


RESEARCH METHODOLOGY

(URSP 0010)

RESEARCH METHOD

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Research Methodology

Lecture Outline:

1. Definition of Research
2. Objectives of Research
3. Research Process
4. Research Design and Method



Definition of Research

Research is an **organized, systematic, database, critical, scientific inquiry or investigation into a specific problem**, undertaken with the objective of finding answers or solution to it.

Definition of Research



- **Systematic** investigative process **employed** to **increase or revise** current knowledge by discovering **new facts**.
- It is divided into two general categories:
 - (1) **Basic research** is inquiry aimed at increasing scientific knowledge,
 - (2) **Applied research** is effort aimed at using basic research for solving problems or developing new processes, products, or techniques.

Basic vs Applied

- **Basic**

- Pure, fundamental research
- Discovery of new knowledge; theoretical in nature
- Takes many years for the results of basic research to find some practical utility

- **Applied**

- Central purpose to solve an immediate problem
- Improved products or processes
- Infers beyond the group or situation studied
- Interpretation of results relies upon Basic research

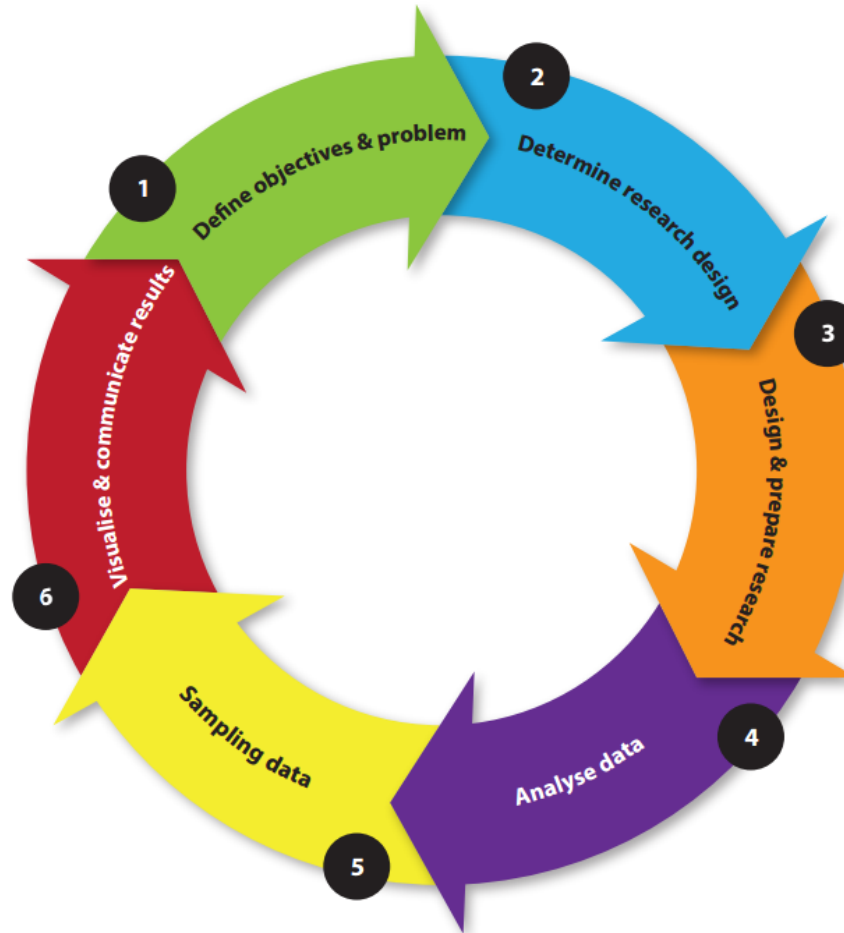


BASIC



APPLIED

Definition of Research



Important Characteristics

1. SYSTEMATIC

Research is systematic, because **it follows certain steps that are logical in order**. These steps are:

- Understanding the **nature of problem** to be studied and **identifying the related area of knowledge**.
- **Reviewing literature** to understand how others have approached or dealt with the problem.
- **Collecting data** in an organized and controlled manner so as to arrive at **valid decisions**.
- **Analyzing data** appropriate to the problem.
- **Drawing conclusions** and making generalizations.

Important Characteristics

2. FOLLOWS A SCIENTIFIC METHOD

- This means that it makes an integrated use of Inductive and Deductive reasoning. This makes it very useful for explaining and predicting phenomena.
- The basic assumption of the scientific method is that every effect has a cause.

BASIS FOR COMPARISON	INDUCTIVE REASONING	DEDUCTIVE REASONING
Meaning	Inductive Reasoning connotes the argument in which the premises give reasons in support of the probable truth of the conjecture.	Deductive reasoning is the fundamental form of valid reasoning, wherein the premises give guarantee of the truth of conjecture.
Approach	Bottom-up approach	Top-down approach
Starting point	Conclusion	Premises
Based on	Patterns or trend	Facts, truths and rules
Process	Observation > Pattern > Tentative Hypothesis > Theory	Theory > Hypothesis > Observation > Confirmation
Argument	May or may not be strong.	May or may not be valid.
Structure	Goes from specific to general	Goes from general to specific
Draws inferences with	Certainty	Probability

Progress?

