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Research Methodology Follow-Up Using Android

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Abstract: The paper collects, records, and reports information regarding project performance. This paper utilizes the data from the monitoring activity to compare actual performance against planned performance. As a prerequisite to finishing their academic studies, students must submit a project on their topic of study at the start of the graduation session or final semester. To enhance the accuracy and academic acceptability of the project work, each student is assigned to a supervisor who will oversee the academic project. In particular institutions, the project coordinator or the head of the academic department or unit often assigns students to supervisors. The student is assigned a project topic after meeting with their supervisor. However, this process can sometimes be problematic. If the supervisor does not have expertise in the student's chosen topic, or the student is unable to cope with the assigned topic, it can lead to wasted time and a lack of research interest alignment between the student and supervisor. The effectiveness of the project coordinator in assigning students to the lecturer or supervisor is examined in this research. The goal of the study is to provide a solution to the issue of assigning project students to suitable project supervisors. In the hands of a skilled researcher, an Android device becomes a powerful instrument for scientific discovery, opening up new frontiers in fields ranging from psychology and sociology to medicine and environmental science.

Keywords: Research Process, Research Design, Sampling Design, Data Collection, Analysis of Variance.

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INTRODUCTION

A scientific and methodical search for relevant data on a particular subject is called research, carried out to establish facts or principles or to solve a problem. The goal of research is to use scientific methods to find answers to problems. The finding of the unexplored fact is the main objective of the study. The first and most important phase in the research process is choosing and accurately identifying a research issue [1].

The formidable problem that follows the task of defining the research problem is the preparation of the design of the research project, popularly known as the "research design". To the researcher, the usage of computers to analyze complex data has made complicated research designs practical. Electronic computers have by now become an indispensable part of research for students in the physical and behavioral sciences as well as in the humanities. In this era of computer technology, the research student has to be familiar with computer usage and procedures. A research proposal is a very difficult writing, which is made when a researcher has gone through the highest academic steps of education. It is the first thing that should be done by the researcher in the case he/or she wants to make the research successful. It gives the justification for the suggested investigation. It also demonstrates the researcher's familiarity with the topic [2].

Types of Research: The basic types of research are

Descriptive vs. Analytical: A wide range of investigation methods and questionnaires are included in descriptive research. Ex post facto investigation is mostly employed in business and sociological research. Researchers apply ex post facto studies to figure out and modify the factors. Comparative and correlational research approaches are typically used in descriptive research. The researcher is responsible for making use of the information that is currently accessible when conducting the analytical study.

Applied vs. Fundamental: The researcher has the option of using applied or fundamental research. Resolving a particular issue is the ultimate objective of applied research. The fundamental research is used to "Gather knowledge for knowledge's sake". The example of fundamental research is human behavior. The example of applied research is copy research; the

copy research is nothing, it is easy to read and understand.

Quantitative vs. Qualitative: Quantitative research is called measurements of quantity or amount. The qualitative research is called measurements of quality. The motivation is important to quantitative research, human behaviour is important to qualitative research, and it aims to discover the underlying motives of human behavior.

Conceptual vs. Empirical: The ultimate objective of conceptual research is to develop novel ideas or modify existing ones. This research is mostly used by philosophers and thinkers. The empirical research is based on observations or experiences; it is data-based research, it is verified by observations or coming up with conclusions, and it may be called an experimental type of research. In this research, the researcher must use the working hypothesis themselves, he/she must get enough data to disprove his/herhypothesis [3, 4].

Research Process: The research process consists of a series of actions or sequences of steps,

