero points.
- **Characteristics of Ratio Scale:**
- Ratio scale has a feature of absolute zero
- It doesn’t have negative numbers, because of its zero-point feature
- It affords unique opportunities for statistical analysis. The variables can be orderly added, subtracted, multiplied, divided. Mean, median, and mode can be calculated using the ratio scale.
- Ratio scale has unique and useful properties. One such feature is that it allows unit conversions like kilogram – calories, gram – calories, etc.

Scales of Measurement

- **Example:**
- An example of a ratio scale is:
- What is your weight in Kgs?
- Less than 55 kgs
- 55 – 75 kgs
- 76 – 85 kgs
- 86 – 95 kgs
- More than 95 kgs

Scaling techniques

Scaling technique is a method of placing respondents in continuation of gradual change in the pre-assigned values, symbols or numbers based on the features of a particular object as per the defined rules. All the scaling techniques are based on four pillars, i.e., order, description, distance and origin.

The marketing research is highly dependable upon the scaling techniques, without which no market analysis can be performed.

Scaling techniques

1. **Primary Scaling Techniques**
    1. **Nominal Scale**
    2. **Ordinal Scale**
    3. **Interval Scale**
    4. **Ratio Scale**
2. **Other Scaling Techniques**
    1. **Comparative Scales**
    2. **Non-Comparative Scales**

Scaling techniques

Nominal Scale

- Nominal scales are adopted for non-quantitative (containing no numerical implication) labelling variables which are unique and different from one another.

Types of Nominal Scales

1. **Dichotomous**: A nominal scale that has only two labels is called ‘dichotomous’; for example, Yes/No.
2. **Nominal with Order**: The labels on a nominal scale arranged in an ascending or descending order is termed as ‘nominal with order’; for example, Excellent, Good, Average, Poor, Worst.
3. **Nominal without Order**: Such nominal scale which has no sequence, is called ‘nominal without order’; for example, Black, White.

Scaling techniques

- **Ordinal Scale**
- The ordinal scale functions on the concept of the relative position of the objects or labels based on the individual's choice or preference.
- *For example*, At Amazon.in, every product has a customer review section where the buyers rate the listed product according to their buying experience, product features, quality, usage, etc.
- The ratings so provided are as follows:
- 5 Star – Excellent
- 4 Star – Good
- 3 Star – Average
- 2 Star – Poor
- 1 Star – Worst

Scaling techniques

An interval scale is also called a cardinal scale which is the numerical labelling with the same difference among the consecutive measurement units.

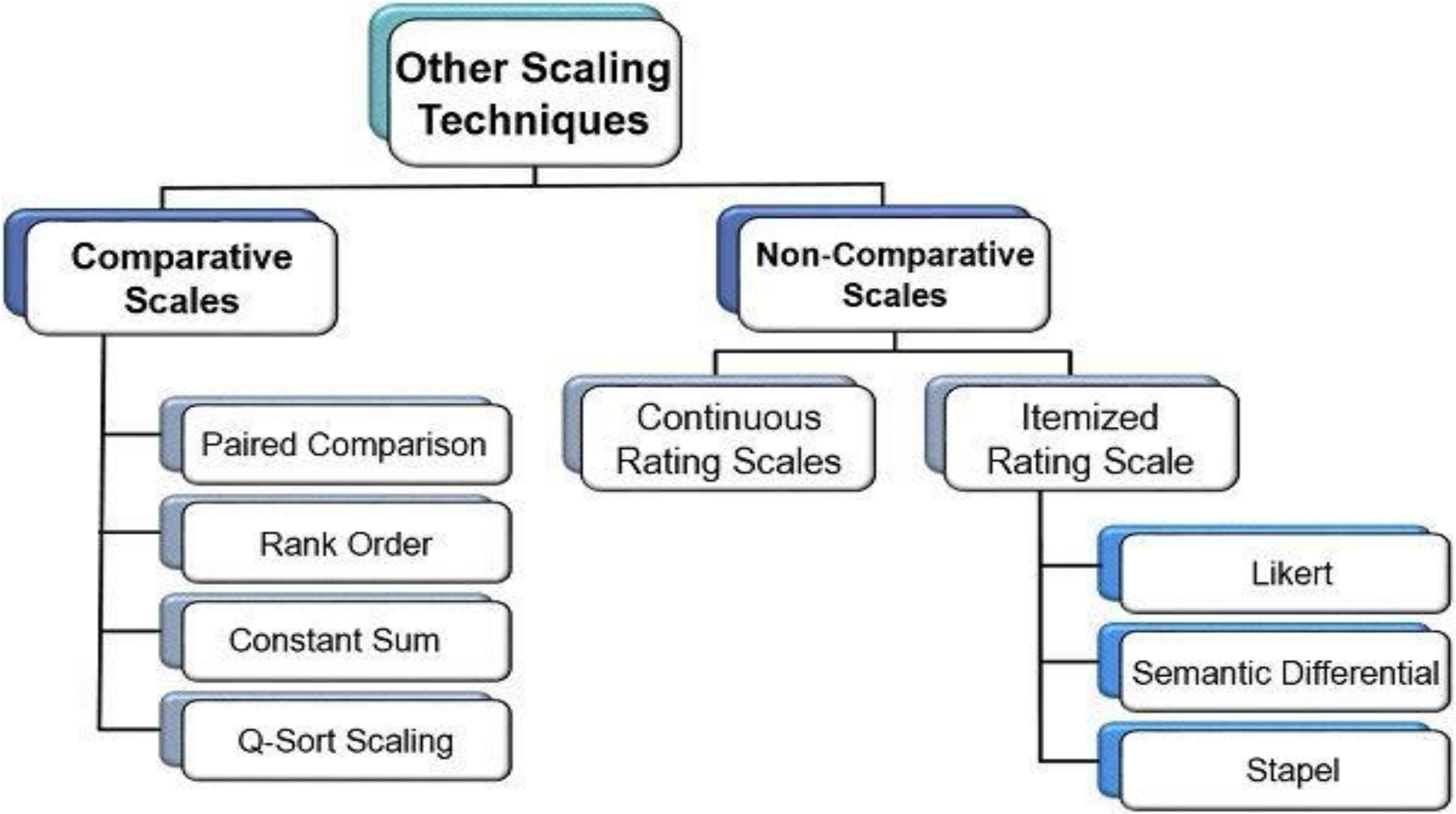
Example: A survey conducted by an automobile company to know the number of vehicles owned by the people living in a particular area who can be its prospective customers in future. It adopted the interval scaling technique for the purpose and provided the units as 1, 2, 3, 4, 5, 6 to select from.

Scaling techniques

Ratio Scale

It allows measurement at proper intervals, order, categorization and distance, with an added property of originating from a fixed zero point. Here, the comparison can be made in terms of the acquired ratio.

- A health product manufacturing company surveyed to identify the level of obesity in a particular locality. It released the following survey questionnaire:
  Select a category to which your weight belongs to:
- Less than 40 kilograms
- 40-59 Kilograms
- 60-79 Kilograms
- 80-99 Kilograms
- 100-119 Kilograms
- 120 Kilograms and more


Other Scaling Techniques
Comparative Scales
Paired Comparison
Rank Order
Constant Sum
Q-Sort Scaling
Non-Comparative Scales
Continuous Rating Scales
Itemized Rating Scale
Likert
Semantic Differential
Stapel

Comparative Scales

- For comparing two or more variables, a comparative scale is used by the respondents. Following are the different types of comparative scaling techniques:
- A paired comparison symbolizes two variables from which the respondent needs to select one. This technique is mainly used at the time of product testing, to facilitate the consumers with a comparative analysis of the two major products in the market.
- To compare more than two objects say comparing P, Q and R, one can first compare P with Q and then the superior one (i.e., one with a higher percentage) with R.

For example, A market survey was conducted to find out consumer's preference for the network service provider brands, A and B. The outcome of the survey was as follows:
Brand 'A' = 57%
Brand 'B' = 43%
Thus, it is visible that the consumers prefer brand 'A', over brand 'B'.