Research Topic: The broad **general area** expected to investigate. It is a broad idea or concept from which many problems may be delineated.



Research Problem: A situation or circumstance that **requires a solution to be described, explained, or predicted**. It is an unsatisfactory situation that wants you to confront.



Research Objectives: A **goal** that the project hopes to achieve. Research objectives are found by deciding what type of **research needs to be done** and what **type of information** a certain entity is hoping to obtain from the research.



Literature Review: A literature review **discusses published information** in a particular subject area, and sometimes information in a particular subject area within a certain time period.

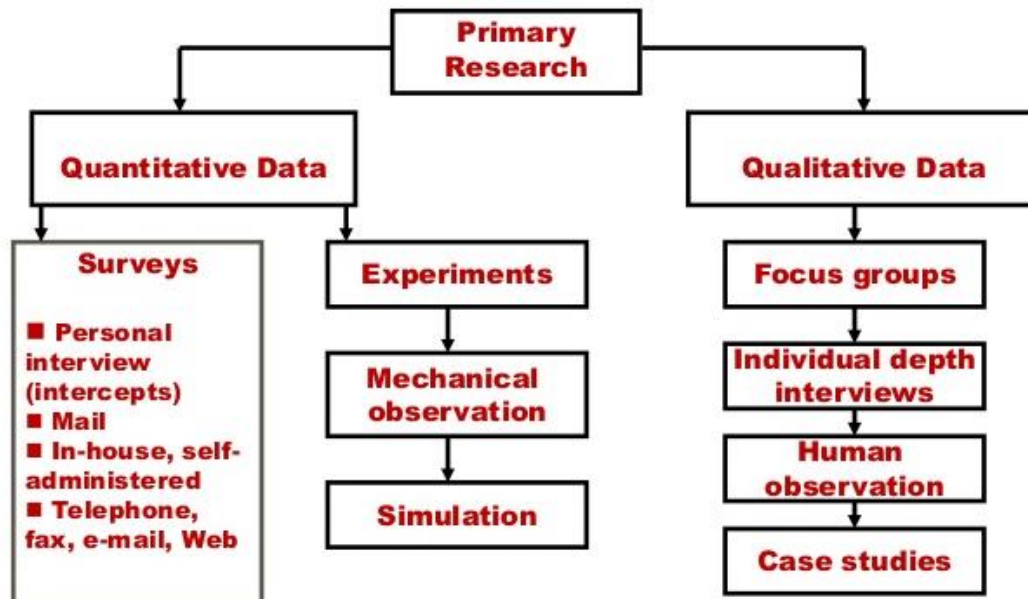


Research Types

- On a broader perspective, all researches can be classified into two groups:

✓ **Qualitative Research**

✓ **Quantitative Research**



Quantitative vs. Qualitative

- **Quantitative**

- **Numerical, measurable data**
- Traditional or positivist approach
 - Clearly stated questions
 - Rational hypotheses
 - Developed research procedures
 - Extraneous variable controls
 - Large samples
 - Traditional, statistical analyses

- **Qualitative**

- Generally **non-numerical data**
- Typically anthropological and sociological research methods
- **Observations** of a “natural” setting
- **In-depth descriptions of situations**
- Interpretive and descriptive

Qualitative research

- **Qualitative research** is research dealing with phenomena that are **difficult or impossible to quantify mathematically**, such as **beliefs, meanings, attributes, and symbols**.
- Qualitative researchers aim **to gather an in-depth understanding of human behaviour and the reasons that govern such behaviour**. The qualitative method investigates the why and how of decision making, not just what, where, when.

Qualitative research

Advantages

- It enables more complex aspects of a persons experience to be studied
- Fewer restriction or assumptions are placed on the data to be collected.
- Not everything can be quantified, or quantified easily, Individuals can be studied in more depth
- Good for exploratory research and hypothesis generation
- The participants are able to provide data in their own words and in their own way

Disadvantages

- It is more difficult to determine the validity and reliability of linguistic data
- There is more subjectivity involved in analysing the data.
- “Data overload” – open-ended questions can sometimes create lots of data, which can take along time to analyse!
- Time consuming

Quantitative research

- **Quantitative research** refers to the **systematic empirical investigation of any phenomena via statistical, mathematical or computational techniques.**
- The objective of quantitative research is to develop and **employ mathematical models, theories and/or hypotheses pertaining to phenomena**
- Quantitative research is generally made using **scientific methods**, which can include:
 - The generation of models, theories and hypotheses
 - The development of instruments and methods for measurement
 - Experimental control and manipulation of variables
 - Collection of empirical data
 - Modelling and analysis of data
 - Evaluation of results

Quantitative research

Advantages

- Quantitative research allows the researcher to **measure** and **analyse data**.
- The researcher is **more objective** about the findings of the research.
- Quantitative research can be used to **test hypotheses in experiments** because of its ability to measure data using statistics.

