CHAPTER

9

PROJECT WORK

Project Work is a student-centered pedagogy in which students learn about a subject through the experience of solving an open-ended problem. This necessitates to synthesize knowledge from various areas of learning, and critically and creatively apply it to real life situations.

LEARNING OBJECTIVES

The student will be able to

- Design a questionnaire for a given project
- Collect data using questionnaire.
- Compile and tabulate the collected data.
- Statistically analyze the data
- Write a brief report

SFI2T

Introduction

A mechanical engineer has to spend time in an Industry as an apprentice, a medical doctor with a hospital as a house surgeon, an auditor with an accountant, a budding lawyer with an established senior as a junior to get to know intricacies of the profession in his day to day affairs. *Where is the counterpart of this for a student studying Statistics?* It is in this background, the inclusion of **project work** in the curriculum gains importance. This would help to some extent to bridge the gap between the theory learned in the class room and application.

Characteristics

The Project work is an assignment to be carried out by students during the course, either individually or in a group under supervision of the teacher. A brief written report of this work is an integral part of the assignment. Thus the project work is a *complete assignment*. . It contains the levels of planning, execution, analysis and reporting the work done.

Advantages

1. Formulating a real world problem with statistical perspective, student acquires application knowledge through the completion of the project.
2. Project works provides the knowledge about systematic collection of data, organization of ideas and an ability to analyze them with in a stipulated time. The following intangible benefits will be derived on completion of the project work.
    - ❖ Development of the capacity to identify and correctly specify statistical problem.
    - ❖ Being aware of the assumptions and the steps to validate them.
    - ❖ Ability to interpret results.
    - ❖ Development of report writing skill.
3. It pave the way for interaction with the respondents, the ability to fit into a team, provides co-operation and provides interaction among the students and between the teachers.
4. It gives them a sense of involvement and commitment.

9.1 DESIGNING A PROJECT

There are Six stages while doing a project work.

- ❖ Stage 1 - Identify the topic of the project work
- ❖ Stage 2 - Define Your Goals. Formulate Objectives / Hypothesis
- ❖ Stage 3 - Develop Your project work Plan.
- ❖ Stage 4 - Collection of Data and creating a data file.
- ❖ Stage 5 - Analyze Data
- ❖ Stage 6 - Report writing

Stage 1 . Fixing the project work topic

The first and foremost stages of any project work is identifying the topic of the project work. The sources for selecting the topic include (i) individual experiences, (2) personal conversation, (4) day-to-day practical experience, (5) Social problems (6) Politics like opinion poll.

The criteria for fixing the topic depends about data availability, time period to complete a research, availability of expertise.

Stage 2. Clearly state the objectives / Formulate Hypotheses

Objectives:

The aspects, the project worker want to probe in the project be spelt out in clear terms as objectives. Research should not proceed until objectives are clearly spelt out.

Hypothesis

Hypothesis is the perception of the researcher. It is stated as a testable proposition subject to empirical verification. Some times it is called as research hypothesis.

Stage 3: Project work planning

It involves selecting the most appropriate methods of (i) selecting respondents, (ii) method of collecting the data, (iii) selecting the data gathering instrument and test for its reliability and validity reliability and (iv) techniques to solve the problem under investigation. Designing a research project can be compared to that of an architect designing a building. It is a plan or blue print for collection, analysis and interpretation of data.

Stage 4: Data collection and data file preparation

Once the project plan is ready, the student will know from whom/ where to collect the data and the data gathering instrument. Now he moves to collect the required data.

Data file preparation involves entering in a spread sheet and checking for errors if any.

Stage 5: Statistical Data Analysis

This activity is most important. Here, we select the appropriate statistical tool for data analysis. This necessitates a good conceptual clarity and application understanding of the subject. T*he selection of statistical tool primarily depends on* Research Objective. And subsequently on the variables involved, its measurement scale (nominal, ordinal and scale) and number of variables considered at a time.

Stage 6: Report writing

The important step in any project study is that of preparing the project report. The report records the purpose, the importance, the procedure, the findings, the limitations and the conclusion of the project study. This should be prepared in such a way that it is easily understood and is helpful to other research or project workers in a similar field.

9.2 PROJECT WORK PLAN

A project work plan find the answers to the following host of questions:

1. What is study about?
2. Why is the study being made? (***Motivation of the study)***
3. Where will the study be carried out? (***Scope of coverage)***
4. **What type of data is required**? *(Survey data / Experimental data)*
5. What are instruments needed? (Questionnaire / Instruments)
6. From whom can be required data be found? (***Where to collect?*** ***Target group?)***
7. What periods of time will study include? (***How many times to collect***?)
8. What techniques of data collection will be used? (***Which method to follow?)***
9. How the data will be analyzed?