- **Rank Order**
- In rank order scaling the respondent needs to rank or arrange the given objects according to his or her preference.
- *For example*, A soap manufacturing company conducted a rank order scaling to find out the orderly preference of the consumers. It asked the respondents to rank the following brands in the sequence of their choice:

SOAP BRANDSS	RANK
Brand V	4
Brand X	2
Brand Y	1
Brand Z	3

- **Constant Sum**
- It is a scaling technique where a continual sum of units like dollars, points, chits, chips, etc. is given to the features, attributes and importance of a particular product or service by the respondents.

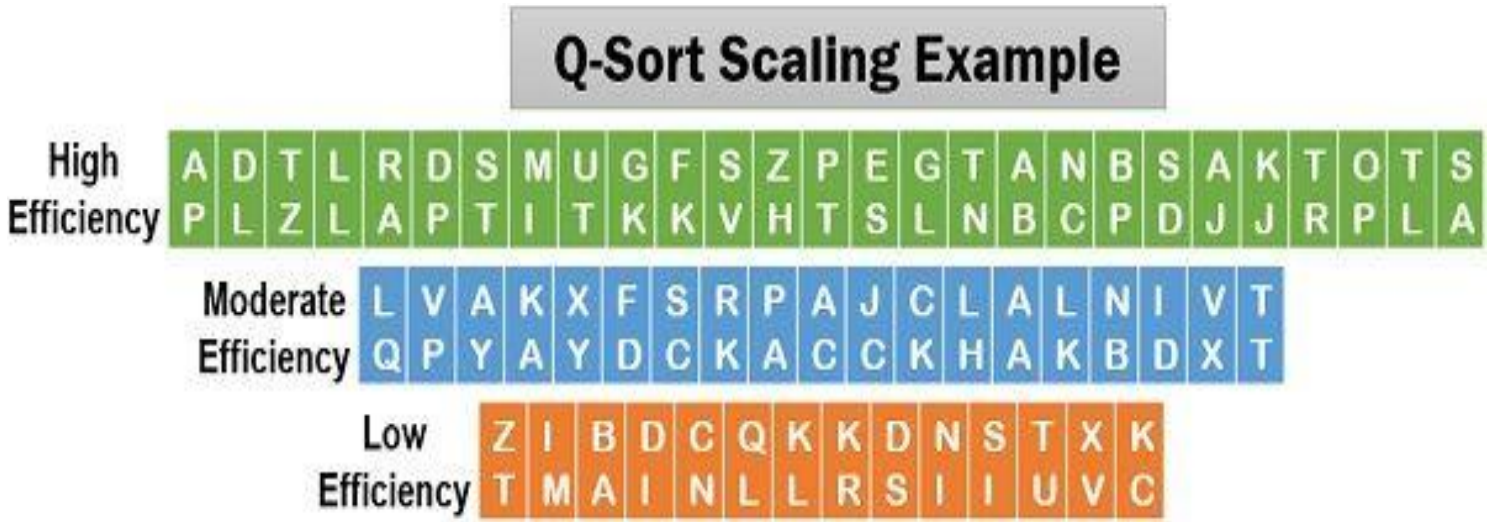
Example: The respondents belonging to 3 different segments were asked to allocate 50 points to the following attributes of a cosmetic product ‘P’.

ATTRIBUTES	SEGMENT 1	SEGMENT 2	SEGMENT 3
Finish	11	8	9
Skin Friendly	11	12	12
Fragrance	7	11	8
Packaging	9	8	10
Price	12	11	11

- **Q-Sort Scaling**
- Q-sort scaling is a technique used for sorting the most appropriate objects out of a large number of given variables. It emphasizes on the ranking of the given objects in a descending order to form similar piles based on specific attributes.
- It is suitable in the case where the number of objects is not less than 60 and more than 140, the most appropriate of all ranging between 60 to 90.

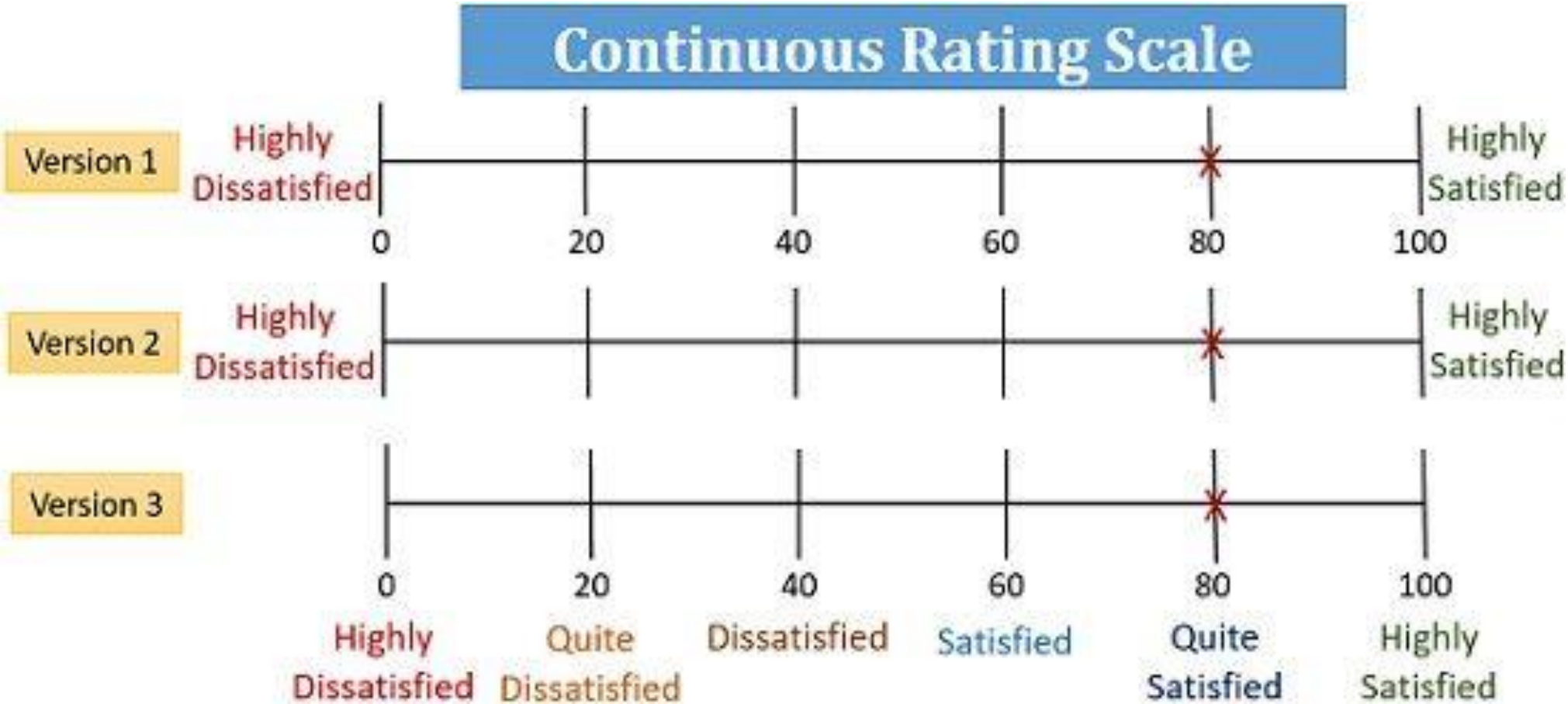
For example, The marketing manager of a garment manufacturing company sorts the most efficient marketing executives based on their past performance, sales revenue generation, dedication and growth.

The Q-sort scaling was performed on 60 executives, and the marketing head creates three piles based on their efficiency as follows:


Q-Sort Scaling Example
High Efficiency
A D T L R D S M U G F S Z P E G T A N B S A K T O T S
P L Z L A P T I T K K V H T S L N B C P D J J R P L A
Moderate Efficiency
L V A K X F S R P A J C L A L N I V T
Q P Y A Y D C K A C C K H A K B D X T
Low Efficiency
Z I B D C Q K K D N S T X K
T M A I N L L R S I I U V C

- **Non-comparative scale**
- A non-comparative scale is used to analyse the performance of an individual product or object on different parameters. Following are some of its most common types:
- **Continuous Rating Scales**
- It is a graphical rating scale where the respondents are free to place the object at a position of their choice. It is done by selecting and marking a point along the vertical or horizontal line which ranges between two extreme criteria.