Disadvantages

- The main disadvantage of quantitative research is the context of the study or experiment is ignored.
- Quantitative research **does not study things in a natural setting** or discuss the meaning things have for different people.
- **A large sample of the population must be studied** for more accurate results

Methodology

Methodology and Method are often (incorrectly) used interchangeably

- **Methodology** – the study of the general approach to inquiry in a given field
- **Method** – the specific techniques, tools or procedures applied to achieve a given objective
 - ✓ Research methods include regression analysis, mathematical analysis, operations research, surveys, data gathering, etc.

Methodology

- Methodology is the **core of your thesis / dissertation** as it is a **proof that you use the scientific method**.
- Through this chapter, **your study's validity** is judged.
 - ✓ Therefore, provide a **clear and precise description** of
 - **how an experiment / analysis was done**
 - **the rationale for the specific experimental / analysis procedures chosen.**
 - ✓ Others could repeat the experiment and evaluate whether the results are **reproducible**.
 - ✓ Readers could judge whether the results and conclusions are valid.



by Experiment-Resources.com

Methodology

- The methodology chapter should be structured in a set of subsections describing its main content.
 1. **Study design / Concepts and theories**
 2. Selection **criteria** and selection **methods**
 3. **Data collection** – variables, methods and instruments
 4. **Data analysis.**

Methodology

- Methodology implies more than simply the methods you intend to use to collect data.
- **Concepts and theories which underlie the methods**
 - The **theory** used is meant to shed light on the data in a scholarly or scientific manner.
 - Main purpose using theory is to **analyse and interpret your data**. Therefore, you should not present theoretical perspectives that are not being put to use.
 - Since theory is the foundation for your data analysis, useful to select a theory that lets you distinguish between, and categorise different phenomena.

$$\begin{aligned}
 \hat{B}_{h,i \rightarrow j} &= \sum_g \beta_{hig} W_{g,i \rightarrow j} \\
 &= \sum_g \beta_{hig} \left(\sum_j \alpha_{gij} d_{i,j} + Q_{g,i \rightarrow j} \right)
 \end{aligned}$$

actor i's expectation of the outcome of behavior h in situation g
 actor i's behavior disposition towards j in situation g
 specific behavior, such as threats
 the perceived salience in situation g of i's interests and capabilities
 i's unique interests and capabilities regarding j in situation g
 i's interests and capabilities regarding j (as reflected in the distance vector from j to i in the β_{ij} component of socio-cultural space-time

Methodology

- In other words, the methodology chapter should cover the following:
 1. Define the **population** and the **methods of sampling**
 2. Describe the **instrumentation**
 3. Describe the **procedures** and if relevant, the time frame
 4. Describe the **analysis plan**
 5. Describe any **approaches** to ensure **validity and reliability**
 6. State any **assumptions**
 7. Describe the **scope** and **limitations** of the methodology

Methodology

- The order of the methods section could flow like this:
 1. Describing the **research design / concept/ theory**
 2. Describing the **materials / samples/ participants** you used in the study
 3. Explaining how you **prepared / collect** the materials
 4. Explaining how you made **measurements** and what **calculations you performed**
 5. Stating which **statistical tests** you did to analyze the data.

Research Process

3 phases of research process:

1

- Starting the research (Choosing a general topic (area of research))
- Narrowing the topic and collecting information