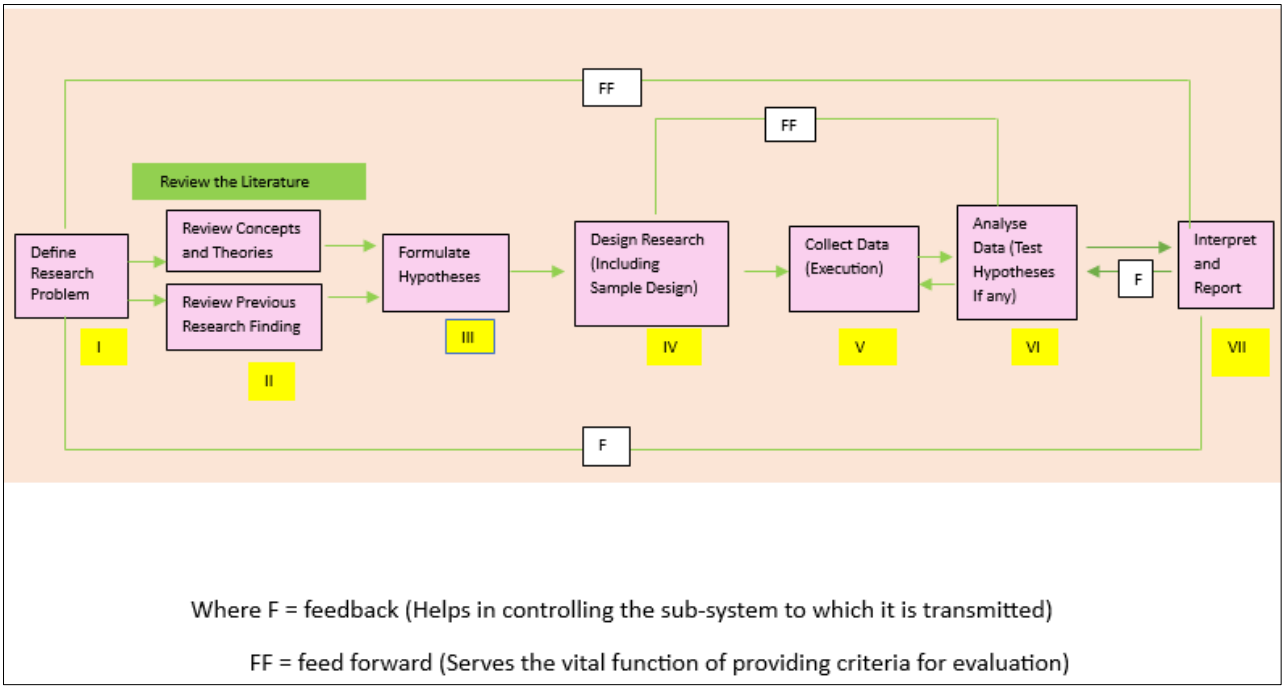

Figure 1: Research Process in Flow Chart

This figure shows the sequences of the research process; it shows the subsequent steps of the research process. One should know that this process is not mutually exclusive or separate and distinct.

GUIDELINE REGARDING RESEARCH PROCESS

This is very useful for the researcher, done his/her research step by step.

Formulating the Research Problem: It is used to find the solution for a particular problem before working on formulating the research problem, and then the researcher must rephrase his/her problem from an analytical point of view. The best solution for this problem is to discuss with his/her colleagues or a guide who has experience. The majority of models used in establishing the research issue are governmental entities or private company sections.

Extensive Literature Survey: One of the biggest issues is that a research worker creating a Ph.D. thesis must create a summary of the topic and present it to the authorized committee or scientific board for approval. The primary area for searching is the published or unpublished references and the abstracting and indexing articles [5].

Development of Working Hypotheses: This problem is based on two methods, one is the working hypothesis and the other is the working hypotheses. The working hypothesis is nothing; it is used for the researcher to draw out and test it logically or empirically. The researcher must focus on the working hypotheses, in the manner of a focal point, which may also affect the analysis of data and indirectly the quality of data required for the analysis. This problem plays an important role before use; it must be tested.

Preparing Research Design: This is the main problem; the researcher finds it very difficult to design a part of his/her study. Research may be conducted as efficiently as possible and convey the most details once a plan is developed. Stated alternatively, the research

methodology serves to ensure that pertinent data is gathered with the least amount of time, money, and effort. This is based on four categories: (i) Exploration, (ii) Description, (iii) Diagnosis, and (iv) Experimentation. The purpose of the research study is based on the exploration and then the purpose of the accurate description based on the association between variables. From this, one can minimize the bias and maximize the reliability of the data collected and analyzed.