For example, A mattress manufacturing company used a continuous rating scale to find out the level of customer satisfaction for its new comfy bedding. The response can be taken in the following different ways.

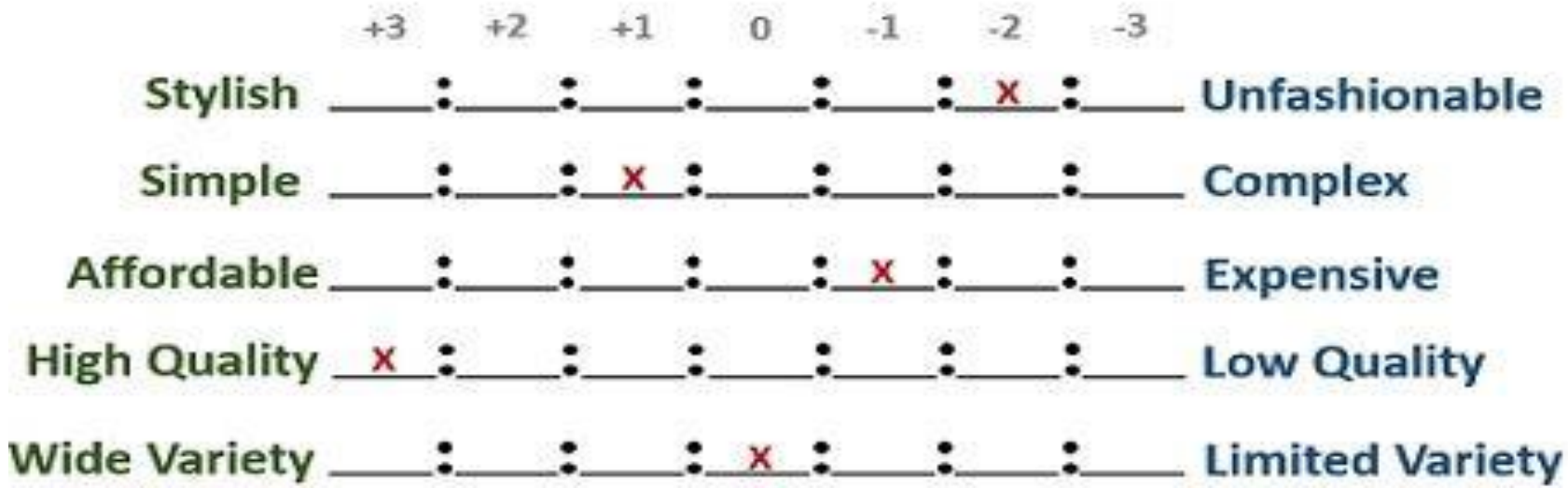

Continuous Rating Scale
Version 1
Highly Dissatisfied
Highly Satisfied
0
20
40
60
80
100
Version 2
Highly Dissatisfied
Highly Satisfied
Version 3
0
20
40
60
80
100
Highly Dissatisfied
Quite Dissatisfied
Dissatisfied
Satisfied
Quite Satisfied
Highly Satisfied

- Itemized scale is another essential technique under the non-comparative scales. It emphasizes on choosing a particular category among the various given categories by the respondents. Each class is briefly defined by the researchers to facilitate such selection.
- The three most commonly used itemized rating scales are as follows:
- **Likert Scale**: In the Likert scale, the researcher provides some statements and ask the respondents to mark their level of agreement or disagreement over these statements by selecting any one of the options from the five given alternatives.
  For example, A shoes manufacturing company adopted the Likert scale technique for its new sports shoe range named Z sports shoes. The purpose is to know the agreement or disagreement of the respondents.
  For this, the researcher asked the respondents to circle a number representing the most suitable answer according to them, in the following representation:
  - 1 – Strongly Disagree
  - 2 – Disagree
  - 3 – Neither Agree Nor Disagree
  - 4 – Agree
  - 5 – Strongly Agree

Semantic Differential Scale: A bi-polar seven-point non-comparative rating scale is where the respondent can mark on any of the seven points for each given attribute of the object as per personal choice. Thus, depicting the respondent's attitude or perception towards the object.

Example, A well-known brand for watches, carried out semantic differential scaling to understand the customer's attitude towards its product.

Semantic Differential Scale



Stapel Scale: A Stapel scale is that itemized rating scale which measures the response, perception or attitude of the respondents for a particular object through a unipolar rating. The range of a Stapel scale is between -5 to +5 eliminating 0, thus confining to 10 units.

For example, A tours and travel company asked the respondent to rank their holiday package in terms of value for money and user-friendly interface as follows:

Stapel Scale

Value for Money		User Friendly Interface	
+5		+5	
+4		+4	x
+3		+3	
+2	x	+2	
+1		+1	
-1		-1	
-2		-2	
-3		-3	
-4		-4	
-5		-5	

Single Item v/s Multi Item Scales

Single-item measures are acceptable when constructs are unidimensional, clearly defined, and narrow in scope.

Multi-item scales are typically applied when seeking to measure things that cannot be directly asked due to being either particularly technical and thus not explainable to a survey respondent, or, because they are ill-defined and a shotgun approach is required.

Multiple-item scalesare designed to sample a broader range of meanings to cover the full range of a construct.

Single items, the respondent is left with greater ambiguity to interpret the meaning of the item.

Comparative v/s Non-Comparative scales

In comparative scaling, the respondent is asked to compare one brand or product against another. With noncomparative scaling respondents need only evaluate a single product or brand.

A comparative scale is an ordinal or rank order scale that can also be referred to as a non-metric scale. Respondents evaluate two or more objects at one time and objects are directly compared with one another as part of the measuring process.

Comparative scaling involves rank-ordering each stimulus individually against every other stimulus; categorical scaling does not.

Criteria for Good Measurement Criteria for Questionnaire Designing

A good questionnaire should be valid, reliable, clear, succinct and interesting. It is important to design the questionnaire based on a conceptual framework, scrutinize each question for relevance and clarity, and think of the analysis you are going to perform at the end of the day.

Criteria for Good Measurement Criteria for Questionnaire Designing

1. Decide the information required.
2. Define the target respondents.
3. Choose the method(s) of reaching your target respondents.
4. Decide on question content.
5. Develop the question wording.
6. Put questions into a meaningful order and format.
7. Check the length of the questionnaire.
8. Pre-test the questionnaire.
9. Develop the final survey form.

Criteria for Good Measurement Criteria for Questionnaire Designing

- 1. A well-designed questionnaire should meet the research objectives. This may seem obvious, but many research surveys omit important aspects due to inadequate preparatory work, and do not adequately probe particular issues due to poor understanding. To a certain degree some of this is inevitable. Every survey is bound to leave some questions unanswered and provide a need for further research but the objective of good questionnaire design is to 'minimise' these problems.

Criteria for Good Measurement Criteria for Questionnaire Designing

2. It should obtain the most complete and accurate information possible. The questionnaire designer needs to ensure that respondents fully understand the questions and are not likely to refuse to answer, lie to the interviewer or try to conceal their attitudes. A good questionnaire is organised and worded to encourage respondents to provide accurate, unbiased and complete information.

Criteria for Good Measurement Criteria for Questionnaire Designing

- 3. A well-designed questionnaire should make it easy for respondents to give the necessary information and for the interviewer to record the answer, and it should be arranged so that sound analysis and interpretation are possible.
- 4. It would keep the interview brief and to the point and be so arranged that the respondent(s) remain interested throughout the interview.

Types of Questionnaire

- Questionnaires can be classified as both, quantitative and qualitative method depending on the nature of questions. Specifically, answers obtained through closed-ended questions with multiple choice answer options are analyzed using quantitative methods. Research findings in this case can be illustrated using tabulations, pie-charts, bar-charts and percentages.
- Answers obtained to open-ended questionnaire questions on the other hand, are analyzed using qualitative methods. Primary data collected using open-ended questionnaires involve discussions and critical analyses without use of numbers and calculations.

Types of Questionnaire

Structured Questionnaire

- This type of questionnaire has a fixed format with predetermined questions that the respondent must answer. The questions are usually closed-ended, which means that the respondent must select a response from a list of options.

Unstructured Questionnaire

- An unstructured questionnaire does not have a fixed format or predetermined questions. Instead, the interviewer or researcher can ask open-ended questions to the respondent and let them provide their own answers.