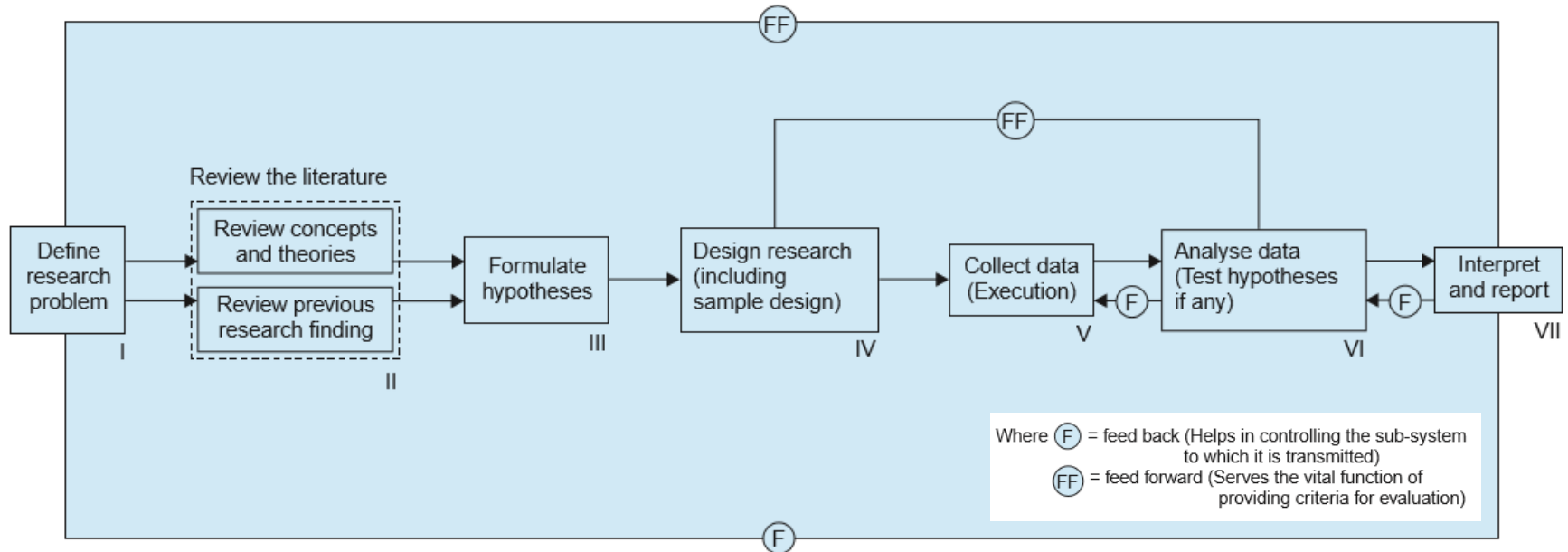
2

- Recording information
- Organizing ideas and Analysis

3

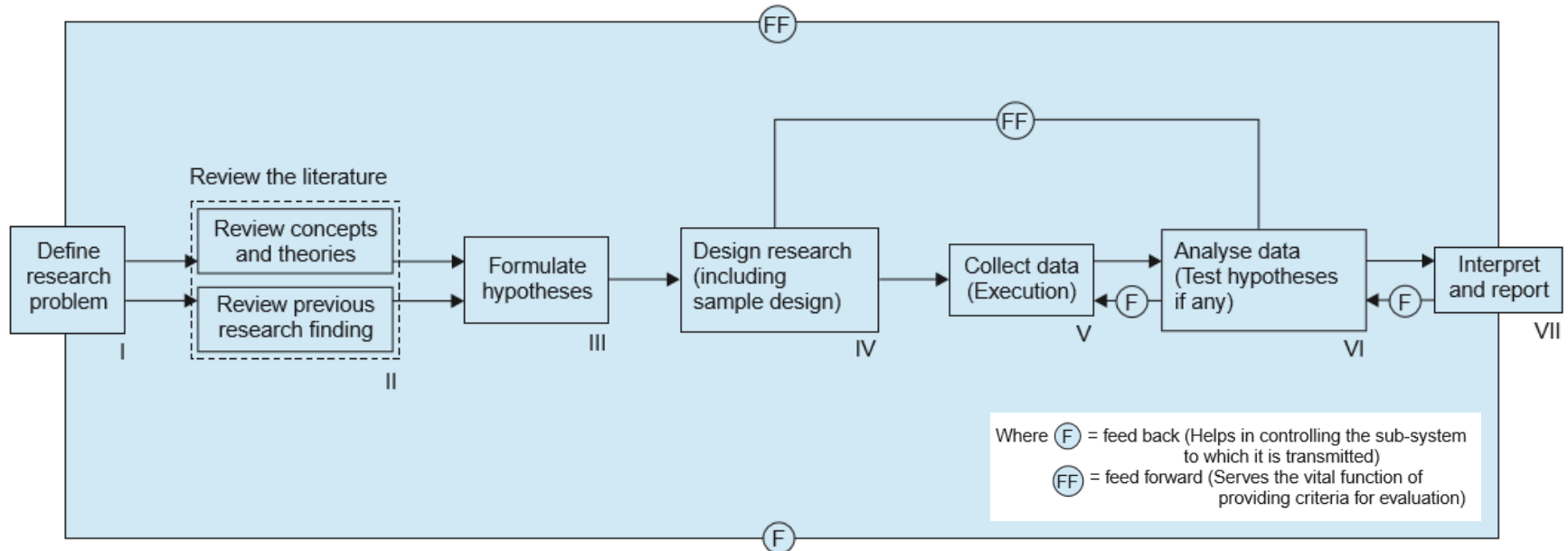
- Writing, Documentation
- Presentation

Research Process



The following order concerning various steps provides a useful procedural guideline regarding the research process: **(1) formulating the research problem; (2) extensive literature survey; (3) developing the hypothesis; (4) preparing the research design; (5) collecting the data; (6) analysis of data; and (7) preparation of the report or presentation of the results**, i.e., formal write-up of conclusions reached.