Criteria of Good Research

1. The researcher must clearly define his/her research study
2. To ensure the integrity of the results, the research process should be sufficiently comprehensive to allow another researcher to repeat the study for additional development.
3. The research design should be clear and planned to yield the results for the objectives.
4. The conclusions should be sufficient, and it should be mentioned that for later.[3,6]

Good Research is Systematic: It is based on the set of rules, but it is not a rule out creative thinking, and it does not reject the guessing and intuition in arriving at its conclusions.

Good Research Is Logical: It is based on logical research, in the logical process of induction and deduction for the carrying out of research. The action of reasoning from a component to the entirety is called induction, whereas the process of reasoning from a basis to a result that flows from that assumption is called deduction.

Research Problem: The research problem is based on the researcher's topic; this problem is created either in a theoretical or practical situation and aims to obtain a solution for the same.

1. There must be individuals or groups of organizations.
2. There must be alternative means for obtaining his/her objectives.
3. There must be doubt in the selection of alternatives.
4. There must be some environments with difficult pertains [7].

Problem Based on Selection: The researcher must select the data, and that data must be based on his/her study. if he/she selects the unwanted data, it may create some problems during the execution time. Another problem during selection is researcher must have some ideas about his/her topic; if he/she not have any ideas about his/her study, it is very difficult to conduct research.

Necessity of Defining the Problem: The researcher must collect the data relevant to his/her study. It should be discriminated and unambiguously to help the relevant data from the irrelevant ones. Sometimes the problem is done by the researcher themselves, because the researcher must know that if he/she apply that data in an unwanted area [8].

TECHNIQUE INVOLVED IN DEFINING A PROBLEM

In the research, there are some techniques involved in defining a problem, they are

1. Problem in a general way,
2. Nature of the problem
3. Surveying the available literature
4. Ideas behind the group discussions
5. Rephrasing the problem

Problem in a General Way: The problem in general way is nothing, it is if the researcher must have some ideas regarding the his/her study, he/she must use the ideas is correct manner, if the researcher uses his ideas in unwanted area that is general way, this is may cause some problem during the execution time.

Nature of Problem: The researcher must understand the nature of the problem before execution time. Otherwise, the researcher must consult or discuss it with those who have experience in research. They may guide or give the reason for the problem.

Surveying the Available Literature: The researcher performing the literature survey must have the data in their control and utilize it for their purposes; otherwise, the research may not be concluded with an associated study, if the researcher needs a data, he/she must survey the literature with the guide or they must give the assurance regarding the data collected. Then they may accurate lycompare the data with the literature.

Ideas behind the Group Discussions: Discussing the issue with colleagues and other people who have sufficient expertise in the same field or working on related issues is essential for researchers. This is frequently referred to as an experience survey. In addition to focusing on the formulation of the particular problem at present, discussions with these individuals should also address the problem's general approach, potential solutions, and approaches that may be employed.

Rephrasing the Problem: Rephrasing the problem is verification of the problem to find the solution for it, and then it is a very difficult work done by a researcher, and then form a result that yields.

Research Design: The process of establishing the project's design, or "research design," involves determining the research problem. The specifications for data collecting and analysis have been established in a research design to balance operational efficiencies with significance for the study's goal.

1. The sample strategy addresses how things were selected to be examined for the particular analysis.
2. The conditions in which the experiments are to be performed relate to the observational design.
3. The statistical design which concerned with the question of how many items are to be observed and how the information and data gathered are to bean alyzed.
4. The operational design, which addresses the methods for carrying out the steps outlined in the statistical, observational in nature, and sampling models [9, 10].

FEATURES OF A GOOD DESIGN

A good design is based on flexibility, appropriateness, efficiency, economy, and so on. A good design enhances the dependability of the data gathered and processed while minimizing the bias. When considering a different research topic, a design that works well in one situation could be deemed inadequate in another. Generally, a research design that is suitable for a certain research topic is based on the following aspects.

i. The means of obtaining information;
ii. The study's staff members, and their accessibility and competence.
iii. The reason behind the study.
iv. The type of issue to be examined.
v. Amount of money and time available for the inquiry.

When the purpose of a study is an accurate description of a situation or of an association between variables (or in what are called the descriptive studies), accuracy becomes a major consideration, and a research design that minimizes bias and maximizes the reliability of the evidence collected is considered a good design.