Open-ended Questionnaire

- An open-ended questionnaire allows the respondent to answer the question in their own words, without any pre-determined response options. The questions usually start with phrases like “how,” “why,” or “what,” and encourage the respondent to provide more detailed and personalized answers.

Types of Questionnaire

Close-ended Questionnaire

- In a closed-ended questionnaire, the respondent is given a set of predetermined response options to choose from. This type of questionnaire is easier to analyze and summarize, but may not provide as much insight into the respondent’s opinions or attitudes.

Mixed Questionnaire

- A mixed questionnaire is a combination of open-ended and closed-ended questions. This type of questionnaire allows for more flexibility in terms of the questions that can be asked, and can provide both quantitative and qualitative data.

Pictorial Questionnaire

- In a pictorial questionnaire, instead of using words to ask questions, the questions are presented in the form of pictures, diagrams or images. This can be particularly useful for respondents who have low literacy skills, or for situations where language barriers exist. Pictorial questionnaires can also be useful in cross-cultural research where respondents may come from different language backgrounds.

Types of Questionnaire

- **Computer questionnaire**. Respondents are asked to answer the questionnaire which is sent by mail. The advantages of the computer questionnaires include their inexpensive price, time-efficiency, and respondents do not feel pressured, therefore can answer when they have time, giving more accurate answers. However, the main shortcoming of the mail questionnaires is that sometimes respondents do not bother answering them and they can just ignore the questionnaire.
- **Telephone questionnaire**. Researcher may choose to call potential respondents with the aim of getting them to answer the questionnaire. The advantage of the telephone questionnaire is that, it can be completed during the short amount of time. The main disadvantage of the phone questionnaire is that it is expensive most of the time. Moreover, most people do not feel comfortable to answer many questions asked through the phone and it is difficult to get sample group to answer questionnaire over the phone.

Types of Questionnaire

- **In-house survey**. This type of questionnaire involves the researcher visiting respondents in their houses or workplaces. The advantage of in-house survey is that more focus towards the questions can be gained from respondents. However, in-house surveys also have a range of disadvantages which include being time consuming, more expensive and respondents may not wish to have the researcher in their houses or workplaces for various reasons.
- **Mail Questionnaire**. This sort of questionnaires involve the researcher to send the questionnaire list to respondents through post, often attaching pre-paid envelope. Mail questionnaires have an advantage of providing more accurate answer, because respondents can answer the questionnaire in their spare time. The disadvantages associated with mail questionnaires include them being expensive, time consuming and sometimes they end up in the bin put by respondents.

Types of Questionnaire

- Questionnaires can include the following types of questions:
- **Open question questionnaires**. Open questions differ from other types of questions used in questionnaires in a way that open questions may produce unexpected results, which can make the research more original and valuable. However, it is difficult to analyze the results of the findings when the data is obtained through the questionnaire with open questions.
- **Multiple choice question**s. Respondents are offered a set of answers they have to choose from. The downsize of questionnaire with multiple choice questions is that, if there are too many answers to choose from, it makes the questionnaire, confusing and boring, and discourages the respondent to answer the questionnaire.
- **Dichotomous Questions**. Thes type of questions gives two options to respondents – yes or no, to choose from. It is the easiest form of questionnaire for the respondent in terms of responding it.
- **Scaling Questions**. Also referred to as ranking questions, they present an option for respondents to rank the available answers to questions on the scale of given range of values (for example from 1 to 10).

Questionnaire Design Procedure

1. **Specify the Information Needed:** The first and the foremost step in designing the questionnaire is to specify the information needed from the respondents such that the objective of the survey is fulfilled. The researcher must completely review the components of the problem, particularly the hypothesis, research questions, and the information needed.
2. **Define the Target Respondent:** At the very outset, the researcher must identify the target respondent from whom the information is to be collected. The questions must be designed keeping in mind the type of respondents under study. Such as, the questions that are appropriate for serviceman might not be appropriate for a businessman. The less diversified respondent group shall be selected because the more diversified the group is, the more difficult it will be to design a single questionnaire that is appropriate for the entire group.

Questionnaire Design Procedure

Determine the Content of Individual Questions: Once the information needed is specified and the interviewing methods are determined, the next step is to decide the content of the question. The researcher must decide on what should be included in the question such that it contribute to the information needed or serve some specific purpose.In some situations, the indirect questions which are not directly related to the information needed may be asked. It is useful to ask neutral questions at the beginning of a questionnaire with intent to establish respondent's involvement and rapport. This is mainly done when the subject of a questionnaire is sensitive or controversial. The researcher must try to avoid the use of **double-barreled questions**. A question that talks about two issues simultaneously, such as Is the Real juice tasty and a refreshing health drink?

Questionnaire Design Procedure

Overcome Respondent's Inability and Unwillingness to Answer: The researcher should not presume that the respondent can provide accurate responses to all the questions. He must attempt to overcome the respondent's inability to answer. The questions must be designed in a simple and easy language such that it is easily understood by each respondent. In situations, where the respondent is not at all informed about the topic of interest, then the researcher may ask the filter questions, an initial question asked in the questionnaire to identify the prospective respondents to ensure that they fulfil the requirements of the sample.Despite being able to answer the question, the respondent is unwilling to devote time in providing information. The researcher must attempt to understand the reason behind such unwillingness and design the questionnaire in such a way that it helps in retaining the respondent's attention.

Questionnaire Design Procedure

Decide on the Question Structure: The researcher must decide on the structure of questions to be included in the questionnaire. The question can be structured or unstructured. The unstructured questions are the open-ended questions which are answered by the respondents in their own words. These questions are also called as a free-response or free-answer questions.While, the structured questions are called as closed-ended questions that pre-specify the response alternatives. These questions could be a multiple choice question, dichotomous (yes or no) or a scale.

Questionnaire Design Procedure

Determine the Question Wording: The desired question content and structure must be translated into words which are easily understood by the respondents. At this step, the researcher must translate the questions in easy words such that the information received from the respondents is similar to what was intended.In case the question is written poorly, then the respondent might refuse to answer it or might give a wrong answer. In case, the respondent is reluctant to give answers, then "nonresponse" arises which increases the complexity of data analysis. On the other hand, if the wrong information is given, then " response error" arises due to which the result is biased.

Questionnaire Design Procedure

Determine the Order of Questions: At this step, the researcher must decide the sequence in which the questions are to be asked. The opening questions are crucial in establishing respondent's involvement and rapport, and therefore, these questions must be interesting, non-threatening and easy. Usually, the open-ended questions which ask respondents for their opinions are considered as good opening questions, because people like to express their opinions.

Questionnaire Design Procedure

Reproduction of Questionnaire: In case, the questionnaire is reproduced on a poor-quality paper; then the respondent might feel the research is unimportant due to which the quality of response gets adversely affected. Thus, it is recommended to reproduce the questionnaire on a good-quality paper having a professional appearance. In case, the questionnaire has several pages, then it should be presented in the form of a booklet rather than the sheets clipped or stapled together.

Questionnaire Design Procedure

Pretesting: Pretesting means testing the questionnaires on a few selected respondents or a small sample of actual respondents with a purpose of improving the questionnaire by identifying and eliminating the potential problems. All the aspects of the questionnaire must be tested such as question content, structure, wording, sequence, form and layout, instructions, and question difficulty. The researcher must ensure that the respondents in the pretest should be similar to those who are to be finally surveyed.

Pilot test

“A small scale-study conducted prior to conducting an actual experiment; designed to test and refine procedures.” Examples: Checking to see if the designed tool works.

A pilot study helps you determine if your research method is reliable. In other words, it enables you to determine if your methods are precise and that your research is easy to replicate. If your study isn't reliable, it's difficult to trust the data you gather.

A pilot study can be defined as a 'small study to test research protocols, data collection instruments, sample recruitment strategies, and other research techniques in preparation for a larger study.A pilot study is one of the important stages in a research project and is conducted to identify potential problem area.

Validity and Reliability of Questionnaire

The validity of a questionnaire is determined by analyzing whether the questionnaire measures what it is intended to measure.

The extent to which the results really measure what they are supposed to measure.