9.3 QUESTIONNAIRE DEVELOPMENT PROCESS

Questionnaire Format

It consists of two parts namely (1) Questions and (2) Responses.

Questions	**RESPONSES**
	
1. Name 2. Age (in completed years) 3. Sex	---------- _____ Years 1. Male 2. Female

Once the researcher has decided on the specific type of questions and the response formats, the next task is the actual writing of the questions. The wording in specific questions always poses significant time investment for the researcher. The general guidelines are useful to bear in mind during the wording and sequencing of each question.

Characteristics of a questionnaire

- ❖ The wording must be clear
- ❖ Select words so as to avoid biasing the respondent
- ❖ Consider the ability of the respondent to answer the question
- ❖ Create the willingness of the respondent to answer the questions.

Evaluate the Questionnaire

Once a rough draft of the Questionnaire has been designed the researcher is obligated to take a step back and critically evaluate it. This phase may seem redundant, given all the careful thoughts that went into each question. But recall the crucial role played by the questionnaire. At this point in the questionnaire development of the following item should be considered.

- Is the question necessary?
- Is the survey too long?
- Will the question provide the answers to the survey objectives?

Pre-Test

After the questionnaire is prepared, pre-test is to be done. The process collecting information from the related respondent in small number with the framed questionnaire is called *Pre-Test*. Sometimes, the questionnaire is circulated among some competent investigators and they are asked to make suggestions for its improvement. Once this has been done and suggestion incorporated in the final form of the questionnaire is ready for the collection of data.

9.4 FEATURES OF A PROJECT REPORT

Features of a project report.

The general structure of a project report consists of three main divisions.

A. The Preliminary Section:

This includes the title page, the preface, the acknowledgement, the table of contents and the list of tables and figures.

B. The Main Body Or The Text Of The Project :

This contains the introduction to the problem, the review of previous research in a similar field, the details of the procedure, the findings, the analysis of that, and conclusions.

C. The Reference section :

This includes Foot Notes, Bibliography Appendix , Index, etc.

LANGUAGE OF THE REPORT:

Report should be written in a simple language. It should be clear, precise and simple in style, and brief. It should be written in third person or passive voice. Spelling mistakes, colloquial form of presentation should be avoided. Spelling of non-English words, if used, should be kept uniform throughout.

EXERCISE 9

I. Choose the best answer.

1. Which one is the correct sequence of activities in project work?
   a) formulating objectives, report writing, data analysis, project work plan
   b) report writing, data analysis, project work plan , formulating objectives
   c) formulating objectives, data analysis report writing, , project work plan
   d) formulating objectives, , project work plan, data analysis, report writing.

2. Qualitative data implies:
   a) Measurable b) Non measurable c) Partly measurable d) All the above

3. The measurement scale of 'taste of a coffee' is :
   a) Nominal b) Ordinal c) Interval d) Ratio

4. When the researcher uses the data of an agency, then the data is called:
   a) Quantitative data b) Qualitative data
   c) Secondary data d) Primary data

5. Opinion poll in a study is conducted:
   a) Before the process start b) After the process start
   c) Middle of the process d) At any point of time of the process

6. A study is conducted on impact of stress on blood pressure. In this study blood pressure is a
   a) Independent variable b) Dependent variable
   c) Intervening variable d) Extraneous variable

7. Which one is false in the questionnaire method?
   a) Vast coverage in less time b) This method can be adopted to any respondent
   c) Response rate may be low d) It offers greater anonymity.

8. Null hypothesis in a research is:
   a) A positive directional hypothesis b) A negative directional hypothesis
   c) Hypothesis of no difference d) None of the above.

9. When we study the effect of any new intervention is,
   a) F test b) ANOVA c) Chi Square test d) Paired *t* test

10. Thanking the people who helped as to complete the project work will come under:
    a) Reference b) Conclusion
    c) Acknowledgement d) Need not appear in the report.

II. Give very short answer to the following questions.

11. Why is a project work needed in the curriculum?
12. Define population or target group under study.

13. List the points to be noted before fixing the project topic.
14. State the situations where hypothesis testing is inevitable in a project work
15. List the components that decide the tool selection.

