Research paper and Dissertation

INTRODUCTION

Research is an essential ingredient of all fields of study as well as all professions. Whether an academician or a working professional, one has to be involved in research to become better equipped in the chosen field. Research can be performed individually on one's own initiative or as a member of a research project team.

Any systematic investigation towards increasing the sum of knowledge can be termed as research. Sometimes one may undertake research work that is a replica of some previous study in order to test the reported findings or the relevance of such findings under different circumstances. At other times, one may undertake research to make decisions regarding a new development or to refine or qualify the findings of earlier studies. Research may also be based on a meticulous search of material in journals, books, or other publications, or carefully designed experiments. However, every piece of research must make an original contribution to existing data and knowledge, irrespective of the method of enquiry.

At the end of a research, once books and magazines have been referred to, field trips have been completed, and experiments have been carried out in the laboratory, there remains the task of organizing the results and publishing them. The research would hardly be of any value unless the findings are disseminated to others working on or interested in the same sphere of activity or knowledge. Now, how does one go about this? The findings can be presented in a professional gathering, or if one wishes to reach a wider audience, the work can be published in a journal. In either case, the facts and opinions have to be organized so as to present their meaning as clearly and descriptively as possible. Such an organized analysis of a subject written mainly to record and disseminate information or knowledge, or to present a point of view on a selected topic, is known as a research paper. It is a documented prose work incorporating the results or findings of an original work. It may also be called a scientific paper, investigative paper, or library paper. In fact, it is a long essay often supported by relevant references from suitable sources. It gives a concise account of the work performed, the materials used, the methods adopted, and the results arrived at.

A research paper must be the first disclosure of a new research finding, presenting information that would enable peers (people associated with the field of study) to (a) assess observations, (b) repeat experiments, and (c) evaluate intellectual processes. It is obvious that the knowledge required from research should be quickly publicized to avoid wasteful duplication of work (by another researcher) and to establish the researcher's claim to the priority of discovery. Further, when the findings of a research are published in the form of a research paper; the efforts acquire a permanent value. However, it is worth noting that all research journals of repute control the number of papers published by a rigorous referring system to ensure the originality and quality of contribution.

RESEARCH PAPER

In its style, structure, and approach, a research paper closely resembles a formal report. Hence,

the characteristics are also similar, except for a few differences. While a research paper is written mainly to disseminate new knowledge acquired through research, a report is written to facilitate decision-making or problem resolution.

The audience of a research paper might choose not to read a research paper, but a report will definitely be read by the target audience. The incentive of a research paper maybe one's professional advancement, whereas a report always arises out of a specific need.

1. A research paper is the most important form of expository discourse. It may be written on any topic or subject— scientific, technical, social, cultural, etc., but the treatment is scholarly in nature.
2. It is highly stylized and contains a high concentration of certain writing techniques such as definition, classification, interpretation, abstraction, and description.
3. It is objective in nature and the presentation of information is accurate, concise, direct, and unambiguous.
4. Generally, it contains almost all the formal elements that a technical report includes.
5. Most research papers are characterized by the use of visual aids, and scientific, technical, or specialized vocabulary.
6. Every research paper is a unified composition arising out of the study of a particular subject, assembling the relevant data, and organizing and analysing the same.
7. A research paper is a documented prose work. All-important analyses have to be supported by adequate evidence. In short, documentation is essential for all research papers.

Components

A research paper is a piece of written communication organized to meet the needs of a standard, valid publication. It is therefore highly structured, with distinctive and clearly evident component parts, which are listed below:

- Title
- Authors, affiliations, and addresses
- Abstract
- Introduction
- Materials and methods
- Discussion
- Results
- Conclusions
- References or bibliography
- List of symbols

Title

The title of a research paper may be defined as the fewest possible words that adequately describe the contents of the paper. It ought to be well-studied and should give a definite and

concise indication of the rest of the paper.

In preparing the title for a paper, remember that the title will be read by thousands of people. Many people will read the title either in the original journal or in one of the secondary (abstracting and indexing) publications. Therefore, choose all the words in the title with great care and ensure that their association with one another is meaningful. Remember that the indexing and abstracting services depend heavily on the accuracy of the title. Also, an improperly titled paper may be virtually lost and may never reach its intended audience. An effective title

- Is a clear indication of the contents of the paper
- Is neither too short nor too long
- Contains specific and not general terms
- Is built on careful syntax
- Is a label and not a sentence?
- Avoids the use of common abbreviations, specific notations, and reference numbers

Names, affiliations, and addresses of authors

The full names of the authors and their designations are mentioned just below the title of the research paper.

