

<b>Course Code</b>	<b>:</b>	<b>MMPC-015</b>
<b>Course Title</b>	<b>:</b>	<b>Research Methodology for Management Decisions</b>
<b>Assignment Code</b>	<b>:</b>	<b>MMPC-15/TMA/JULY/2022</b>
<b>Coverage</b>	<b>:</b>	<b>All Blocks</b>

Note: Attempt all the questions and submit to the Coordinator of your study centre. **Last date of submission for July 2022 session is 31<sup>st</sup> October, 2022 and for January 2023 session is 30<sup>th</sup> April, 2023.**

1. What is research? Discuss the various types of research with suitable examples.
2. What are the functions and goals of research design? Discuss different types of research designs.
3. Write a short note on the following:
  - a. Methods of data collection
  - b. The Likert's scale
  - c. Non-Probability Sampling Methods
  - d. Ethics in research
4. Describe, in brief, the importance of editing, coding, classification, tabulation and presentation of data in the context of the research study.
5. What is regression analysis? In what ways can multiple regression be used to forecast some industry's sales? Discuss the steps involved in conducting regression analysis.

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*Disclaimer/Special Note: These are just the sample of the Answers/Solutions to some of the Questions given in the Assignments. These Sample Answers/Solutions are prepared by Private Teacher/Tutors/Authors Meenakshi Sharma for the help and guidance of the student to get an idea of how he/she can answer the Questions given the Assignments. We do not claim 100% accuracy of these sample answers as these are based on the knowledge and capability of Private Teacher/Tutor Meenakshi Sharma. Sample answers may be seen as the Guide/Help for the reference to prepare the answers of the Questions given in the assignment. As these solutions and answers are prepared by the private Teacher/Tutor Meenakshi Sharma so the chances of error or mistake cannot be denied. Any Omission or Error is highly regretted though every care has been taken while preparing these Sample Answers/ Solutions. Please consult your own Teacher/Tutor before you prepare a Particular Answer and for up-to-date and exact information, data and solution. Student should must read and refer the official study material provided by the university.*

**1. What is research? Discuss the various types of research with suitable examples.**

**ANS: RESEARCH :**

Research is a systematic inquiry process that includes data gathering, documentation of important information, analysis, and interpretation of that data and information in accordance with appropriate procedures established by particular academic and professional disciplines. A systematic investigation to describe, explain, forecast, and control the observed phenomenon is known as research. Both inductive and deductive strategies are used in research. Bettie, 1998 . Inductive methods analyze the observed phenomenon and identify the general principles, structures, or processes underlying the phenomenon observed; deductive methods verify the hypothesized principles through observations. The purposes are different: one is to develop explanations, and the other is to test the validity of the explanations.

One thing that we have to pay attention to research is that the heart of the research is not on statistics, but the thinking behind the research. How we really want to find out, how we build arguments about ideas and concepts, and what evidence that we can support to persuade people to accept our arguments.

Research is "creative and systematic work undertaken to increase the stock of knowledge".[ It involves the unbiased collection, organization and analysis of information to increase understanding of a topic or issue. A research project may be an expansion on past work in the field. To test the validity of instruments, procedures, or experiments, research may replicate elements of prior projects or the project as a whole.]

**various types of research:**

**Action research**

Action research is a method for attempting to identify workable answers to organisational problems. It's like practical research, really.

Learning by doing is essentially what action research is. A problem is first discovered, then steps are taken to address it, the effectiveness of the solutions is assessed, and if the outcomes are unsatisfactory, the process is repeated.

**It can be put into three different groups:**

- **Positivist:** This type of research is also called "classical action research." It considers research a social experiment. This research is used to test theories in the actual world.

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- Interpretive: This kind of research is called “contemporary action research.” It thinks that business reality is socially made, and when doing this research, it focuses on the details of local and organizational factors.
- Critical: This is a sort of action research that takes a critical approach to corporate systems and tries to enhance them.

