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Course: Data Analysis
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Chapter 02

Data Collection



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Objectives of the course :

At the end of the course, the learner will be able to:

- Understand what data collection is and why it is important for research and decision-making.
- Differentiate between data collection methods (Primary and secondary data collection)
- Learn about the tools used to gather data and how to select the best ones for specific data needs.
- Become familiar with the steps involved in collecting data properly.

Chapter 02 :Data collection

1. Definition of data collection

Data collection is the process of gathering and measuring information on variables of interest, that enables the researcher to find answers to research questions, test hypotheses, and evaluate outcomes.

Data collection is one of the most important stages in conducting a research. « You can have the best research design in the world but if you cannot collect the required data you will be not be able to complete your project» (Kabir, 2016, p202).

2. Objectives of Data Collection

- Provides factual information to make informed choices and strategic decisions.
- Creates a record of information that can be referenced or used in future research.
- Helps predict future scenarios and plan accordingly
- provides the necessary information to test hypotheses, validate research findings, and conduct thorough analysis.

3. Data Collection methods

Generally, data collection methods are divided to two main categories of Primary Data Collection Methods and Secondary Data Collection Methods.

3.1 Primary data collection methods

Primary data collection is based on the processes by which you gather data yourself for your purpose of study and no one has access to use this data until it is published and both qualitative and quantitative approaches are used for this purpose.

Data that is not published yet and is the first-hand information which is not changed by any individual is known as primary data. In other words, researchers use different approaches to gather and collect primary data for a specific purpose

There are many methods of collecting primary data. The main methods include:

- Questionnaires
- Interviews
- Focus Group Interviews
- Observation
- Survey
- Case-studies
- Experimental Method
- Statistical Method etc.

3.2. Secondary data collection methods

Secondary data is the data gathered from published sources meaning that the data is already gathered by someone else for another reason and can be used for other purposes in a research as well. In all papers, the literature review section is based on secondary data sources.

Thus, secondary data is an essential part of research that can help to get information from past studies as basis conduction for implementing a research or as the required background information. It can also help to design a study and provide a baseline to compare primary results. However, it should be noted that researchers need to re-examine the validity and reliability of these backgrounds to gain authentic results.

This gathered data can be from both qualitative sources such as interview reports and quantitative sources data such as the census. The secondary data collection methods, generally, can be categorized as Figure (01).

Secondary Data Collection Methods	Description and Credibility Points
Published Printed Sources	In these types, the writer, publication, and publishing time are important.
Books	The most authentic ones among the secondary sources.
Journals/Periodicals	The most important methods as they are up-to-date and provide data and information about very specific subjects.
Magazines/Newspapers	Not highly reliable but can be effective in your research as well.
Published Electronic Sources	Very fast and accessible.
E-Journals	Very available compared to the printed ones. Nowadays these types are very credible as well
General Websites	Not very reliable.
Weblogs	Commonly used methods and provide reliable diaries.
Unpublished Personal Records	Useful in some cases.
Diaries	Useful in descriptive methods, although they can be not very accessible.
Letters	Must be checked in terms of reliability before using.
Government Records	Very useful in different subjects such as human research, social sciences, etc.
Census Data/Population Statistics	Include educational and health records.
Public Sector Records	Provided by private companies and NGO surveys.

Figure (1): Types Of Secondary Data Collection Methods. **Source :** Hamed Taherdoost, 2021, P33

3.3 Difference between primary and secondary collection data

Aspect	Primary Data Collection	Secondary Data Collection
Definition	Data collected directly from original sources by the researcher.	Data that has already been collected and recorded by others.
Source	First-hand sources such as surveys, interviews, observations, and experiments.	Existing sources such as books, articles, reports, and databases.
Purpose	To gather specific, original data tailored to the research objectives.	To use previously collected data for new analyses or comparisons.
Data Collection Methods	Surveys, interviews, focus groups, observations, experiments.	Literature reviews, archival research, reports, databases.
Time and Cost	Often time-consuming and expensive as it involves direct engagement with subjects.	Generally quicker and less costly as data is already available.
Control Over Data	High control over the design, methodology, and quality of the data collected.	Less control over how the data was collected, its quality, and its relevance.
Examples	Conducting a new survey to assess current safety practices on a construction site, performing interviews with project managers about challenges in project scheduling.	Analyzing historical project performance data from a construction management database, reviewing existing research studies on construction site safety trends, examining industry reports on project delays.



