Research Process Framework

[1] **Lilavati Samant,** [2] **Amrita Naik**

[1] Asst. Prof, Computer Engineering Department, Don Bosco College of Engineering-fatorda,
Goa University

[2] Asst. Prof, Computer Engineering Department, Don Bosco College of Engineering-fatorda,
Goa University

Abstract - Research refers to a search for knowledge. The purpose of research is to discover answers to questions through the application of scientific procedures. Its aim is to find out the truth which is hidden and which has not been discovered as yet. In order to systematically solve the research problem, one needs to follow a proper research methodology. This paper focuses on the research process, reading a research paper, development of communication skills for presenting a research paper and the issue of plagiarism.

Keywords **- Research Methodology, Research Paper, Plagiarism**.

1. Introduction

The term "research" refers to the systematic method consisting of enunciating the problem, formulating a hypothesis, collecting the facts or data, analyzing the facts and reaching certain conclusions either in the form of solutions(s) towards the concerned problem or in certain generalizations for some theoretical formulation. The possible motives for doing research may be either one or more of the following:

- Desire to get a research degree along with its consequential benefits;
- Desire to face the challenge in solving the unsolved problems, i.e., concern over practical problems initiate research;
- Desire to get intellectual joy of doing some creative work;
- Desire to be of service to society;
- Desire to get respectability.

Intelligence, motivation and perseverance are needed for doing research. Research has its special significance in solving various operational and planning problems of business and industry. Market research is the investigation of the structure and development of a market for the purpose of formulating efficient policies for purchasing, production and sales. Operations research refers to the application of mathematical, logical and analytical techniques to the solution of business problems of cost minimization or of profit maximization or what can be termed as optimization problems.

The significance of research can also be understood keeping in view the following points:

(a) To those students who have to write a master's or Ph.D. thesis, research may mean careerism or a way to attain a high position in the social structure;

(b) To professionals in research methodology, research may mean a source of livelihood;

(c) To philosophers and thinkers, research may mean the outlet for new ideas and insights;

(d) To literary men and women, research may mean the development of new styles and creative work;

(e) To analysts and intellectuals, research may mean the generalizations of new theories.

Thus, research is the fountain of knowledge for the sake of knowledge and an important source of providing guidelines for solving different business, governmental and social problems.

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a

researcher in studying his research problem along with the logic behind them. It is necessary for the researcher to know not only the research methods/techniques but also the methodology.

2. Research Process

Research process consists of series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps.

2.1 Formulating the Research Problem

There are two types of research problems, viz., those which relate to states of nature and those which relate to relationships between variables. At the very outset the researcher must single out the problem he wants to study, i.e., he must decide the general area of interest or aspect of a subject-matter that he would like to inquire into.

Initially the problem may be stated in a broad general way and then the ambiguities, if any, relating to the problem be resolved. Then, the feasibility of a particular solution has to be considered before a working formulation of the problem can be set up. The formulation of a general topic into a specific research problem, thus, constitutes the first step in a scientific enquiry. Essentially two steps are involved in formulating the research problem, viz., understanding the problem thoroughly, and rephrasing the same into meaningful terms from an analytical point of view.

2.2 Extensive Literature Survey

Once the problem is formulated, a brief summary of it should be written down. It is compulsory for a research worker writing a thesis for a Ph.D. degree to write a synopsis of the topic and submit it to the necessary Committee or the Research Board for approval. At this juncture the researcher should undertake extensive literature survey connected with the problem. For this purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to. Academic journals, conference proceedings, government reports, books etc., must be tapped depending on the nature of the problem.

2.3 Formulate a Hypothesis

Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences. It arises as a result of a-priori thinking about the subject,

examination of the available data and material including related studies and the counsel of experts and interested parties. The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track. It sharpens his thinking and focuses attention on the more important facets of the problem. It also indicates the type of data required and the type of methods of data analysis to be used.

2.4 For Experimental Work

- Design and build experimental set-up.
- Do preliminary testing to check set-up.
- Collect data in a systematic manner by varying the independent parameters.

2.5 For Theoretical Work

- Model the situation and set up the governing equations with constraints.
- Solve the equations.
- Obtain results by systematically varying
- The independent parameters.
- Tabulate, analyze and interpret results.