### **Applied Research**

Here, the goal is to find strategies that can be used to address a specific research problem. Applied research draws on theory to generate practical scientific knowledge, and its use is very common in STEM fields such as engineering, computer science and medicine.

#### **This type of research is subdivided into two types:**

- Technological applied research: looks towards improving efficiency in a particular productive sector through the improvement of processes or machinery related to said productive processes.
- Scientific applied research: has predictive purposes. Through this type of research design, we can measure certain variables to predict behaviours useful to the goods and services sector, such as consumption patterns and viability of commercial projects.

For example, market research, because by examining consumption patterns, strategies can be developed for the development of new products and marketing campaigns, etc.

Note: Applied research is usually based on knowledge or results obtained through theoretical research.

In fact, it is common for research projects to first establish the theoretical framework both to define the field of study and to identify possible theories that could be tested or applied to solve the specific problem posed in the project.

### **Fundamental research**

Fundamental research (or academic research) is “experimental or theoretical works mainly performed to obtain new knowledge on the basics of observable phenomena or facts, without prior consideration that it will result in any practical application or use”.

Fundamental research, also known as basic research or pure research does not usually generate findings that have immediate applications in a practical level. Fundamental research is driven by curiosity and the desire to expand knowledge in specific research area. This type of research makes a specific contribution to the academic body of knowledge in the research area.

Fundamental studies tend to make generalizations about the phenomenon, and the philosophy of this type of studies can be explained as ‘gathering knowledge for the sake of knowledge’.

Fundamental researches mainly aim to answer the questions of why, what or how and they tend to contribute the pool of fundamental knowledge in the research area.

### **According to the Type of Data Used**

#### **Qualitative Research**

Qualitative methods are often used in the social sciences to collect, compare and interpret information, has a linguistic-semiotic basis and is used in techniques such as discourse analysis, interviews, surveys, records and participant observations.



In order to use statistical methods to validate their results, the observations collected must be evaluated numerically. Qualitative research, however, tends to be subjective, since not all data can be fully controlled. Therefore, this type of research design is better suited to extracting meaning from an event or phenomenon (the 'why') than its cause (the 'how').

For example, examining the effects of sleep deprivation on mood.

### **Quantitative Research**

Quantitative research study delves into a phenomena through quantitative data collection and using mathematical, statistical and computer-aided tools to measure them. This allows generalised conclusions to be projected over time.

For example, conducting a computer simulation on vehicle strike impacts to collect quantitative data.

## **2. What are the functions and goals of research design? Discuss different types of research designs.**

### **ANS: What is Research Design ?**

When a research is carried-out, it follows a definite pattern or plan of action throughout the procedure, i.e., since the problem identification to the report preparation and presentation. This definite pattern or plan of action is called "research design". It is a map that guides the researcher in collecting and analyzing the data. In other words, research design acts as a blueprint that is followed throughout the research work.

For example, a building cannot be constructed without the knowledge of its structure. A builder cannot order raw materials or set dates till he knows the structure of this building, such as office building, school, home, etc

### **Definition of Research Design**

#### **According to William Zikmund :**

"Research design is defined as a master plan specifying the methods and procedures for collection and analyzing the needed information."

functions and goals of research design:

#### **Purpose of research design / Use of research designs are as follows :**

##### **1) Reduces Cost :**

Research design is needed to reduce the excessive costs in terms of time, money and effort by planning the research work in advance.

##### **2) Facilitate the Smooth Scaling :**

In order to perform the process of scaling smoothly, an efficient research design is of utmost importance. It makes the research process effective enough to give maximum relevant outcome in an easy way.

##### **3) Helps in Relevant Data Collection and Analysis :**

Research design helps the researchers in planning the methods of data collection and analysis as per the objective of research. It is also responsible for the reliable research work as it is the foundation for entire research. Lack of proper attention in preparation of research design can harm the entire research work.



**4) Assists in Smooth Flow of Research Operations :**

Research design is necessary to give better and effective structure to the research. Since all the decisions are made in advance, therefore, research design facilitates the smooth flow of research operations and reduces the possible problems of researchers.