Figure 02 : Data Collection Methods . **Source :** Hamed Taherdoost, 2021, P13

3.4 How Primary and Secondary Data Complement Each Other?

- Secondary data provides background and identifies gaps, while primary data fills those gaps with specific information.
- Secondary data reduces the need for extensive primary research, saving time and costs.
- Secondary data offers broad trends, while primary data delivers detailed, specific insights.

4. Most common primary data collection methods

The most common primary data collection methods will be explained in this section, including questionnaires, interviews, focus groups, observation, surveys, and experimental methods, all in detail, to help guide your research work.

4.1 Questionnaire Method

4.1.1 Definition

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents (from a specific population)

The data given from a questionnaire cannot be achieved from the secondary resources (Pandey & Pandey, 2015). These forms are suitable to gather both qualitative and quantitative data. Although they are not the most common methods used in qualitative research, they are useful in case of facing a large sample in a study.

4.1.2 Types of Questions used in a questionnaire:

Each type of question serves a distinct purpose and can influence the quality and depth of the information obtained from respondents.

1. Closed-Ended Questions : provide respondents with a limited set of predefined answer options. These questions can be further categorized into several subtypes:

a. Multiple-Choice Questions - Respondents select one or more options from a list of choices.

Example: "Which safety measures do you regularly follow? (Select all that apply)

b-Yes/No Questions: Simple binary choices.

Example: "Do you wear protective equipment on the construction site? (Yes/No)"

c-Rating Scale Questions: Rate a statement on a scale (e.g., 1 to 5).

Example: "How satisfied are you with the current project management process? (1 = Very Dissatisfied, 5 = Very Satisfied)

d-Likert Scale Questions: Measures agreement or disagreement with a statement.

Example: "I feel adequately trained to use the project management software. (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree)"

e-Ranking Questions: Rank options in order of preference.

Example: "Rank the following project management challenges in order of importance."

2-**Open-Ended Questions**

- **Definition**: Respondents provide their own answers without predefined options.
- **Example**: "What challenges have you faced in completing tasks on schedule?"

3. **Demographic Questions**

- **Definition**: Collect personal or demographic information.
- **Types**:
  - **Age**: "What is your age group? (20-30, 31-40, etc.)"
  - **Gender**: "What is your gender? (Male, Female, Other)"
  - **Occupation**: "What is your current role in the construction project?"

4. Matrix Questions

- **Definition**: Multiple similar questions presented in a table format with a shared set of response options.
- **Example**:

Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Communication on the site is effective					
The safety measures are adequate					

5. Filter/Contingency Questions

- **Definition**: These are used to guide respondents to different follow-up questions based on their previous answers.
- **Example**:
  - Q1: "Have you been involved in a project delay? (Yes/No)"
  - Q2 (if yes): "What were the main reasons for the delay?"

6. Checklist Questions

- **Definition**: Respondents select all items that apply to them from a list.
- **Example**: "Which of the following equipment do you regularly use on-site? (Check all that apply)"

4.1.3 Types of Questionnaires

Structured Questionnaires: These contain closed-ended questions that provide respondents with predefined answer options, such as multiple-choice or Likert scale questions. Structured questionnaires facilitate quantitative analysis and are often used in large-scale surveys.

Unstructured Questionnaires: These include open-ended questions that allow respondents to provide their answers in their own words. Unstructured questionnaires are useful for exploratory research and can yield rich qualitative data.

Semi-Structured Questionnaires: These combine elements of both structured and unstructured formats, featuring a mix of closed and open-ended questions. This approach allows researchers to obtain specific information while also exploring respondents' perspectives in greater depth.

4.1.4 Questionnaire Administration Modes

there is different methods used to distribute and collect responses from participants. The choice of mode affects response rates, data quality, and the ease of administration

Face-to-face questionnaire administration, where an interviewer presents the items orally.(asking questions and recording answers.)

Paper-and-pencil questionnaire administration, Participants complete the questionnaire themselves without any direct interaction with the researcher.

(kabir,2016)

Telephone Surveys

The questionnaire is administered over the phone, with the interviewer asking questions and recording responses.