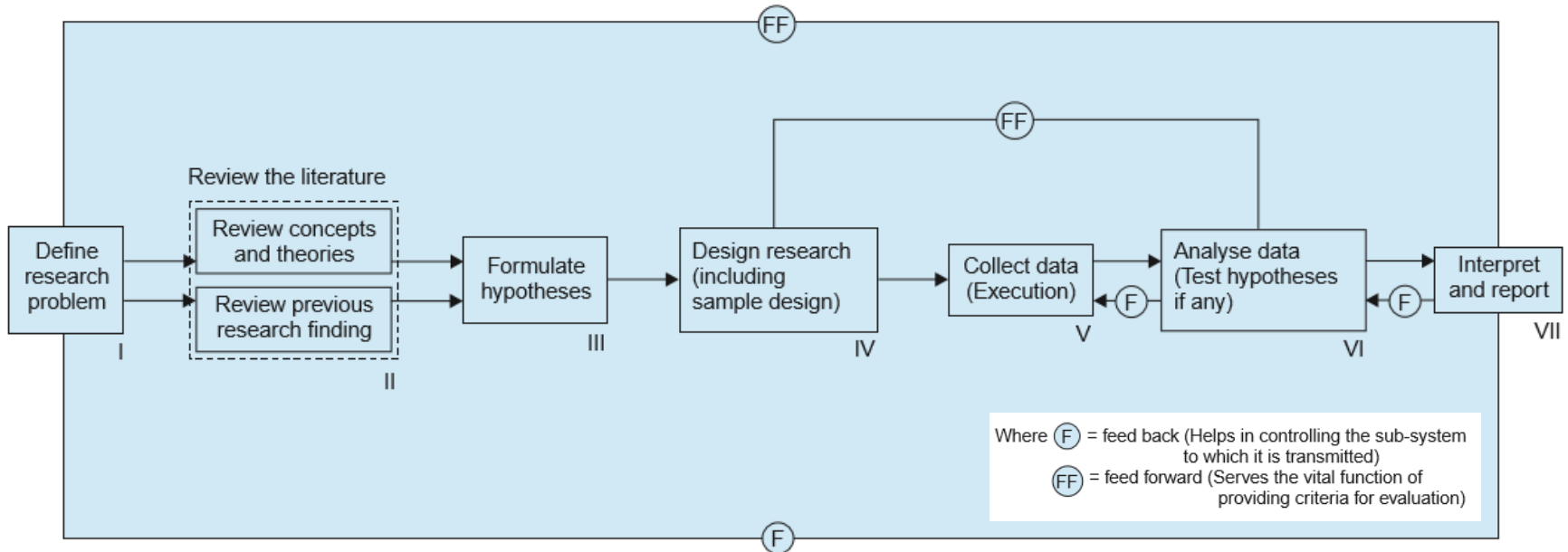
Research Process



1. Formulating the research problem:

- 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; **understanding the problem thoroughly**, and **rephrasing the same into meaningful terms from an analytical point of view**.

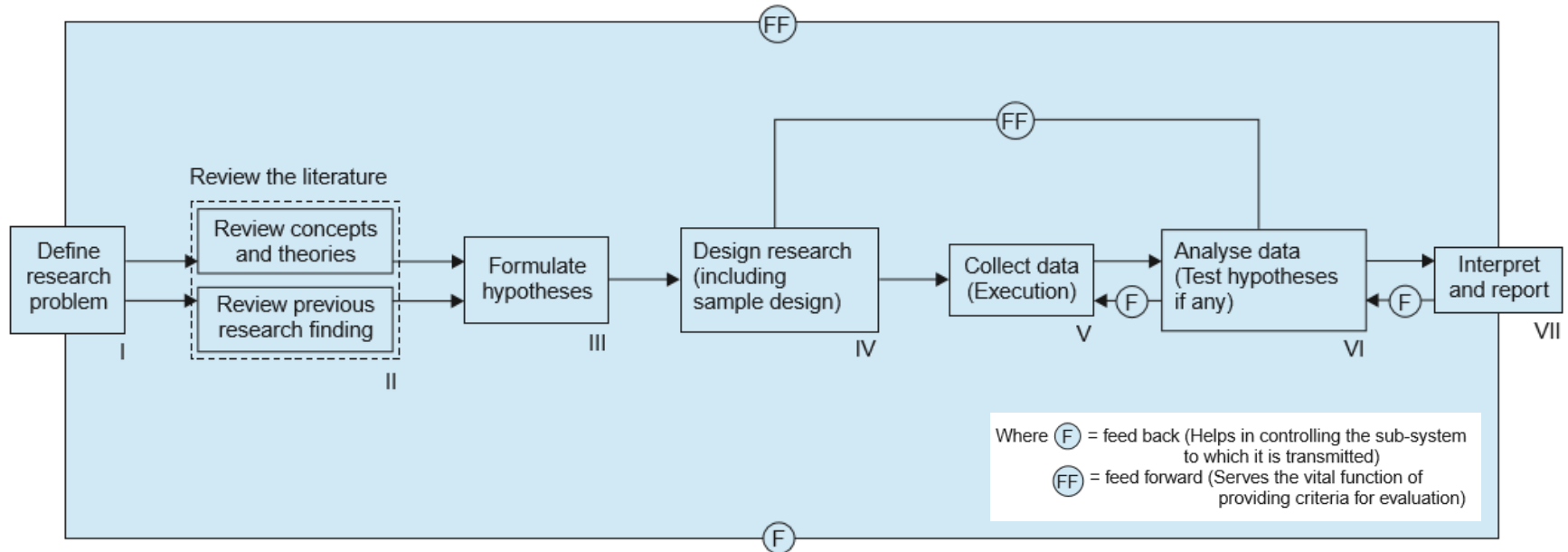
Research Process



2. Extensive literature survey

- Once the problem is formulated, **a brief summary of it should be written down.**
- 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.
- In this process, **it should be remembered that one source will lead to another.** The earlier studies, if any, which are similar to the study in hand should be carefully studied. A good library will be a great help to the researcher at this stage.