**5) Helps in Getting Reviews from Experts :**

Research design helps in developing an overview about the whole research process and thus assists in getting responses and reviews from different experts in that field.

**6) Provides a Direction to Executives :**

Research design directs the researcher as well as the executives involved in the research for giving their relevant assistance.

**different types of research designs:**

**Based on the aim of study, there are three types of research design :**

**1) Exploratory Research Design :**

Exploratory research design aims to get a better understanding of the problem by explaining the concepts and developing hypotheses regarding the research study. Various techniques used in exploratory research study are literature survey, surveys, focus groups, case studies, etc. Exploratory research does not emphasize upon sampling, but tries to gather information from participants who are considered knowledgeable.

**2) Descriptive Research Design :**

Unlike exploratory research, the aim of descriptive research is to describe the characteristics of a phenomenon is more rigid than exploratory research. It describes various aspects related to a population. It is the study that is designed to depict the population in much more accurate way. It attempts to describe, explain and interpret the conditions in much detailed approach. It examines a phenomenon that is occurring at a specific place and at specific time.

**3) Experimental or Causal Research Design :**

Experimental or Causal or Conclusive research design is a type of research design which is predetermined and structured in nature. It is used for causal or conclusive research, which is conducted quantitatively. It is called causal research, because it is helpful in exploring the cause and effect relationship of a research problem. The main objective of casual research is to test the hypotheses which were defined in the exploratory Research Design. Causal research is simply opposite to the descriptive research, as with the help of experimentation, it can interpret whether the relationship is causal or not.

**3. Write a short note on the following: a. Methods of data collection**

**ANS: Qualitative**

Qualitative data collection refers to non-numerical research that gathers information on concepts, thoughts or experiences. Typically, qualitative results are useful for experience-based topics, like disc golf player needs. Qualitative research is common in humanities research and may use more personal methods of data collection. Some examples of qualitative data collection and research include:

- Observations
- Surveys
- Focus groups
- Interviews



### **Quantitative**

Quantitative data collection is the opposite of qualitative and instead collects numerical or statistical information. For example, your results might be a number of something, a percentage or an amount of time. Quantitative data can be useful for measuring demographics for marketing or comparing key statistics in board reports. Quantitative research is typically common in financial or scientific areas of study. Some examples of quantitative data collection and research include observations and surveys.

### **Primary**

Primary data collection happens when researchers obtain information directly from the original sources. For example, if you were researching to find the best material for your product, you may interview experts to gather primary research data to help inform the development of your product. These primary sources of data collection can vary depending on research subjects. Sources of primary data can also include market or academic research.

### **Secondary**

Secondary data collection refers to information gathered from previous research. The previous research might come from researchers who originally conducted the studies for another project and then made their findings public, or organizations who have published the research for awareness, like government organizations or nonprofits. This data is usually already analyzed and put into context. Sources of secondary data can include:

- Books
- Scholarly journals and papers
- Newspapers
- Websites
- Podcasts

### **1. Observation**

Observational methods focus on examining things and collecting data about them. This might include observing individual animals or people in their natural spaces and places. Avoiding direct interactions between researchers and the subjects they are observing can ensure that results are more accurate.

### **2. Survey**

Survey methods focus on gathering written or multiple choice answers about various subjects from individuals. Typically, individuals interact with these questions online and there is little to no interaction between survey distributors and survey respondents. Companies may use them to gather quick internal or external feedback.

### **3. Focus group**

Focus group methods focus on gathering information directly from users. This method usually focuses more on feelings, opinions or emotions rather than statistics. Companies may use focus groups to better understand their consumers.

### **4. Interview**

Interview methods can be more personal and involve face-to-face discussions about a topic between the researcher and participant. Researchers might share the questions with participants



before interview sessions to allow them to decide if they feel comfortable taking part. This method may include gathering consent forms for video or audio recordings.