2.6 Check Hypothesis, Draw Conclusions

Do the facts support the hypotheses or they happen to be contrary? This is the usual question which should be answered while testing hypotheses. Various tests, such as Chi square test, t-test, F-test, have been developed by statisticians for the purpose. The hypotheses may be tested through the use of one or more of such tests, depending upon the nature and object of research inquiry. Hypothesis-testing will result in either accepting the hypothesis or in rejecting it.

2.7 Write Thesis

Writing of report must be done with great care keeping in view the following:

1. The layout of the report should be as follows:

   (i) The preliminary pages;

   (ii) The main text, and

   (iii) The end matter.

2. Report should be written in a concise and objective style in simple language avoiding vague expressions such as "it seems", "there may be", and the like.

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3. Charts and illustrations in the main report should be used only if they present the information more clearly and forcibly.

4. Calculated "confidence limits" must be mentioned and the various constraints experienced in conducting research operations may as well be stated.

3. How to Read A Research Paper

The Scientific Research Paper is a Peculiar Piece of Writing.
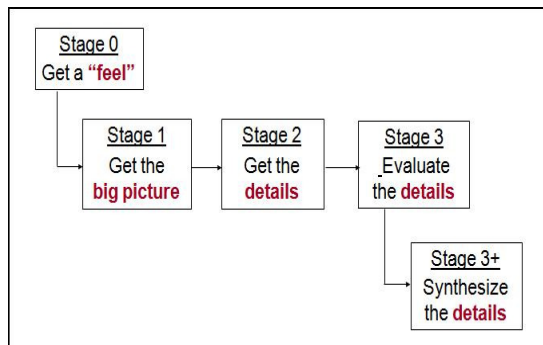

Figure 1   3+ stage approach to reading a research paper

3.1 Get a "feel" of the paper

- Read the title
- See how long the paper is (2 to 40+) Conference research papers typically 4-8 pages Journal research papers typically 6-15 pages Review/survey papers much longer
- Where is the paper published? (How to find this information?) Look at the figures
- Read the section / sub-section

3.2 Structure of a Scientific Research Paper

A scientific research paper is highly structured as follows:

- Title
- Abstract Introduction
- Background / Motivation Contribution of paper Related work
- Problem definition (research questions)
- Solution approach or outline
- Scope / Assumptions / Limitations

- Details of solution - experiment / system / model
- Findings
- Evaluation
- Take-away from paper
- References

3.3 Get the Big Picture

Table 1: Getting the big picture

What you are looking for	*Where to find it*
What research area / sub-topic does the paper fall under?	Title, Abstract
What problem does the paper attempt to solve?	(Title), Abstract, Introduction, Problem
What is related work and why is it not sufficient, what are gaps	Introduction
What key contribution does the paper claim?	(Title), (Abstract), Introduction, Conclusion
Broadly, how does the paper solve the problem?	Introduction, figures
How do the authors defend the solution?	Introduction, figures
What category of paper is this?	Introduction,.Heading

3.4 Get the Details

Table 2: Getting Details

What you are looking for	*Where to find it*
What problem does the paper attempt to solve?	Introduction, Problem definition
What is related work? What are gaps?	Introduction, Literature Survey or Related Work
What contribution does the paper claim – idea, technique, proof, surprising result etc?	Introduction, Conclusion
How does the paper solve the problem?	Solution, Experiment,figures

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How do the authors defend the solution?	Methodology,Experiment, Results
What is the precise research question addressed?	Introduction, Problem definition
Why is it believed that solution work better than previous?	Solution approach, figures
What are assumptions, scope?	Problem definition, solution approach
What are details of proposed solution – argument, proof, implementation, experiment?	Solution, System details, Experiment, Methodology, figures
What evidence is provided?	Figures, Results
What is the take-away message from the paper?	Overall

3.5 Evaluate the Details

- Is the research problem significant? Is the problem novel?
- Is the solution approach novel? Are the contributions significant?
- Is relevant related work surveyed "sufficiently" enough?
- Have alternate approaches of solution been explored?
- Are assumptions valid? Has paper violated assumptions?
- Are the claims valid?
- Are the different parts of the paper consistent?
- Are the figures, graphs, diagrams precise? Does the paper flow logically?
- What is the paper trying to convince you of? Does it succeed?