Ex: ABC

Professor, Department of Chemical Engineering

XYZ University, Address

Email address

Abstract

With increased importance acquired by secondary services, particularly abstracting periodicals, the abstract of a research paper has assumed special significance. It has two main functions:

1. To enable readers identify the basic content of a document quickly and accurately in order to determine its relevance to their interests and thus to decide whether they need to read the document in its entirety, and
2. To meet the requirement of abstracting journals.

There are two types of abstracts: informative and indicative. Normally, a research paper should have an informative abstract that gives information about the purpose of the study, newly observed facts, conclusions of an experiment or argument, and, if possible, the essential parts of any new theory, treatment, apparatus, technique, etc. Sometimes, the abstract is read instead of reading the full paper. It should, therefore, be self-contained with regard to the new information being presented in the paper. The other common type of abstract is an indicative or descriptive abstract. This is more suitable for long, descriptive papers. An indicative abstract

indicates the contents of the paper and the scope of the work carried out without giving much information about the results and conclusions.

The characteristics of an abstract are as follows:

1. It is as concise as possible and does not exceed 3 per cent of the total length of the paper.
2. It is self-contained.
3. It does not contain any bibliography, figure, or table references.
4. It does not contain any unfamiliar abbreviations and acronyms.

Introduction

The purpose of an introduction is to supply sufficient background information so as to allow the reader to understand and evaluate the results of the study. It may, therefore, become necessary to refer to work performed earlier only in strict relevance to the above purpose. Sometimes it is necessary to outline the author's earlier attempts to solve the problem along with citations to relevant literature. It is, however, redundant to attempt a complete historical survey of the earlier work. Very often, it is possible to cite a single reference to an important recent review article instead of giving a long list of references; all of them might have been referred to in the review article. The following are guidelines for writing a good introduction:

- First, present the nature and scope of the problem investigated.
- Review the pertinent literature to orient the reader.
- State the method of investigation and, if necessary, the reasons for the choice of a particular method.
- State the principal results of the investigation and also the principal conclusions suggested by the results.

Materials and methods

The main purpose of this section is to describe (and if necessary, defend) the experimental design, experimental technique, or theoretical derivation, and then provide enough details so that a competent worker can repeat the experiments.

If a well-known technique or approach is used, it is enough to cite the relevant literature reference where the description is available. If the original source is difficult to understand, the method must be described more in detail than just citing a reference. In cases where the technique or approach adopted involves some modification over the earlier technique or approach, give only a detailed description of the modification.

For materials, mention relevant specifications. Describe the experiments performed, the ranges covered, the new equipment used, etc. in sufficient detail. Also include quantities and even physical properties of the reagents used besides providing the technical specifications. This

section usually has subheadings.

Discussion

The main functions of this section are to interpret data and to highlight the significant features of the data and the possible causes of these features. It should also mention the limitations, if any, of the data and point out any sources of error.

Avoid the tendency to repeat the description of data in this section. What is obvious from the tables or figures need not be described in the text again. This section should interpret the data depicted in the figures and tables.

Results

Interpret the results or findings

Conclusions

Conclusions should stem directly from the data presented and no extra material should be introduced. When there are significant findings, conclusions are a necessary part of the paper.

The major function of conclusions is to make recommendations based on the results of the study.

In such cases where the study has led to clear-cut findings, it is preferable to give the conclusions in the form of a series of numbered points.

References

The main purpose in citing references to the work of earlier researchers is to enable the reader to consult the original source. Therefore, unless the references are complete in respect of all bibliographic details, the readers will face immense difficulty in locating the original sources.

Only such references should be cited as have been actually consulted.

List of symbols

Standard abbreviations can be used. It is a good practice to give the full version followed by the abbreviation within parentheses at the first occurrence. Thereafter, only the abbreviated form may be used throughout.

One- or two-letter symbols may be used to represent physical quantities, units, or chemical elements. Use only standard symbols. All symbols other than those that are in common use must be explained in the ‘nomenclature’ section.

Names of units and their abbreviations should conform to standard practices. The most

appropriate system is the International System (SI) of Units.