### **5. Design thinking**

Design thinking methods may focus on brainstorming with participants to generate unique ideas or solutions. Companies might use this if they are interested in solving challenges consumers face on their journey as product users. These sessions can happen face-to-face or virtually depending on where researchers and participants are located.

### **6. User testing**

Companies usually use user testing during or after the development of products or services. If they choose to use it during development, it might be to determine where users find the product challenging to navigate. They might also use it after they have already released a product or service if they are interested in making updates.

#### **b. The Likert's scale**

ANS: Definition: A Likert scale is a unidimensional scale that researchers use to collect respondents' attitudes and opinions. Researchers often use this psychometric scale to understand the views and perspectives towards a brand, product, or target market.

Different variations of Likert scales are focused directly on measuring people's opinions, such as the Guttman scale, Bogardus scale, and Thurstone scale. Psychologist Rensis Likert established a distinction between a scale that materializes from a collection of responses to a group of items (maybe 8 or more). Responses are measured in a range of values.

#### **Types of Likert Scales**

The Likert Scale has become a favourite among researchers to collect opinions about customer satisfaction or employee experience. You can divide this scale primarily into two major types:

- Even Likert Scale
- Odd Likert Scale

#### **Even Likert Scale**

Researchers use even Likert scales to collect extreme feedback without providing a neutral option. 4-Point Likert Scale for importance: This type of Likert scale allows researchers to include four extreme options without a neutral choice. Here the various degrees of importance are represented in a 4-Point Likert Scale.

8-Point Likelihood of recommendation: This is a variation of the previously explained 4-point Likert scale, the only difference being, this scale has eight options to collect feedback about the likelihood of a recommendation.

#### **Odd Likert Scale**

Researchers use the odd Likert scale to give the respondents the choice of responding neutrally.

5-point Likert scale: With five answer options, researchers use this odd Likert scale question to gather information about a topic by including a neutral answer option for respondents to select if they don't wish to answer from the extreme choices in their research design.

7-point Likert scale: The 7-point Likert scale adds two more answer options at extreme ends of a 5-point Likert scale question.



9-point Likert scale: A 9-point Likert scale is quite uncommon, but you can use it by adding two more answer options to the 7-point Likert scale question.

### **Characteristics of Likert scale**

The Likert scale came into existence in 1932 in the form of the 5-point scale, which is used extensively. These scales range from a group of general topics to the most specific ones that ask respondents to indicate their level of agreement, approval or, belief. Some significant characteristics of the Likert scale, are:

- Related answers: Items should be easily related to the sentence's answers, regardless of whether the relationship between item and sentence is evident.
- Scale type: The items must always have two extreme positions and an intermediate answer option that serves as graduation between the extremes.
- Number of answer options: It is essential to mention that although the most common Likert scale is that of 5 items, the use of more items helps to generate greater precision in the results.
- Increasing reliability of the scale: Researchers often increase the ends of the scale to create a seven-point scale by adding "very" to the top and bottom of the five-point scales. The seven-point scale reaches the upper limits of the reliability of the scale.
- Using wide scales: As a general rule, Likert and others recommend that it be better to use a scale as wide as possible. One can always collapse the answers into concise groups, if appropriate, for analysis.
- Lack of a neutral option: By considering these details, scales are sometimes curtailed to an even number of categories (usually four) to eliminate the "neutral" possibility on a "forced choice" survey scale.
- Intrinsic variable: The primary Likert record clearly states that there could be an inherent variable whose value marks the feedback or attitudes of the respondents, and this underlying variable is the interval level, at best.