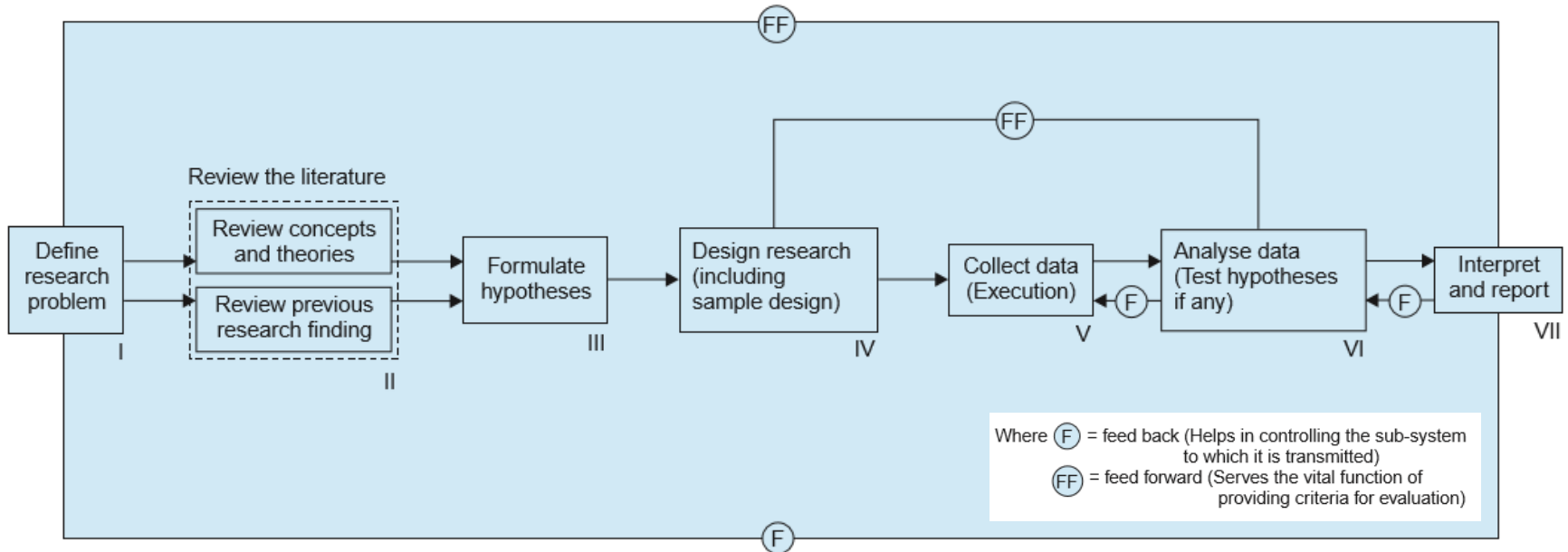
Research Process



3. Development of working hypotheses

- After extensive literature survey, researcher should state in clear terms the working hypothesis or hypotheses. Working hypothesis is **tentative assumption made in order to draw out and test its logical or empirical consequences**.
- As such the manner in which research hypotheses are developed is particularly important since they provide the **focal point for research**. They also **affect the manner in which tests must be conducted in the analysis** of data and indirectly the quality of data which is required for the analysis.
- In most types of research, the development of working hypothesis plays an important role. Hypothesis should be **very specific and limited to the piece of research** in hand because it has to be tested.
- The role of the hypothesis is **to guide the researcher by delimiting the area of research and to keep him on the right track**.