An online questionnaire

is a cost-efficient option; however, you should consider the possibility of missing samples due to problems with internet access.

different online survey services can be used which provide questionnaires for the purpose of study, and then the collected data can be easily added to the analyzing software (Taherdoost, 2021)

4.1.5 Factors to Consider When Choosing an Administration Mode

Target Audience: Consider their access to technology and comfort with different modes (e.g., older populations may prefer phone or face-to-face, while younger people might prefer online).

Budget: Some methods (e.g., face-to-face) can be costly, while online and email surveys are generally cheaper.

Questionnaire Complexity: Complex surveys may require interviewer administration to clarify questions.

Time Sensitivity: Some modes (e.g., mobile surveys) may yield quicker responses than others.

4.1.5 Steps in Designing a Questionnaire

1. **Define the Research Objectives** - Clearly articulate the purpose of the questionnaire and the specific research questions it aims to address. This foundational step guides the entire design process and ensures that the questions are relevant to the research goals **(Aithal & Aithal, 2020; Rowley, 2014)**.

2. **Identify the Target Population** - Determine the demographic characteristics of the respondents from whom data will be collected. Understanding the target population helps in tailoring the questionnaire to their specific context and ensuring that the language and content are appropriate (Rowley, 2014; Govender et al., 2014).

3. **Develop the Questionnaire Items** - Create questions that align with the research objectives. This involves deciding on the types of questions to include (e.g., closed-ended, open-ended, Likert scale) and ensuring that they are clear, concise, and unbiased. It is essential to avoid leading questions that may influence respondents' answers (Rowley, 2014; Pluye et al., 2014).

4. **Pilot Testing -** Conduct a pilot test with a small sample of the target population to identify any issues related to question clarity, format, and overall flow. Feedback from the pilot test can be used to refine the questionnaire before full-scale administration (Aithal & Aithal, 2020). This step is crucial for assessing the reliability and validity of the questionnaire items (Sukrisman, 2020).

5. **Revise the Questionnaire** - Based on the feedback obtained during the pilot testing, make necessary revisions to improve clarity, relevance, and comprehensiveness. This iterative process may involve rewording questions, adjusting response options, or removing ambiguous items (Rowley, 2014; Aithal & Aithal, 2020).

6. **Determine the Mode of Administration -** Decide how the questionnaire will be distributed (e.g., online, paper-based, face-to-face). The mode of administration can affect response rates and the quality of the data collected. Considerations such as accessibility and convenience for respondents should guide this decision (Rowley, 2014; Govender et al., 2014).

7. **Administer the Questionnaire** - Distribute the finalized questionnaire to the target population, ensuring that instructions for completion are clear. Monitor the response rate and follow up as necessary to encourage participation (Aithal & Aithal, 2020).

8. **Analyze the Data -** Once the data is collected, analyze it using appropriate statistical methods. For quantitative data, descriptive and inferential statistics may be employed, while qualitative data may be analyzed thematically (Aithal & Aithal, 2020). Ensure that the analysis aligns with the original research objectives.

9. **Report the Findings** - Present the results in a clear and organized manner, highlighting key findings in relation to the research objectives. Include discussions on the implications of the findings and any limitations of the study (Rowley, 2014).

4.1.7 Advantages and disadvantages of Questionnaires

Advantages of Questionnaires

- Collecting a large amount of data from a large sample size;
- The possibility of gaining high accurate data;
- Analyzing the results easily by entering the achieved data to the software quickly in the majority of cases; (Frechtling, 2002; Kabir, 2016; Taherdoost, 2021);

Disadvantages of Questionnaires

- The possibility of misunderstanding the questions which can overshadow the answers;
- Low response rates if respondents' low interests cannot be addressed to answer questions (Frechtling, 2002);
- Useless and wrong answers are prevalent (Pandey & Pandey, 2015).

● Determining the reliability of answers is not possible; (Hamed Taherdoost ,2021)

4.2 Interview



interviewing involves asking questions and getting answers from participants in a study. Interviewing has a variety of forms including: individual, face-to-face interviews and face-to-face group interviewing. The asking and answering of questions can be mediated by the telephone or other electronic devices (e.g. computers). (kabir,2016)

This method is particularly useful for gaining detailed, nuanced, and personal perspectives, which may not be captured through other data collection tools like questionnaires or surveys.