### **c. Non-Probability Sampling Methods**

ANS: Non-probability sampling may be used for many different reasons. For example, non-probability sampling may be used if researchers have limited time or finances. It may also be used to determine whether a particular trait exists in a population or if an issue needs further in-depth analysis. There are various non-probability sampling methods that can be used to select subjects for a study, which include the following:

1. Convenience sampling — Subjects are selected based on convenience and availability. This method may be used when time and money are limited.
2. Quota sampling — A population is split into segments based on demographic information. Subjects are selected from each segment to fill a quota. This method may be used to study larger populations.
3. Judgmental sampling — Also referred to as purposive sampling. The researcher uses their own judgment to select the most appropriate subjects for their study. This method is most effective when there are a limited number of people who have the expertise to participate in the study.
4. Consecutive sampling — The researcher selects and studies a sample for a period of time. After the data from the first sample has been collected, the researcher will then move on to a second



sample. This process continues until the researcher either accepts the null hypothesis or accepts an alternative conclusion. This method is an effective way to obtain results because it allows the researcher to modify and adjust their methods.

5. Snowball sampling — Current study subjects recruit additional subjects for the study. This method is used when study subjects are limited or difficult to locate.

#### **d. Ethics in research**

ANS: Ethics are the set of rules that govern our expectations of our own and others' behavior.

Research ethics are the set of ethical guidelines that guides us on how scientific research should be conducted and disseminated.

Research ethics govern the standards of conduct for scientific researchers. It is the guideline for responsibly conducting the research.

Research that implicates human subjects or contributors raises distinctive and multifaceted ethical, legitimate, communal and administrative concerns.

Research ethics is unambiguously concerned in the examination of ethical issues that are upraised when individuals are involved as participants in the study.

Research ethics committee/Institutional Review Board (IRB) reviews whether the research is ethical enough or not to protect the rights, dignity and welfare of the respondents.

#### **Objectives of Research Ethics:**

- The first and comprehensive objective – to guard/protect human participants, their dignity, rights and welfare.
- The second objective – to make sure that research is directed in a manner that assists welfare of persons, groups and/or civilization as a whole.
- The third objective – to inspect particular research events and schemes for their ethical reliability, considering issues such as the controlling risk, protection of privacy and the progression of informed consent.

#### **Principles of Research Ethics:**

The general principles of research ethics are:

Honesty	Being honest with the beneficiaries and respondents. Being honest about the findings and methodology of the research. Being honest with other direct and indirect stakeholders.
Integrity	Ensuring honesty and sincerity. Fulfilling agreements and promises. Do not create false expectations or make false promises.
Objectivity	Avoiding bias in experimental design, data analysis, data interpretation, peer review, and other aspects of research.
Informed consent	Informed consent means that a person knowingly, voluntarily and intelligently gives consent to participate in a research. Informed consent is related to the autonomous right of the individual to participate in the research.



		Informing the participant about the research objective, their role, benefits/harms (if any) etc.
Respect person/respondent	for	It includes: autonomy, which requires that those who are capable of deliberation about their personal goals should be treated with respect for their capacity for self-determination; and protection of persons with impaired or diminished autonomy, which requires that those who are dependent or vulnerable be afforded security against harm or abuse.
Beneficence		Maximize the benefits of the participants. Ethical obligation to maximize possible benefits and to minimize possible harms to the respondents.
Non-maleficence/ Protecting the subjects (human)		Do no harm. Minimize harm/s or risks to the human. Ensure privacy, autonomy and dignity.
Responsible publication		Responsibly publishing to promote and uptake research or knowledge. No duplicate publication.
Protecting anonymity		It means keeping the participant anonymous. It involves not revealing the name, caste or any other information about the participants that may reveal his/her identity.

**4. Describe, in brief, the importance of editing, coding, classification, tabulation and presentation of data in the context of the research study.**

ANS: Data required for the purpose of analysis & presentation of a research study is often consisting of errors such errors must be rectified before the final presentation is made.

This process involves editing, coding, classification, tabulation & presentation of data. Editing- This is concerned with removal of redundant data, filling of missing data completeness of data substance & reliability of data. The data obtained from variance sources are not always complete-sometimes fields remain black due to the human errors also this requires to be corrected. It also corrects the entries present at wrong positions. Many techniques like filling the empty values by frequent values, average values, random value, lowest value etc are common. The editing must be performed just after the data have been collected. This ensures that consistency is maintained various details like editor, data of editing etc are recorded. Coding^ Coding is performed to assign a predefined meaning to the data captured. The records that satisfy a given constraints are often marked with some Alphabets numerals etc. so that while sorting. Searching such records are taken out by a single search command. This concept is mutually exclusive.