III. Give short answer to the following questions.

16. State the characteristics of a project
17. List the intangible benefits derived by doing a project work
18. State the stages involved in doing a project work
19. What are things to be included in the primary section of a project report?
20. What is a pretest in the questionnaire method?

IV. Give detailed answer to the following questions.

21. State the advantages of doing a project work?
22. Briefly explain the characteristics of various stages in a project work.
23. State the points kept in mind while writing the questionnaire
24. In project work planning, state the aspects to be focused?
25. Discuss the features of a project report.

Answers: *Since the answers are part and parcel of the course and none of the questions have any problem, writing answers does not arise.*

ANNEXURES

(These Annextures use for understanding purpose only and questions should not be asked in this portion)

SAMPLE PROJECT - TEMPLATE

Stage 1. Fixing the project work topic

A study on the prevalence of obesity among the students

Stage 2. Clearly state the objectives / Formulate Hypotheses

1. How the respondents are distributed in sex and community wise.
2. How obesity is prevalent among the college students?
3. Whether sex has any influence on obesity?
4. Whether diet intake and obesity are related?
5. Establish a simple linear equation (linear model) for prediction purpose between height and weight?
6. Do the male and female differs with respect to average height?
7. Whether the average weights of different diet takers can be taken as equal?

Objectives:

1. *To describe the demographic features of the respondents*
2. *To find the prevalence of obesity among the population.*
3. *To know whether sex and diet in take is associated with obesity.*
4. *To test whether the suggested linear model between height and weight is good fit to the given data.*
5. *To test whether the sex and diet intake has influence on average weight*

Hypothess:

1. *Obesity doesn't depend on sex*
2. *Diet intake is not associated with obesity.*
3. *The linear model is good fit for the data between height and weight*
4. *The average weight of male and the average height female do not differ due to sex.*
5. *Different diet intake do not affect the average height.*

Stage 3: Project work planning

Planning for Data Collection

(i). Source : a). Survey ☑ *b). Experiment* ☐ *c). Observational study* ☐

(ii) Type of data: a). Primary data ☑ *b). Secondary data* ☐

(iii) Population or target group: _____

(iv) Coverage : _____

a). Census survey ☐ *b). Sample survey* ☑

If you go for a sample survey, answer the following:

(v) Sampling frame : a). available ☑ *b). Not available* ☐

(vi) Sample size determination: _____

(vii) Number of contacts: a). Only one time (Cross section study). ☑

b). Two times (before and after the intervention/ treatment) ☐

c). Several times (Longitudinal study) ☐

(viii) Sampling to be used? _____

(ix) Is it appropriate or whether will it give representative population ?

1. Yes ☑ *2. No* ☐

(x) The measuring instruments you intend to use? _____

(xi) In case of, questionnaire, Whether " Pre test " is conducted

1. Yes ☑ *2. No* ☐

(xii) Are they reliable and valid? 1. Yes ☐ *2. No* ☑

QUESTIONNAIRE

For this purpose the researcher has prepared a suitable questionnaire.

1. Name :

2. Sex 1.Male ☐ 2.Female ☐

3. Residence type: 1. Urban ☐ 2. Rural. ☐

4. Height in cms

5. Weight in kgs.

Stage 4: Data collection and data file preparation

Data Entry

S.No	Diet in take	Sex	Height	Weight
1	2	1	137.8	30
2	3	1	131.5	30.5
3	1	2	132.8	31.5
4	3	1	139.8	30.5
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39	2	1	126	24
40	3	2	128.5	23.5

Stage 5. Statistical Data Analysis

The appropriate statistical tools are selected based on the four following aspects.

1. Purpose.
2. Variables involved.
3. Types of measurement scales.
4. Number of variables considered at a time.

Interpretation: While interpreting data, the researcher should give both findings/inference and conclusion. It should be remembered that finding is what you have obtained from the data and conclusion is with related to answering the research question.