Reliability of questionnaires means the extent to which the results can be reproduced when the research is repeated under the same conditions.

Cronbachs alpha

- Cronbach’s alpha coefficient measures the internal consistency, or reliability, of a set of survey items. Use this statistic to help determine whether a collection of items consistently measures the same characteristic. Cronbach’s alpha quantifies the level of agreement on a standardized 0 to 1 scale. Higher values indicate higher agreement between items.
- High Cronbach’s alpha values indicate that response values for each participant across a set of questions are consistent. For example, when participants give a high response for one of the items, they are also likely to provide high responses for the other items. This consistency indicates the measurements are reliable and the items might measure the same characteristic.
- Conversely, low values indicate the set of items do not reliably measure the same construct. High responses for one question do not suggest that participants rated the other items highly. Consequently, the questions are unlikely to measure the same property because the measurements are unreliable.

Interview Schedule Primary Data Collection

This method can be used through personal interviews and, if possible, through telephone interviews. Personal interviews: Personal interview method requires a person known as the interviewer asking questions generally in a face-to-face contact to the other person or persons.

Interview Schedule Primary Data Collection

Interview Schedule is the tool or instrument used to collect data from the respondents while interview is conducted. Schedule contains questions, statements (on which opinions are elicited) and blank spaces/tables for filling up the respondents. The features of schedules are: The schedule is presented by the interviewer.

An interview schedule is basically a list containing a set of structured questions that have been prepared, to serve as a guide for interviewers, researchers and investigators in collecting information or data about a specific topic or issue.

Interview Schedule Primary Data Collection

Primary data collection is the process of gathering data directly from a first-hand source. In other words, it's data that's collected by the organization that expects to use it. Methods include surveys, interviews, observation, and focus groups.

Classification of Survey methods

- Online Survey Method
- Face-to-Face Surveys
- Focus Groups
- Panel Sampling
- Phone Survey
- Mail Surveys
- Paper Surveys
- SMS Surveys

Classification of Survey methods

Online Survey Method

- Easy to build surveys with different question types, multiple choice, rank-based, rating based, and many more
- Questionnaire templates to conduct surveys in almost every industry.
- Online surveys pose a challenge in such cases, but one can use offline surveys in those scenarios.
- Online surveys don’t have an interviewer to clarify queries

Classification of Survey methods

Face-to-Face Surveys

- Face-to-face surveys are apt for respondents who have low literacy.
- In addition, it helps uncover deep insights by asking more open-ended questions..
- To ensure that no data goes ignored, the researcher records the interview.
- Face-to-face surveys can be long and time-consuming.
- They are pricey due to travel expenses and the costs of hiring and training an interviewer.
- The success of the survey relies heavily on the interviewer’s skills.

Classification of Survey methods

Focus Groups

- There is a group of people (around 6 to 10). The group is selected to represent the survey's target population.
- This survey method is good for market research because it lets you uncover personal attitudes and perceptions.
- Focus groups are increasingly becoming digital. There are no geographical restrictions – anyone can participate from anywhere.
- The participants should be aware of the research objectives and essential facts before the discussion.

Classification of Survey methods

Panel Sampling

Panel sampling is when you choose people randomly from a target audience to be a part of a panel.

Organizations ranging from news media and government agencies to market research companies employ panel surveys. They roll out similar surveys to the target audience many times over various weeks and months.

Classification of Survey methods

Phone Survey

- If the interviewer is skillful, it can also lend a personal touch which helps build a relationship.
- In market research, CATI (Computer Assisted Telephone Interviewing) has led to a faster way to handle and process data obtained from phone surveys.
- Phone interviews are effortless since the survey displays on the computer screen, and the interviewer can easily record answers with a mouse and keyboard.
- Phone surveys are time-constrained and usually can’t go longer than 15 minutes.
- Many people screen their calls to accept only select callers and may not attend calls from an unknown number.
- Phone surveys can be mistaken as telemarketing calls and perceived negatively

Classification of Survey methods

Mail Surveys

- Mail surveys are questionnaires distributed and delivered via postal service to a sample audience. Respondents then have to complete these surveys and return them via mail.
- When drafting a mail survey, ensure that the study does not exceed one page.
- Mail surveys are straightforward and consist of a few open-ended questions.

Classification of Survey methods

Paper surveys

- Paper surveys, in conjunction with online surveys, can boost response rates.
- Moreover, a paper survey is the best alternative when the respondent cannot access its online version.
- Moreover, not everyone is tech-savvy enough to be at ease with online surveys. For an audience like this, paper surveys are a more effective tool.
- With its printing costs, the paper surveys method is expensive.
- Paper surveys are not environmentally friendly.

Classification of Survey methods

SMS surveys

- SMS surveys gather user feedback through text messages.Users can either text a short code to access the survey or click on the survey link through their phones.
- This survey method is ideal for collecting feedback on recent events.
- Ensure that the messages are short, and make the responses quantifiable rather than ask for qualitative feedback.
- There’s limited space for elaboration in a text message. This makes SMS surveys unsuitable for studies that need an introduction or context for better answers.

Evaluation Criteria for Survey Methods

Task factors

The demand that task to be performed places on the respondents and the data collection process influence the survey method that should be used. the nature of the task involved has an impact on the diversity of questions and flexibility, use of physical stimuli, sample control, a quantity of data and response rate

Evaluation Criteria for Survey Methods

Diversity of questions and flexibility of data collection

The diversity of questions that can be asked in a survey and the flexibility of data collection is determined primarily by the extent to which the respondent can interact with the interviewer and the survey questionnaire.

Evaluation Criteria for Survey Methods

sample control

- sample control is the ability of the survey mode to reach the units specified in the sample effectively and efficiently.
- Quantity Of Data
- the ability to collect large amounts of data.

Evaluation Criteria for Survey Methods

- Response rate
- survey response rate is broadly as the percentage of the total attempted interviews that are completed.
- situational factors
- in any situational situation, the researcher has to balance the need to collect accurate and high-quality data with the budget and time constraints.

Evaluation Criteria for Survey Methods

- potential for interviewer bias
- - the extent of the interviewer's role determines the potential for bias.speed
- - the total time taken for administering the survey to the entire sample.
- cost
- - The total cost of administering the survey and collecting the data.

Evaluation Criteria for Survey Methods

- Respondents factors

The respondents characteristics should also be considered while selecting a survey method. these factors include perceived anonymity, social desirability, low incidence rate, respondent control.

- Perceived anonymity
  perceived anonymity refers to the respondent's perceptions that their identities will not be exposed by the interviewer or the researcher.

Evaluation Criteria for Survey Methods

- social desirability
- - social desirability is the tendency of the respondents to give answers that are socially acceptable, whether or not they are true. with some exceptions, obtaining sensitive information is inversely related to social desirability.
- low incident rate

- - incidence rate refers to rate of occurrence of persons eligible to participate in the study.
  respondent control

- - methods that allow respondents control over the interviewing process will solicit greater cooperation and are therefore desirable.

Observation Techniques

Observational research is a method of data collection that has become associated with qualitative research. Compared with quantitative research and experimental research, observational research tends to be less reliable but often more valid.

Observation technique is a qualitative research technique where researchers observe participants' ongoing behavior in a natural situation.

Observational techniques are marketing methods that companies use to measure the performance of their products qualitatively. These techniques employ a series of methods that rely on observation and analysis of customer behaviour and product usage.

Classification of Observation Methods

1. Controlled observation

- The controlled observation is carried out in a closed space. It is the researcher who has the authority to decide the place and the time where and when the observation will take place. He also decides who the participants will be and in what circumstances will he use the standardized process.
- The participants are chosen for a variable group randomly. The researcher observes and records a detailed and descriptive quantitative data of behavior and divides it into a distinct category. Sometimes the researcher codes the action as per an agreed scale by using a behavior schedule. The coding can include letters or numbers or a range to measure behavior intensity and describe its characteristics.

Classification of Observation Methods

2. Naturalistic observation

The process of naturalistic observation involves observing and studying the spontaneous behavior of the participants in open or natural surroundings. The role of the researcher is to find and record whatever he can see and observe in natural habitat.

The naturalistic observation method is used by the researchers to create new ideas. The researcher has the chance to observe the total situation.