Classification- This step of data sorting involves the segregation of data into various classified forms. The step of-classification makes the data analysis easy often a research study conducted.

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Serves not only single but multiple purposes. The various departments in organisation are interested in different aspects of the same data collected by the researches. These data correspond to the various form of analysis to make a particular decision. Data classification helps in making-comparisons & design strategies & policies for future action classification is performed accounting to various criterias like year wise, caste wise income group wise, department wise etc. During the problem study itself the classification criteria must be mentioned. Data classified into various forms may be further summed up to form an aggregated plan & even the aggregated data may be drilled down to achieve the desired results as per specifications. Tabulation" Classified data is presented in the form of rows & columns called tables. Such an approach is helpful for sorting, indexing, searching, aggregating & performing all sorts of operations leading to the data bank. This is further used for performing what if analysis. They present data clearly & to the point. The table must have row & column name to identify what the table represents. There must also be table names & headings for proper presentation Table also help to perform joining of two data sources. There must be appropriate messages attached to the cells, column, Page header & footer to allow easy referencing. Table hence designed must present simple, accurate & clear picture of the conclave to be displayed. The table designed must be able to fulfill the basic criteria for which if were designed. Presentation^ Data available in table in form of facts & figures are also presented in the form of the charts, pictorial graphics, picture analysis-graphics etc. This helps the top management to perform an effective data decision presentation is in the form of presentation is in the form of Graphics, pictorial. Pie charts etc. These are" tools for top managements for an accurate data interpretations.

**5. What is regression analysis? In what ways can multiple regression be used to forecast some industry's sales? Discuss the steps involved in conducting regression analysis**

ANS: Regression analysis is the mathematically measured correlation of a link between two variables: the independent variable X and the dependent variable Y. Regression analysis evaluates how strongly related the two elements are in order to help you make stronger business plans, decisions and forecasts.

**multiple regression be used to forecast some industry's sales:**

Multiple regression is a specific statistical technique that can help people understand the relationship between one dependent variable and two or more independent variables. Because multiple regression allows for more variance, it provides analysts with the ability to make optimal predictions of the response variable's outcomes.

**steps involved in conducting regression analysis:**

**1. Problem definition**

The very first step is to,ofcourse, define the problem we are trying to solve. Perhaps a business question that needs to be answered or simply a prediction we want to make based on some set of data. In this stage we must know the target variable and the attributes we presume affects the target variable. This would be later analysed to judge its credibility.

**2. Analyse Data**

The key is to have visual representations of our data so we can better understand the 'inter-relationships' of the variables and likely so, the book I was referring to earlier, highly recommends using visual tools to make the EDA(Exploratory Data Analysis) process easier.



### **3. Model Selection**

Based on the data, we are to pick a suitable model or regression equation. You may be familiar with many such models like Linear Regression, Support Vector Machine, Random Forest etc. The task in this step is to pick one that we assume will express the relationships of our data in the best way possible. This assumption can be later accepted or refuted based on analysis after fitting the model.

### **4. Model Fitting**

For simplicity's sake, let's consider Linear regression.  $Y = mx + c$ . We have the data, we have a model. At this stage we are going to train the model on the given dataset but what of the parameters of this equation?

We must estimate these parameters when fitting the model however they can be optimised with many algorithms. Perhaps this is when terms like 'Gradient Descent' or 'Adam optimiser' rings a bell. The purpose of an optimiser is simply to update the values in every iteration of training so we can minimise loss or error.

### **5. Model evaluation**

Final step is model evaluation — measuring and criticising exactly how good is the model fitting the data points. We run the model on the test data and check to see how accurately it was able to predict the output values.