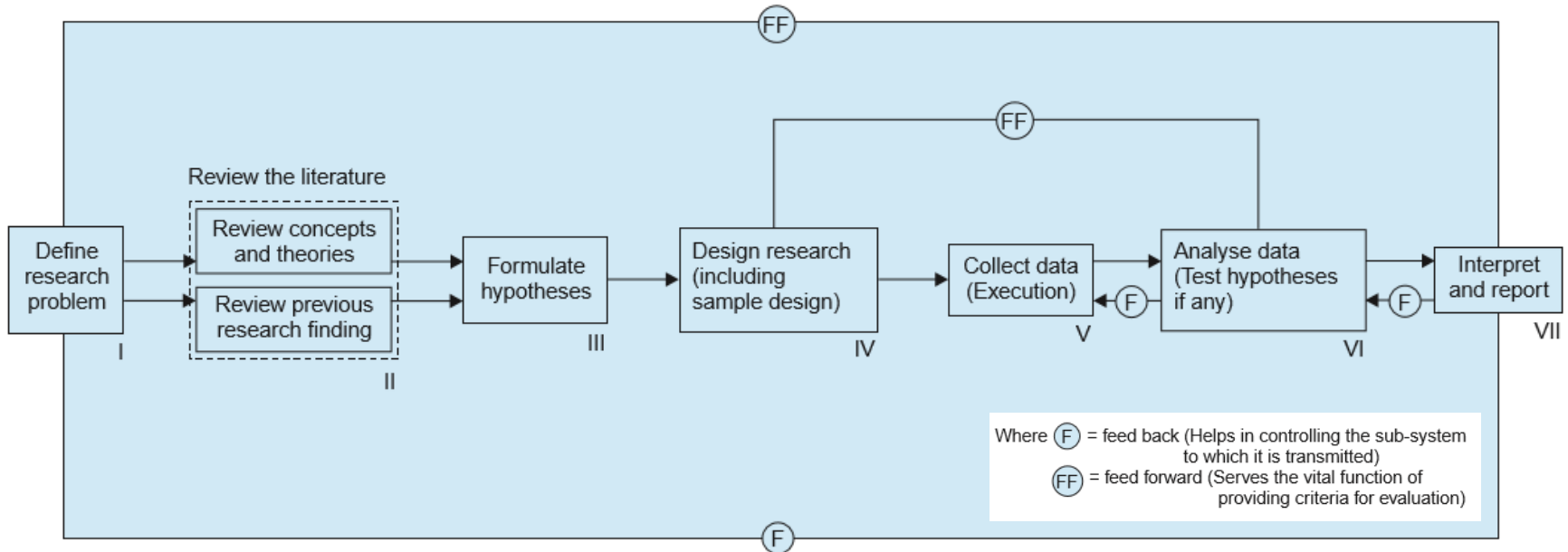
Research Process



4. Preparing the research design

- The research problem having been formulated in clear cut terms, the researcher will be required to prepare a research design, i.e., he will have to state the **conceptual structure** within which research would be conducted. The preparation of **such a design facilitates research to be as efficient as possible yielding maximal information.**
- The preparation of the research design, appropriate for a particular research problem, involves usually the consideration of the following: (i) **the means of obtaining the information;** (ii) **the availability and skills of the researcher and his staff (if any);** (iii) **explanation of the way in which selected means of obtaining information will be organised and the reasoning leading to the selection;** (iv) **the time available for research;** and (v) **the cost factor relating to research, i.e., the finance available for the purpose.**