Research Design in the Case of Exploratory Research Studies:

Exploratory research is termed formative research. Its main purpose is to investigate or develop the working hypotheses from an operational point of view. Because experimental investigations modify the original, widely stated research topic into one with significance, inherent flexibility in the methodology is required. This may need adjustments to the research technique in order to collect pertinent data [5].

Sampling Design: In every field of study, everything is a "universal" or "group." The term statistical enquiry refers to a comprehensive listing of every item in the population. It may be assumed that the highest possible level of precision is achieved in such an investigation when every aspect is reviewed and there is no part of the probability left. This might not be the case in actuality, yet.

IMPLICATIONS OF A SAMPLE DESIGN:

A sample design is an organized approach for selecting a sample from a certain population. It outlines the method or process the researcher will utilize to choose items for the sample, and it is solely based on sample size. A researcher may select from several types of sample layouts, some of which are more accurate and simpler to use than others. The investigator has to decide on or prepare a sample design that is legitimate and suitable for their study [9].

STEPS IN SAMPLE DESIGN:

The following considerations must be made by the researcher while establishing an exploratory design:

i. The initial phase in sampling design; it relies on the limiting and boundless. The finite ideas behind it may be countable and helpful for the researcher. The infinite research is not countable, and the researcher does not have an idea of an infinite researcher.
ii. **Sampling unit:** This corresponds to a decision-making tool that may be selected before sample selection. A geographical unit, such as a village, state, district, etc., serves as the basis for the unit of analysis. The chosen field of study needs to be supported by the researcher's opinions.
iii. **Source list:** It is known as a "sampling frame" and includes the names of every object in the universe. The researcher must create the source list if they don't already have one. Lists need to be appropriate, precise, reliable, and complete. The list of sources should be as indicative of the general population as feasible.
iv. **Size of sample:** The sample size, which corresponds to the number of elements selected from the vast universe to make up the sample, is neither excessive nor insufficient. It needs to be perfect. Dependability, flexibility, authenticity, and efficacy are all met by an ideal sample. The sample size is additionally restricted by the total population size, which must be recognized.

CHARACTERISTICS OF A GOOD SAMPLE DESIGN

The following are features of an effective sample design:

a) The sample design must result in a truly representative sample.
b) The sample setup has been optimized for a minimal sampling error.
c) Given the funding available for the study, the sample design needs to be logical.
d) The sample design must be such that systematic bias can be controlled in a better way.
e) The sample size should be sufficient to ensure there is an adequate level of confidence in extrapolating the outcome of the study's findings to the entire universe.

DIFFERENT TYPES OF SAMPLE DESIGNS:
Sample designs can be classified as either probability sampling or non-probability sampling.

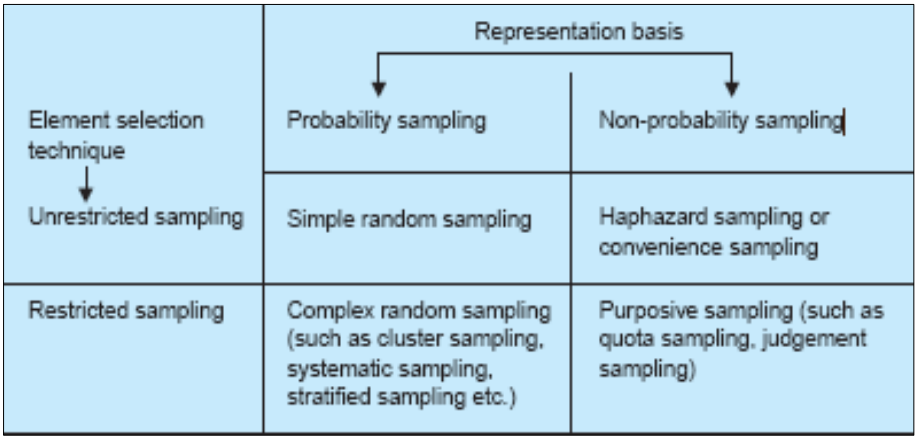

Figure 2: Types of Sampling Design

Simple random sampling, commonly referred to as probability sampling, is a kind of complicated random sampling, and probability sampling is based on stratified sampling, cluster sampling, systematic sampling, and both unrestricted and constrained samples. The non-probability sampling is called haphazard sampling or convenience sampling, and it is based on purposive sampling, such as quota sampling and judgment sampling.