Classification of Observation Methods

3. Participant observation

The researcher interacts with other members of the group freely, participates in their activities, studies their behavior and acquires a different way of life.

1. **Overt participant observation:** When the researcher asks permission from a group to mingle the observation method is known as overt. He does so by revealing his true purpose and real identity to the group with whom he wants to mingle
2. **Covert participant observation:** When the researcher does not show either his true identity or real meaning to the group he wants to join then the observation is known as covert. He keeps both concealed and takes on a false role and identity to enter and mingle in the group. He generally acts as if he is a genuine member of that group

Advantages of Observation Techniques

(1) Simplest Method:

Observation is probably the most common and the simplest method of data collection. It does not require much technical knowledge. Although scientific controlled observation requires some technical skill of the researcher, still it is easier than other methods. Everybody in this world observes many things in their daily life. A little training can make a person perfect, to observe his surroundings.

Advantages of Observation Techniques

(2) Useful for Framing Hypothesis:

Observation is one of the main bases of formulating hypothesis. By observing a phenomenon continuously, the researcher may get well acquainted with the observed. He came to know about their habits, likes, dislikes, problems, perception, different activities and so many other things. All these help him a lot to form a hypothesis on them. Any researcher, therefore, has to be a good observer.

Advantages of Observation Techniques

(3) Greater Accuracy:

the observer can directly check the accuracy from the observed. He can apply various devices to test the reliability of their behaviour. So very often the data collected through observation is more reliable than these collected through interview or questionnaire.

(4) An Universal Method:

Observation is a common method used in all sciences, whether physical or social. So it has greater universality of practice. As a common method, it is very easily followed and accepted.

Advantages of Observation Techniques

(5) Observation is the Only Appropriate Tool for Certain Cases:

Observation can deal with phenomena which are not capable of giving verbal information about their behaviour, feeling and activities simply for the reason that they cannot speak e.g. infants or animals.

(6) Independent of People's Willingness to Report:

Observation does not require the willingness of the people to provide various information about them. Often some respondents do not like to speak about themselves to an outsider. Some people do not have time or required skill to provide important information to the researcher.

Limitations of Observation Techniques

Not all Occurrences Open to Observation can be Observed when Observer is at Hand:

Many social events are very much uncertain in nature. It is a difficult task on the part of the researcher to determine their time and place. The event may take place in the absence of the observer. On the other hand, it may not occur in the constant presence of the observer

Limitations of Observation Techniques

Not all Occurrences Lend Themselves to Observational Study:

Most of the social phenomenon is abstract in nature. For example, love, affection, feeling and emotion of parents towards their children are not open to our senses and also cannot be quantified by observational techniques. The researcher may employ other methods like case study; interview etc. to study such phenomena.

Limitations of Observation Techniques

Lack of Reliability:

The relative-ness of the social phenomena and the personal bias of the observer again create difficulty for making valid generalization in observation

Faulty Perception:

One is never sure that what he is observing is the same as it appears to his eyes. Two persons may judge the same phenomena differently. One person may find something meaningful and useful from a situation but the other may find nothing from it. Only those observers who are having the technical knowledge about the observation can make scientific observation.

Limitations of Observation Techniques

Personal Bias of the Observer:

The personal bias, personal view or looking at things in a particular way often creates obstacle for making valid generalization. The observer may have his own ideas of right and wrong or he may have different pre-conceptions regarding an event which kills the objectivity in social research.

Slow Investigation:

Observation is a time taking process. P.V. Young rightly remarks that the valid observation cannot be hurried; we cannot complete our investigation in a short period through observation. It sometimes reduces the interest of both observer and observed to continue their observation process.

Limitations of Observation Techniques

(8) Expensive:

Observation is a costly affair. It requires high cost, plenty of time and hard effort. Observation involves travelling, staying at the place of phenomena and purchasing of sophisticated equipment's. Because of this it is called as one of the most expensive methods of data collection.

(9) Inadequate Method:

"the full answers cannot be collected by observation alone". Therefore many suggested that observation must be supplemented by other methods also

Limitations of Observation Techniques

(10) Difficulty in Checking Validity:

Checking the validity of observation is always difficult. Many of the phenomena of observation cannot be defined with sufficient precision and does not help in drawing a valid generalization. The lack of competence of the observer may hamper validity and reliability of observation

Secondary Data Collection

Secondary data is data collected by someone other than the actual user. It means that the information is already available, and someone analyses it. The secondary data includes magazines, newspapers, books, journals, etc. It may be either published data or unpublished data.

Classification of Secondary Data Sources

Statistical synopses, census records, and other reports issued by the different departments of the government. Official statements and publications of the foreign governments. Publications and reports of chambers of commerce, financial institutions, trade associations, etc.

Sales reports, HR filings, Annual accounts, Quarterly sales figures, Customer relationship management systems, Emails and metadata,

Website cookies etc.

Evaluation of Secondary Data

Secondary data should be evaluated with respect to several important criteria. The data should be accurate, that is, without errors. The data should be relevant to the particular research need on hand.

1.Who collected the data.

2.What is the data provider's purpose or goal.

3.When was the data collected.

4.How the data was collected.

5.What type of data was collected.

6.Whether the data is consistent with data from other sources.

Roadmap to use Secondary Data

- Identifying the need of secondary data for research
- Utility of internal secondary data sources for the research problem
- Utility of external secondary data sources for the research problem
- Use external secondary data for the research problem

Benefits of Secondary data

- **Ease of access**
  The secondary data sources are very easy to access. The Internet has changed the way secondary research works. Nowadays, you have so much information available just by clicking with the mouse.
- **Low cost or free**
  The majority of secondary sources are absolutely free for use or at very low costs. It saves not only your money but your efforts. In comparison with primary research where you have to design and conduct a whole primary study process from the beginning, secondary research allows you to gather data without having to put any money on the table. (see more on our post: primary vs secondary data)
- **Time-saving**
  As the above advantage suggests, you can perform secondary research in no time. Sometimes it is a matter of a few Google searches to find a source of data.

Benefits of Secondary data

- **Allow you to generate new insights from previous analysis**
  Reanalyzing old data can bring unexpected new understandings and points of view or even new relevant conclusions.
- **Longitudinal analysis**
  Secondary data allows you to perform a longitudinal analysis which means the studies are performed spanning over a large period of time. This can help you to determine different trends. In addition, you can find secondary data from many years back up to a couple of hours ago. It allows you to compare data over time.
- **Anyone can collect the data**
  Secondary data research can be performed by people that aren't familiar with the different data collection methods Practically, anyone can collect it.
- **A huge amount of secondary data with a wide variety of sources**
  It is the richest type of data available to you in a wide variety of sources and topics.

Drawbacks of Secondary data

Might be not specific to your needs

Secondary data is not specific to the researcher's needs due to the fact that it was collected in the past for another reason. That is why the secondary data might be unreliable for your current needs. Secondary data sources can give you a huge amount of information, but quantity does not always mean appropriateness.

You have no control over data quality

The secondary data might lack quality. The source of the information may be questionable, especially when you gather the data via the Internet. As you relying on secondary data for your data-driven decision-making. you must evaluate the reliability of the information by finding out how the information was collected and analyzed.

Biasness

As the secondary data is collected by someone else than you, typically the data is biased in favor of the person who gathered it. This might not cover your requirements as a researcher or marketer.

Drawbacks of Secondary data

- **Not timely**
  Secondary data is collected in the past which means it might be out-of-date. This issue can be crucial in many different situations.
- **You are not the owner of the information**
  Generally, secondary data is not collected specifically for your company. Instead, it is available to many companies and people either for free or for a little fee. So, this is not exactly a “competitive advantage” for you. Your current and potential competitors also have access to the data.

Qualitative methods

Qualitative research is defined as a market research method that focuses on obtaining data through open-ended and conversational communication.

Qualitative method is used to understand people's beliefs, experiences, attitudes, behavior, and interactions. It generates non-numerical data. The integration of qualitative research into intervention studies is a research strategy that is gaining increased attention across disciplines.

Focus Group Method

A focus group is a research method used to collect opinions and feedback from a group of people about a specific product, concept, or service. The group is typically made up of 8-10 people who are invited to discuss their opinions, thoughts, and feelings in a facilitated discussion.