4.2.1 Types of Interviews:

-Structured Interview:

Interviewees face the same set of questions which are pre-prepared before the interview session. The possible responses are limited, and participants may just face a few open-ended questions

Example: Asking a construction project manager the same set of questions regarding time management on multiple projects.

- Semi-structured interviews

It is conducted based on a guide. The interviewers ask questions considering the guidance; however, when researchers or interviewers need extra information, they can continue the conversation based on the questions provided ahead of time.

Example: Interviewing a site engineer about general project issues but allowing them to explore specific challenges like materials or labor.

- Unstructured interviews

It is informal methods of interviewing without using a specific structure. There is no guide in this type, and they just conduct casual conversations.

Example: Open-ended discussions with a project stakeholder about unexpected issues during a project.

4.2.2 Key Factors in Choosing the Right Type of Interview

Choosing the appropriate interview type is crucial to effectively gathering the information you need.

- **Research Objective:** Choose structured interviews for specific, quantifiable data, and semi-structured or unstructured interviews for exploring complex, qualitative insights.

- **Nature of the Information:** Use structured interviews for factual information and semi-structured or unstructured interviews for in-depth, nuanced data on complex topics.
- **Participant Availability and Comfort:** Structured interviews are efficient for participants with limited time, while semi-structured or unstructured interviews allow for a more open, comfortable discussion, especially on sensitive topics.

4.2.3 Interview Process Steps

1. **Define Objectives**: Clearly establish the purpose of the interview and the type of information you aim to gather.
2. **Prepare Questions**: Develop a structured or semi-structured list of questions aligned with the research objectives. Ensure the questions are clear, concise, and unbiased.
3. **Select Participants**: Identify and recruit individuals who have relevant experience or knowledge related to the research topic.
4. **Schedule and Plan**: Arrange the interview at a time and place convenient for the participant, ensuring a comfortable and distraction-free environment.
5. **Prepare Materials**: Gather necessary materials like recording devices, consent forms, and interview guides. Ensure any equipment is functioning properly.
6. **Conduct the Interview**: Begin with an introduction, explain the purpose, and obtain consent. Follow the prepared questions, while being flexible for deeper probing as necessary.
7. **Active Listening**: Engage with the participant by listening attentively, asking follow-up questions, and clarifying responses where needed.
8. **Record Responses**: Take notes or record the interview (with permission) to ensure accuracy in capturing responses.
9. **Wrap-Up**: Thank the participant and provide information about the next steps, if any, such as how the data will be used or any follow-up communication.
10. **Analyze Data**: Review and analyze the collected responses, using qualitative or quantitative methods as appropriate for your research.
11. **Report Findings**: Summarize key insights, trends, and conclusions drawn from the interview data in relation to the research objectives.

Example in Construction Project Management:

- **Interview Objective**: To assess how project managers deal with construction delays.
- **Interview Participants**: Project managers from different construction sites.
- **Questions**: What are the most common causes of delays in your projects? How do you address them? What measures do you take to prevent delays in future projects?

4.2.5 Merits and Demerits

Merits

- Collecting detailed and in-depth information directly from participants.
- Gaining insights into past experiences and future expectations of specific events or topics.
- The ability to explain and clarify questions to interviewees during the interview

Demerits

- Organizing when and where to meet can be complicated, with plans sometimes changing last minute.
- There's a risk of missing important information during interviews.
- The process of organizing and analyzing the responses (coding) can be lengthy and difficult

4.3 Focus Groups method (FGD)

4.2.4 Definition

This method, simply, is a mixture of interviewing and observation. This method is used to discover human behavior, attitudes, and respondents facing a particular concept. This in-depth field method gathers a group of individuals, normally between 6-12 people in each group, commonly with a shared characteristic such as sex, age, and educational status to discuss a specific study field.

4.3.2. Objectives of the method

Focus groups aim to explore complex issues, generate new ideas, and understand collective attitudes within a targeted population

4.3.2 Key Components

1. **Participants**: Typically, a focus group consists of 6-10 participants who are selected based on specific criteria relevant to the research topic.
2. **Moderator**: An experienced facilitator who guides the discussion, ensures that all participants have a chance to speak, and keeps the conversation on track.
3. **Discussion Guide**: A structured set of questions or topics prepared in advance to steer the conversation and ensure that all relevant areas are covered.