METHODS OF DATA COLLECTION:
The data for the study were gathered by the researcher. Primary data and secondary data are the two categories of data. Primary data refers to information that has been obtained for the first time and is regarded as original. Since information has previously been gathered by another party or utilized for a statistical procedure, the secondary data is meaningless. Primary data gathering involves original collection, but secondary data collection involves just compilation. As a result, the methods used to obtain primary and secondary data are different [11].

COLLECTION OF PRIMARY DATA:
In experimental research, the main data may be gathered during the experiments; however, in descriptive research and surveying, the primary data can be acquired by direct conversation or observation.

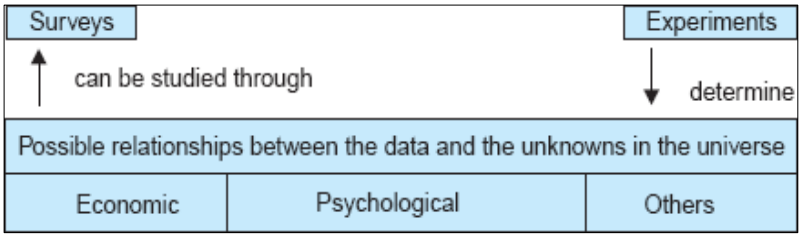

Figure 3: Collection of Primary Data

The primary data are based on,
Observation Method: The observation method is related to behavioral sciences, and in this, the researcher must observe the data correctly and carefully for his/her study, because in this observation, important methods are used.

Interview Method: The conversational approach involves gathering information using verbal responses.

Personal Interview: It involves asking questions to a person, and it requires data from face-to-face contact with other persons.

COLLECTION OF DATA THROUGH QUESTIONNAIRES:
The collection of data through questionnaires is where the researcher collects the data only regarding questions, because the researcher has some ideas about their study. He/she must collect the replies to the questionnaires only. It is considered a census for measurements. It may be raw data or information; in this, it may create more ideas behind questionnaires.

ANALYSIS OF VARIANCE (ANOVA):
The approach known as analysis of variance, or ANOVA, is highly beneficial for doing research in a number of different subjects, including business and

industry, psychology, sociology, economics, biology, and education. When dealing with several sample instances, this method is employed.

Variance, which is defined as the mean value of the squares of variations from the average of the given data series, is a crucial statistical metric. It is an often-employed variation metric. The standard deviation is the square root or standard deviation = variance.

ANOVA TECHNIQUE

One-way ANOVA:

One factor is taken into consideration under the one-way ANOVA, and it is observed that the fact that multiple types of samples may fit under that factor makes it significant [12].

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (d. f)	Mean Square (MS) (This is SS divided by d. f) and is an estimation of variance to be used in F - ratio	F - ratio
Between samples or categories	$n_1(\bar{X}_1 - \bar{\bar{X}})^2 + \ldots + n_k (\bar{X}_k - \bar{\bar{X}})^2$	$(k-1)$	$\frac{\text{SS between}}{(k-1)}$	$\frac{\text{MS between}}{\text{MS within}}$
Within samples or categories	$\sum (X_{1i} - \bar{X}_1)^2 + \ldots + \sum (X_{ki} - \bar{X}_k)^2$ i = 1, 2, 3....	$(n-k)$	$\frac{\text{SS within}}{(n-k)}$	
Total	$\sum (X_i - \bar{\bar{X}})^2$ i = 1, 2.... j = 1, 2....	$(n-1)$		

Figure 4: One–way ANOVA

CONCLUSION

Research methodology follow-up using Android devices has become an increasingly important tool for researchers in the modern era. the problem is expressed broadly, any discrepancies are addressed, and the process of analyzing and reconsidering ends in a more specific formulation of the problem so that it may be a realistic one in terms of the available data and resources and is also analytically meaningful, a researcher has to decide which of the several study designs would be best for their project before commencing data and analysis.We may state that simple random sampling is often the best option as it allows for the estimation of sampling error and the general elimination of bias.

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