Focus group discussion is frequently used as a qualitative approach to gain an in-depth understanding of social issues. The method aims to obtain data from a purposely selected group of individuals rather than from a statistically representative sample of a broader population.

Projective Techniques

Projective techniques allow respondents to project their subjective or true opinions and beliefs onto other people or even objects. The respondent's real feelings are then inferred from what s/he says about others. Projective techniques are normally used during individual or small group interviews.

Exploring the unconscious

Understanding emotions and attitudes

Overcoming social desirability bias

Stimulating creativity and imagination

Enhancing qualitative research

Facilitating therapeutic processes

Projective Techniques

- Exploring the unconscious
- Researchers can access people's unconscious ideas, emotions, and motivations using projective techniques. These methods give us a look into parts of the mind that may be hard to learn about through direct questions or self-reporting
- Understanding emotions and attitudes
- Emotions and views greatly impact how people act and make decisions. Projective techniques allow people to study and understand their feelings and attitudes, even if they are unaware of them.

Projective Techniques

- Overcoming social desirability bias
- Social desirability bias is a common problem in research, where people tend to give answers that they think are socially acceptable or desirable instead of what they really think or feel.
- Stimulating creativity and imagination
- Projective techniques often involve creative and imaginative jobs, like telling stories, drawing, or finishing sentences. These tasks make people more creative and urge them to think outside of the box.

Projective Techniques

- Enhancing qualitative research
- Projective approaches are open-ended, allowing participants to express themselves in their own special ways. This gives market researchers a deeper understanding of the participants' experiences, beliefs, and values.
- Facilitating therapeutic processes
- Projective techniques can be used in therapy to help people figure out and talk about their ideas, feelings, and experiences. These methods give people a creative, non-threatening way to connect with their inner world and learn more about their mental health. Self-reflection, personal growth, and healing can all be aided by projective techniques like art therapy, sand play, or guided imagery

MODULE FIVE: SAMPLING AND DATA PREPARATION

Sampling, Concept of Sample and Target Population, Sample frame, Sample unit and sample size, Characteristics of a Good Sample, Sampling Design Process; Probability and Non Probability Sampling Design, Sampling v/s Non-Sampling Error; Determination of Sample Size. Data Preparation, Field Validation, Data editing, Coding, Content Analysis, Classification and Tabulation of Data.

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Sampling

- Sampling means selecting the group that you will actually collect data from in your research.
- Sampling is the selection of a subset of the population of interest in a research study.
- For example, if you are researching the opinions of students in your university, you could survey a sample of 100 students. In statistics, sampling allows you to test a hypothesis about the characteristics of a population.
- Sampling allows researchers to use a small group from a larger population to make observations and determinations.

Concept of Sample

- Sample is a subset of individuals selected from a larger population for study or investigation.
- A sample is a smaller set of data that a researcher chooses or selects from a larger population using a pre-defined selection bias method.
- A sample refers to a smaller, manageable version of a larger group. It is a subset containing the characteristics of a larger population. Samples are used in statistical testing when population sizes are too large for the test to include all possible members or observations.

Target Population

Target population is the total group of individuals from which the sample might be drawn

A target population, also referred to as a target audience, is a group of people with particular characteristics that may be effectively defined to distinguish them from the general population.

A target population is typically a group or collection of factors you want to learn more about. The target population is a subset of the general public identified as the targeted market for a given product, advertising, or research. It is a subset of the entire population chosen to serve as the objective audience.

Sample frame

- A sample frame is the list of members of the population of interest from which a probability sample is selected. A sample frame does not always include all members of the population of interest.
- It is the actual collection of units. A sample has now been taken from this. A basic random sample gives all units in it an equal probability of being drawn and appearing in the sample. In the ideal scenario, the sample frame should match the sample of people.
- A complete list or collection from which your sample participants will be drawn in a predetermined manner. The list will be organized in some way. That is, each member of a population will have an individual identity and a contact mechanism. This allows you to categorize and code known information about segmentation features.

Sample unit

- A sample unit is the building block of a data set; an individual member of the population, a cluster of members, or some other predefined unit. It must be concretely defined as part of the groundwork for any statistical research or study. Typically, it is the minimum unit of observation that possesses the properties being studied. A lot depends on who your target group is and what data you have about the population.
- For example:
- In surveys and market research, the units might be households or targeted individuals (e.g. children under 18, adults over 60).
- In quality analysis, the unit might be a single production unit—i.e., a single food processor in factory that made these, or a single loaf of bread in a bakery.

Sample size

The sample size is the measure of the number of individual samples used in an experiment.

For example, if we are testing 50 samples of people who watch TV in a city, then the sample size is 50.

The sample size is defined as the number of observations used for determining the estimations of a given population. The size of the sample has been drawn from the population. Sampling is the process of selection of a subset of individuals from the population to estimate the characteristics of the whole population. The number of entities in a subset of a population is selected for analysis.

Characteristics of a Good Sample

- A sample should have a clear goal.
- A good sample should be an accurate presentation of the entire universe or population.
- A good sample is free from bias.
- A sample should be chosen randomly.
- The adequacy of a sample is essential.
- A sample should be proportional.

Characteristics of a Good Sample

1. Representative Sample

- A good sample design should ensure that the sample is representative of the population. The sample should accurately reflect the characteristics of the population.

2. Adequate Sample Size

- A good sample design should have an adequate sample size to ensure that the research findings are reliable and accurate.

3. Random Sampling

- Random sampling is a crucial aspect of a good sample design. Random sampling ensures that every member of the population has an equal chance of being selected for the sample.

Characteristics of a Good Sample

4. Sampling Frame

- The sampling frame should be complete, up-to-date, and accurate. A well-designed sampling frame ensures that the sample is representative of the population.

5. Appropriate Sampling Technique

- The sampling technique should be appropriate for the population, sample size, and research methodology. Appropriate sampling techniques, such as stratified sampling, cluster sampling, or simple random sampling, ensure that the research findings are reliable and accurate.

Sampling Design Process

- **Identify the population of interest(Target population)** :
- Target population refers to the group of individuals or objects to which researchers are interested in generalizing their findings.
- A well-defined population reduces the likelihood of undesirable individuals or objects. A sample is taken from the target population.
- **Select a sampling frame :**
- The sampling frame is the group of individuals or objects from which the researcher will draw the sample.
- It is the actual list of all units in a target population from which the sample is taken.
- **Specify the sampling technique** :
- Sampling can be done by two techniques: probability (random selection) or non-probability (non-random) technique.
- Now, if the sampling frame is approximately the same as the target population, random selection may be used to select samples.

Sampling Design Process

➢Determine the sample size:

- The sample size is defined as the number of units in the sample. Sample size determination depends on many factors such as time, cost, and facility.

➢**Execute the sampling plan :**

- Once population, sampling frame, sampling technique, and sample size are identified, the researcher can use all that information to execute the sampling plan and collect the data required for the research.

Probability and Non Probability Sampling Design

- **Probability sampling** involves random selection, allowing you to make strong statistical inferences about the whole group.
- **Non-probability sampling** involves non-random selection based on convenience or other criteria, allowing you to easily collect data.

Probability and Non Probability Sampling Design

Probability sampling methods

Probability and Non Probability Sampling Design

- **1. Simple random sampling**
- In a simple random sample, every member of the population has an equal chance of being selected. Your sampling frame should include the whole population.
- To conduct this type of sampling, you can use tools like random number generators or other techniques that are based entirely on chance.
- Example: Simple random samplingYou want to select a simple random sample of 1000 employees of a social media marketing company. You assign a number to every employee in the company database from 1 to 1000, and use a random number generator to select 100 numbers.

- **2. Systematic sampling**
- Systematic sampling is similar to simple random sampling, but it is usually slightly easier to conduct. Every member of the population is listed with a number, but instead of randomly generating numbers, individuals are chosen at regular intervals.
- Example: Systematic sampling All employees of the company are listed in alphabetical order. From the first 10 numbers, you randomly select a starting point: number 6. From number 6 onwards, every 10th person on the list is selected (6, 16, 26, 36, and so on), and you end up with a sample of 100 people.

- **3. Stratified sampling**
- Stratified sampling involves dividing the population into subpopulations that may differ in important ways. It allows you draw more precise conclusions by ensuring that every subgroup is properly represented in the sample.