4. **Setting**: The discussion usually takes place in a comfortable, neutral environment where participants feel at ease.

5. **Data Collection**: The discussion is recorded (with participants' consent) and transcribed for analysis. Observations and notes from the session are also used to gather insights.

4.3.3 Advantages and Disadvantage of Focus Group

Advantages

- Provides in-depth insights into participants' thoughts and experiences.
- Facilitates dynamic discussion and idea generation through participant interaction.
- Allows researchers to observe non-verbal cues, like facial expressions and body language, adding depth to the data

Disadvantages

- Face privacy lacks;
- Coordinating schedules, securing a venue, and ensuring effective participation can be time-consuming and costly.
- Responses can be less structured and harder to analyze compared to quantitative data.

4.3.4Example

Safety Practices on Construction Sites.

Objective: To understand how workers feel about safety measures on construction sites.
Participants: Workers, safety officers, and site managers.
Goal: Find out what safety issues they face and how training can be improved.
Questions:

- What safety problems do you see on-site?
- How effective is the current safety training?
- What would make you feel safer while working?

Outcomes:

- Identify common safety concerns.
- Improve training programs based on worker feedback.
- Develop better safety protocols.

4.4 Observation Method

4.4.1 Definition
In these techniques, first-hand data is gathered through the observation of events, behaviors, interactions, processes, etc. directly to obtain an understanding of the concepts. This method can collect both qualitative and quantitative data

4.4.2 Key Features of the Observational Method

- **Natural Setting**: Observations typically occur in a real-world environment where subjects naturally engage in activities without external influences.

- **Non-Interference**: The researcher does not intervene or manipulate variables but records data as it unfolds.

- **Detailed Data Collection**: It emphasizes the collection of rich, detailed qualitative data rather than numerical or quantitative data.

4.4.3 Types of Observational Methods

1. **Participant Observation**: The researcher actively engages with the subjects while also making observations. For example, a manager joining workers on a construction site to observe their workflow.

2. **Non-Participant Observation**: The researcher observes from a distance, without becoming part of the group being studied. For instance, watching safety practices on a construction site from afar.

3. **Structured Observation**: The researcher follows a specific framework or checklist for observations. This is more systematic and is often used in more controlled settings.

4. **Unstructured Observation**: There is no predefined structure or checklist; the researcher observes freely and makes notes on various occurrences that seem relevant or interesting.

4.4.4 Advantages and Disadvantage of Obervation

Advantages:

- Gathering direct information **(**the data collected reflects real-world actions and reactions).
- Offers in-depth insights into complex behaviors and interactions, especially in dynamic environments like construction sites.

Disadvantages:

- It can take significant time to gather sufficient data.
- Observations can be influenced by the researcher's biases or interpretations.

4.4.5 Example

Observing Safety Practices on a Construction Site
Objective: To observe how construction workers follow safety protocols while working on a construction site.
Process:

1. **Setting the Scene:**
    1. A researcher decides to observe a local construction site where a new building is being erected. The focus is on safety practices, such as the use of helmets, harnesses, and safety signage.

2. **Preparation:**
   The researcher creates an observation checklist that includes:
   1. Are all workers wearing safety helmets?
   2. Are safety harnesses being used when working at heights?
   3. Is there visible safety signage in the area?
3. **Conducting Observations:** The researcher visits the site on multiple days and observes workers during various tasks. They take notes on:
   1. The frequency of safety gear usage.
   2. Instances where safety protocols are followed or ignored.
   3. Any conversations or interactions related to safety among the workers.
4. **Data Collection:** The researcher documents their observations, noting specific examples (e.g., "On Day 1, 80% of workers were wearing helmets, but only 50% were using harnesses when working on the scaffolding.").
5. **Analyzing Findings:** After several visits, the researcher reviews their notes to identify trends and common issues. They notice that workers often forget to use harnesses when they are busy or under time pressure.
6. **Conclusion:** The researcher concludes that while most workers adhere to safety protocols, there are gaps in compliance, particularly regarding harness usage. This insight can inform recommendations for additional safety training or reminders on-site.

5. Data Collection Tools

Data collection tools are **instruments or software** used to gather and record information systematically for research. They can be **manual** (like paper questionnaires, interview guides, and observation sheets) or **digital** (like Google Forms, SPSS, NVivo, ……).
Using the right tool ensures data that are **reliable, accurate, and easy to analyze**.