3.6 Synthesize, Ask Creative Questions

- What are some alternative approaches to address the research problem?
- Could there be a different way to substantiate the claim?
- Are their counter-examples or arguments against the paper's claims?
- Are all assumptions identified and validated?
- How can the research results be improved?

- How can the results be generalized?
- What are the new ideas and open problems suggested by this work?

4. Presenting Your Paper

4.1 Content Creation

Creating the contents of paper is most important. For this, you need to understand the topic well. You should spend quite a bit of time in deciding what is to be (a) included, (b) stressed, and (c) flashed. Never underestimate the audience. A good assessment of to whom you are going to talk to would be a bonus. You must know what slide comes next and what the previous one was. Avoid back and forth movements between different slides. In introduction, describe background of the work with due credit to other people who have done similar work ahead of you. It's good to have supporting slides (after a blank slide), which could even include answers to potential questions.

While preparing slides do not pour too much text. In case, it cannot be avoided use animation" effectively. Bring blocks of text, one at a time. Avoid data intensive tables. Try using „representative" set of data. Use highlighting to bring additional emphasis on the most important numbers in a table. Each slide should preferably have a heading. Do not think that slides with a heavy dose of graphics would please „them". Do not spend too much time „decorating" your slides. If you have buffer time after the contents are ready, you may want to „beautify" the slides. Figures should be of good quality, readable from distance. You may include slide numbers.

4.2 Preparation and Practice

Learning how to give a talk is an important step in ones career. First, practice in front of a mirror. Close your eyes and dream. Next, give mock presentations to a friendly group of people. Time management is important. Avoid elaborate introduction. Do not pack 30 slides for a 10 minutes presentation (numbers would vary depending on your natural speed of speech).

4.3 Delivery: On-stage Tips

Do not rush to the stage. A smiling face is the best way to greet. Spend about 30 seconds in adjusting mike position, read the title. Suppose you are still tensed then, take a deep breath. It is okay to carry a bottle of

water with you on stage. Do not worry about being judged. Do your job as best as you can. The stage belongs to you, and only you. It is an opportunity to perform. Start looking at the audience. Avoid reading from slides. Slide are only a reinforcement tool to convey what you want to convey. Stick to natural (yours) English speaking. Use simple words that you are familiar with. You don't have to speak like a native English speaker. Avoid mugging someone's text. Speech modulations and demodulations are important. Speak loud and clear. Listen to the questions carefully. If the question is good, say that it's a good question, and answer. If you do not know an immediate answer, try taking some time, think, and respond. If you have no clue, say that „I am sorry, I can't answer that.

4.4 Improvement: A Continuous Process

For continuous improvement, learn from other speakers when you attend conferences. Time-management would improve as you gain more experience. Speed up and slow down after looking at elapsed time. Humor would add value. Preplanned humor often does not work.

5. Issue of Plagiarism

Plagiarism means using someone else's research work in the form of ideas, results or words and passing it off as one's own work by not giving credit to the original work.

Essentially, there are three basic forms of plagiarism, according to the Office of Research Integrity:

- Lifting the words right from the text verbatim without providing the appropriate sources.

- Paraphrasing the words within a published document without gibing appropriate sources.

- Summarizing the ideas without providing credit to the author of the original text.

Plagiarism is unethical and incorrect, but is widespread.

6. Conclusion

Research is much concerned with proper fact finding, analysis and evaluation. A researcher must know not only the research methods/techniques but also the methodology. A proper research process needs to be followed. A researcher must know how to read paper, how to create contents and present it. Plagiarism, which is an unethical issue, must be avoided.

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Lilavati Samant M.Tech. CSE (VTU),2014 ,currently working as a asst. prof. Computer Engineering Department of Don Bosco College of Engineering,Fatorda-Goa.

Mrs.Amrita Naik ME (IT), Goa University, currently working as a asst. prof. Computer Engineering Department of Don Bosco College of Engineering,Fatorda-Goa.