Example: Stratified samplingThe company has 800 female employees and 200 male employees. You want to ensure that the sample reflects the gender balance of the company, so you sort the population into two strata based on gender. Then you use random sampling on each group, selecting 80 women and 20 men, which gives you a representative sample of 100 people.

- **4. Cluster sampling**
- Cluster sampling also involves dividing the population into subgroups, but each subgroup should have similar characteristics to the whole sample. Instead of sampling individuals from each subgroup, you randomly select entire subgroup.
- Example: Cluster samplingThe company has offices in 10 cities across the country (all with roughly the same number of employees in similar roles). You don't have the capacity to travel to every office to collect your data, so you use random sampling to select 3 offices – these are your clusters.ps.

Non-probability sampling methods

- . **Convenience sampling**
- A convenience sample simply includes the individuals who happen to be most accessible to the researcher.

Example: Convenience samplingYou are researching opinions about student support services in your university, so after each of your classes, you ask your fellow students to complete a survey on the topic. This is a convenient way to gather data, but as you only surveyed students taking the same classes as you at the same level, the sample is not representative of all the students at your university.

- **2. Voluntary response sampling**
- Similar to a convenience sample, a voluntary response sample is mainly based on ease of access. Instead of the researcher choosing participants and directly contacting them, people volunteer themselves (e.g. by responding to a public online survey).

Example: Voluntary response samplingYou send out the survey to all students at your university and a lot of students decide to complete it. This can certainly give you some insight into the topic, but the people who responded are more likely to be those who have strong opinions about the student support services, so you can't be sure that their opinions are representative of all students.

- **3. Purposive sampling**
- This type of sampling, also known as judgement sampling, involves the researcher using their expertise to select a sample that is most useful to the purposes of the research.

Example: Purposive samplingYou want to know more about the opinions and experiences of disabled students at your university, so you purposefully select a number of students with different support needs in order to gather a varied range of data on their experiences with student services.

- **4. Snowball sampling**
- If the population is hard to access, snowball sampling can be used to recruit participants via other participants. The number of people you have access to “snowballs” as you get in contact with more people. The downside here is also representativeness, as you have no way of knowing how representative your sample is due to the reliance on participants recruiting others. This can lead to sampling bias.
- Example: Snowball samplingYou are researching experiences of homelessness in your city. Since there is no list of all homeless people in the city, probability sampling isn’t possible. You meet one person who agrees to participate in the research, and she puts you in contact with other homeless people that she knows in the area.

Quota sampling

Quota sampling relies on the non-random selection of a predetermined number or proportion of units. This is called a quota.

You want to gauge consumer interest in a new produce delivery service in Boston, focused on dietary preferences. You divide the population into meat eaters, vegetarians, and vegans, drawing a sample of 1000 people. Since the company wants to cater to all consumers, you set a quota of 200 people for each dietary group. In this way, all dietary preferences are equally represented in your research, and you can easily compare these groups.You continue recruiting until you reach the quota of 200 participants for each subgroup.

Sampling v/s Non-Sampling Error

Differences	Sampling Error	Non-Sampling Error
Definition	The difference between sample statistics and population parameters due to chance variations in the sample	Any errors or biases that occur in the data collection or processing that are not due to random variation in the sample
Cause	Random variation in the sample	Bias in the data collection or processing
Effect	Can lead to bias in the sample	Can lead to bias in the sample
Solution	Reduce by using larger sample size or implementing good sampling technique	Reduce by using larger sample size, good research design, or implementing good data quality practices
Impact	Can affect the precision of the estimate	Can affect the validity of the research by leading to inaccurate or biased conclusions

Sampling v/s Non-Sampling Error

The key difference between sampling and non-sampling error is that sampling error is the error that arises from taking a sample from a larger population, while non-sampling error is error that arises from other sources, such as errors in data collection or data entry. Sampling error can be measured and controlled through techniques such as random sampling and increasing sample size, while non-sampling error is more difficult to detect and control.

Determination of Sample Size

- Sample size determination is the process of choosing the right number of observations or people from a larger group to use in a sample. The goal of figuring out the sample size is to ensure that the sample is big enough to give statistically valid results and accurate estimates of population parameters but small enough to be manageable and cost-effective.
- In many research studies, getting information from every member of the population of interest is not possible or useful. Instead, researchers choose a sample of people or events that is representative of the whole to study. How accurate and precise the results are can depend a lot on the size of the sample.

Determination of Sample Size

Choosing the statistically significant sample size depends on a number of things, such as the size of the population, how precise you want your estimates to be, how confident you want to be in the results, how different the population is likely to be, and how much money and time you have for the study. Statistics are often used to figure out how big a sample should be for a certain type of study and research question.

Data Preparation

- Data preparation is the process of gathering, cleansing, transforming and modelling data with the goal of making it ready for analysis as part of data visualization or business intelligence.
- Data preparation is an important step in data analytics as well as in business intelligence. It's also a core function of business analysts.
- In its most basic terms, preparation means making sure that data from multiple sources can be combined seamlessly into a single useful source. That usually requires unifying and normalizing data so that it can be used for further analysis and reporting.

Field Validation

Field validation is an automated process of ascertaining that each field contains the correct value before the form is accepted. The concept is straightforward. Does the phone number field contain a phone number? Does the email address field have all the parts that an email address needs to have?

Field validation tests the results of machine learning model training against live data and can be used to evaluate the quality and consistency of predictions across different data sets (training, validation, and testing data).

Field Validation

Field validation ensures that the models optimized for predicting the outcomes using training data also produce quality, consistent predictions with a new set of data, called holdout data. Holdout data is typically set aside from training data for use during a different, separate time period. As a part of the model development and deployment life cycle, field validation is important to demonstrate to the business and process owners that the AI-based application can be embedded successfully into operations and produce dependable results.

Data Editing

Data editing is the application of checks to detect missing, invalid or inconsistent entries or to point to data records that are potentially in error. No matter what type of data you are working with, certain edits are performed at different stages or phases of data collection and processing.

Data editing helps define guidelines that will reduce potential bias and ensure consistent estimates leading to a clear analysis of the data set by correct inconsistent data using the methods later in this article. The purpose is to control the quality of the collected data.

Coding

Coding is the process of converting data into a form that can be analyzed. It involves assigning numerical or categorical codes to data items, such as responses to survey questions or demographic information. Coded data can then be analyzed using statistical software or other tools.

The purpose of coding is to provide structure to free-form data so that it can be examined in a systematic way. Assigning codes helps capture what each qualitative response is about.

Content Analysis

Content analysis is the process of analyzing content and its features with the aim of identifying patterns and the presence of words, themes, and concepts within the content. Simply put, content analysis is a research method that aims to present the trends, patterns, concepts, and ideas in content as objective, quantitative or qualitative data, depending on the specific use case. Simplifying complex, unstructured content.

- Identifying trends, patterns, and relationships in the content.
- Determining the characteristics of the content.
- Identifying the intentions of individuals through the analysis of the content.
- Identifying the implied aspects in the content.

Content Analysis

- Directly examines communication using text
- Allows for both qualitative and quantitative analysis
- Provides valuable historical and cultural insights over time
- Allows a closeness to data
- Coded form of the text can be statistically analyzed
- Unobtrusive means of analyzing interactions
- Provides insight into complex models of human thought and language use
- When done well, is considered a relatively “exact” research method
- Content analysis is a readily-understood and an inexpensive research method

Classification and Tabulation of Data

The process of classifying data int groups is known as classification of data.

Tabulation is the act of presenting data in tabular form, for better interpretation.

- The process of arranging data into different categories, on the basis of nature, behavior, or common characteristics is called classification. A process of condensing data and presenting it in a compact form, by putting data into statistical table, is called tabulation.

Classification and Tabulation of Data

- Classification of data is done after data collection process is completed. On the other hand, tabulation follows classification.
- Data classification is based on similar attributes and variables of the observations. Conversely, in tabulation the data is arranged in rows and columns, in a systematic way.
- Classification of data is performed with the objective of analysing data in order to draw inferences. Unlike tabulation, which aims at presenting data, to ensure easy comparison of various figures.
- In classification, data is bifurcated into categories and sub-categories while in tabulation data is divided into headings and sub-headings.

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