5.1 Types of Data Collection Tools

A-Manual (Traditional) Tools

These are **non-digital instruments** used to collect data directly, often on paper or through in-person observation.

Tool	Description / Use	Example
Questionnaire (paper-based)	Printed survey sheets filled out by hand.	Field or classroom surveys.
Interview Guide	Printed list of questions used during interviews.	Face-to-face interviews.
Observation Checklist	Paper form used to record observations manually.	On-site behavioral or spatial observation.

Advantages: Simple, low cost, no need for technology.
Limitations: Time-consuming, hard to store or analyze large data, prone to errors.

B- Software-Based (Digital) Tools

These are computer or mobile applications used to collect, store, and sometimes analyze data.

B.1 questionnaire Tools

Questionnaire tools are **software applications** designed to collect data from a large audience through structured questionnaires.

QuestionPro
Offers advanced survey features and analytics.
SurveyMonkey
User-friendly interface with customizable survey options.
Google Forms
Free and easy to use, suitable for simple surveys.

B.2 Interview and Focus Group Tools

Interview and focus group tools facilitate the collection of qualitative data through guided conversations and group discussions. These tools often include features for recording, transcribing, and analyzing spoken interactions, enabling researchers to gain in-depth insights into participants' thoughts, attitudes, and behaviors.

Zoom
Great for virtual interviews and focus group discussions.
Microsoft Teams
Offers features for collaboration and recording sessions.
Google Meet
Free, easy to use with a Google account

B.3 Observation and Field Data Collection tool

Observation and field data collection tools are essential for gathering real-world, in-situ data. These tools can help in tracking and recording data while on-site, ensuring accuracy and efficiency. Here are some popular tools and platforms for observation and field data collection:

KoboToolbox
Completely free and open-source. Designed for field data collection in challenging environments.
OpenDataKit (ODK)
This is for mobile data collection in field settings.
Epicollect5
Free and easy-to-use mobile app. Supports geotagged data collection, with multimedia options (photos, audio, videos).

Advantages: Fast, accurate, secure, easier data management and analysis.
Limitations: Needs internet or devices; may require training.

6. Selecting a Data Collection Method/Tool

Selecting the appropriate data collection method or tool is a critical step that depends on several factors related to your goals, the type of data you need, available resources, and the context in which the data will be collected.

It is important to note that no one data collection method/tool is ideal for every situation nor will any one factor determine the most appropriate method/tool. You must consider all the relevant factors together when deciding which ones to employ.

Selecting a Data Collection Method/Tool involves the following key factors:

- **Research Questions and Objectives**: Align the method with the type of data needed (quantitative vs. qualitative) and the specific goals of the study.
- **Participant/Unit Sample**: Consider the characteristics and size of the population or sample, and how accessible they are for participation.
- **Response Rates, Time, and Cost**: Balance efficiency, expected participation, and budget constraints when choosing between methods like surveys, interviews, or fieldwork.
- **Research Team's Expertise**: Ensure the method matches the skillset of the research team, especially for more complex tools or data collection techniques.
- **Data Quality**: Focus on methods that will yield accurate, reliable, and valid data, suited to the study's requirements.

7.Data Collection Process

In the Data Collection Process, there are 5 key steps:

7.1 **Decide What Data to Collect** Start by determining what information you need. This includes selecting the topics to focus on, the sources to gather the data from, and how much data is required. For example, in a construction project, you might decide to collect data on worker productivity and materials used.
7.2 **Set a Deadline for Data Collection** Next, set a timeline for gathering the data. If it's an ongoing project, like tracking construction progress, you might collect data continuously. For a specific project, like evaluating a single construction phase, you would gather data within a defined time period.
7.3 **Choose a Data Collection Method** Select the method that best fits your needs—surveys, direct observations, or digital tools, depending on the type of information you're gathering.
7.4 **Start Collecting Data** With your plan in place, begin the data collection process. Stay organized, store the data properly, and regularly check on your progress to make any necessary adjustments to the plan.
7.5 **Analyze and Use the Data** After gathering the data, analyze it to find patterns and insights. This helps you make informed decisions. For example, you might find that certain materials are being used inefficiently, prompting changes to improve cost and time management in future projects. (udhisthir Sharma,2023)

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