Template for Statistical Tool Selection and Analysis for formula type

Research Objective:

Template for selecting suitable test for testing of hypothesis and Analysis

Identify the variables involved:

Type of measurement scales:

Number of Variables:

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Selection of Appropriate Statistical Tool:

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Statistical calculation:

Findings:

Conclusion:

Research Hypothesis:

1. Study design (Tick appropriate)

   One sample ☐ Two independent sample ☐

   More than two independent sample ☐ Related sample (before – after) ☐

   Repeated measure more tha 2 times (Longitudinal) ☐

2. Identify the appropriate parameter to be used:

   Mean ☐ Proportion ☐ Variance ☐ Median ☐

3. Number of samples considered simultaneously:

   One ☐ Two ☐ More than two ☐

4. Sample size: Greater than 30 ($n \geq 30$) ☐ Less than 30 ($n \leq 29$) ☐

5. Data set follows: Normal Distribution ☐ Non Normal ☐

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Suitable statistical test: Parametric ☐ Non Parametric ☐

Name of the test: _____

TEST PROCEDURE

Test Procedure:

Null Hypothesis H_0 :

Alternative Hypothesis H_1:

Level of Significance α:

Test Statistic:

Calculation of calculated value using sample data:

Critical value from the table:

Inference:

Statistical Tool Selection based on purpose or aim

S.No.	Purpose / Aim	Stat. Tool
1	Describing or highlighting the variables	Descriptive Statistics
2	Relationship between **variables**. In terms of movements	Correlation Analysis Pearson's Correlation,Correlation with Spearman's Correlation
3	Relationship between **Attributes.**	Chi-square test for independence of attributes
4	Finding ***mathematical relationship*** for future prediction Or **impact of** independent variables on the dependent variable	**Regression Analysis** Simple Regression analysis
5	Hypothesis Testing 1. Assigning a value to the parameter 2. Comparing the efficiency of one group over other groups.	Large sample: Z tests ***Parametric Tests:*** Small Sample: , Single sample t test, Independent Sample t test, Paired Sample t test. ANOVA
6	To study the relative changes with respect to a base period in production, salary, prices etc	Index Numbers
7	In time series data to know the trend and to analyze the seasonal effect	Time series analysis Method of moving averages- method of least squares
8	To calculate the demographic details like birth rates, death rates, expected life time etc	Vital statistics -Mortality table

Report writing

RESEARCH REPORT FORMAT

Preliminaries,

Chapter I INTRODUCTION

Introduction about the research area : Broad Area

Problem Selection : Selection of the topic

Objectives of the study

Hypothesis of the study

Methodology of the study:

- Sample Design
- Source of Data - Instrument used for extracting information from the sample units
- Pre test- Reliability and validity of the data collection instrument and Pilot study
- Description of variables
- Frame work of analysis
- Significance of the study
- Period of study
- Scope of Study
- Limitations of the study
- Scheme or layout or organization of the report.

Chapter II METHODOLOGY / DATA COLLECTION

Chapter III ANALYSIS AND INTERPRETATION

Chapter IV SUMMARY AND CONCLUSION

Reference

12th standard – Statistics Practical

The syllabus for 12th standard practical are the following problems should be taken from the textbook examples or Exercises or relevant problems in real life situation. The question paper consists of two sections. Each section contains five questions. The students should answer four questions choosing two from each section.

Section A

1. Tests of Significance of a Proportion and Equality of Proportions based on *Z*-Statistic.
2. Tests of Significance of a Mean and Equality of Means based on *Z*-Statistic
3. Tests of Significance of a Mean based on *t*-Statistic.
4. Tests of Significance for equality of Means of two Independent Populations. (Independent samples '*t*' test)
5. Paired *t*-Test for dependent samples.
6. Test of Significance for Equality of Population Variances based on *F*-Statistic.
7. ANOVA for One Way Classification.
8. ANOVA for Two Way Classification.
9. Chi-square Test for Independence of attributes.
10. Chi-square Test for Goodness of fit.

Section B

1. Computation of Pearson's Correlation Coefficient.
2. Computation of Spearman's Rank Correlation.
3. Computation of Yule's coefficient of association.
4. Construction of Regression Equations.
5. Construction of Index Numbers.
6. Trend by the Method of "Moving Averages" of a Time series data.
7. Trend by the Method of "Least Squares" of a Time series data.
8. Seasonal Indices by the Method of "Simple Averages" of a Time series data.
9. Computation of CBR, ASBR, CDR,ASDR.
10. Construction of Life Table for Vital Statistics.

The Outline of the each of the problems is as follows.

1. Aim or purpose:
2. Selection of the suitable statistical tool
3. The following procedure is to be followed for the *SECTION A* and *SECTION B*.

SECTION B: Problem solving type

- Formula
- Substitution of data in the formula
- Calculation
- Result

SECTION A: Hypothesis testing

Test procedure

- Null Hypothesis H_0
- Alternative Hypothesis H_1
- Level of Significance α
- Test Statistic
- Calculation of test statistic value using sample data
- Critical value from the table
- Decision

Include graphs / diagrams wherever needed