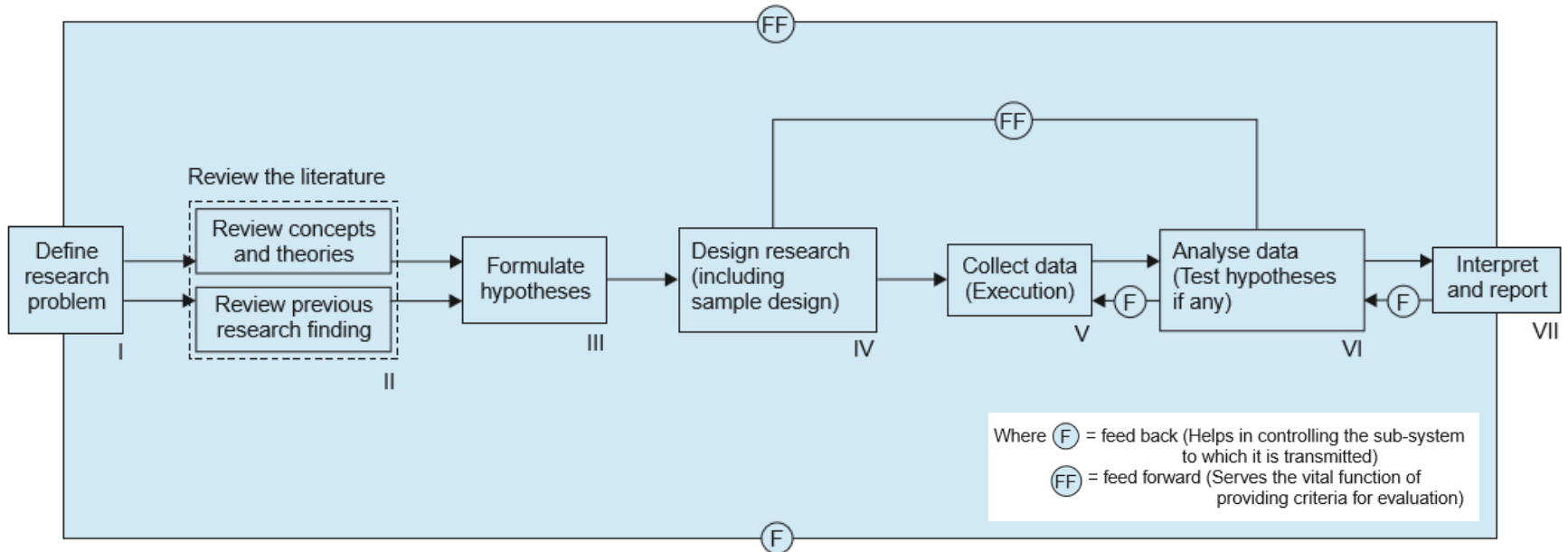
Research Process



5. Collecting the data

- In dealing with any real life problem it is often found that **data at hand are inadequate**, and hence, it becomes necessary to **collect data that are appropriate**.
- There are several ways of collecting the appropriate data which differ **considerably in context of money costs, time and other resources** at the disposal of the researcher.
- **Primary data** can be collected either through **experiment** or **through survey**. If the researcher conducts an experiment, he observes some quantitative measurements, or the data, with the help of which he examines the truth contained in his hypothesis.

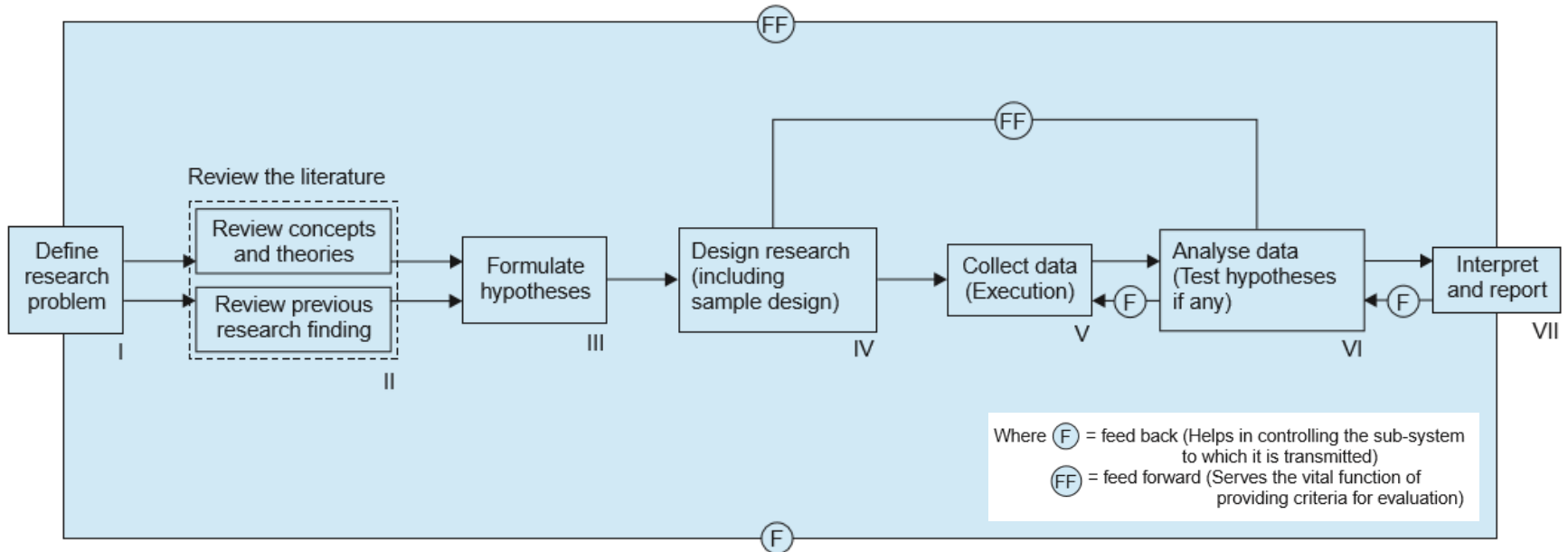
Research Process



6. Analysis of data

- After the data have been collected, the researcher turns to the task of analysing them. The analysis of data requires a number of closely related operations such as **establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences.**

Research Process








7. Preparation of the report or the thesis

- Finally, the researcher has to prepare the **report of what has been done**.

Criteria of Good Research

- Whatever may be the types of research works and studies, one thing that is important is that they all meet on the common ground of **scientific method** employed by them.
- One expects scientific research to satisfy the following criteria:
 1. The **purpose of the research should be clearly defined** and **common concepts** be used.
 2. The **research procedure used should be described in sufficient detail** to **permit another researcher to repeat the research for further advancement**, keeping the continuity of what has already been attained.
 3. The **procedural design of the research should be carefully planned** to yield results that are as objective as possible.
 4. **The researcher should report with complete frankness, flaws in procedural design and estimate their effects upon the findings.**
 5. **The analysis of data should be sufficiently adequate** to reveal its significance and the methods of analysis used should be appropriate. **The validity and reliability of the data should be checked carefully.**
 6. Conclusions should be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.
 7. **Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity.**

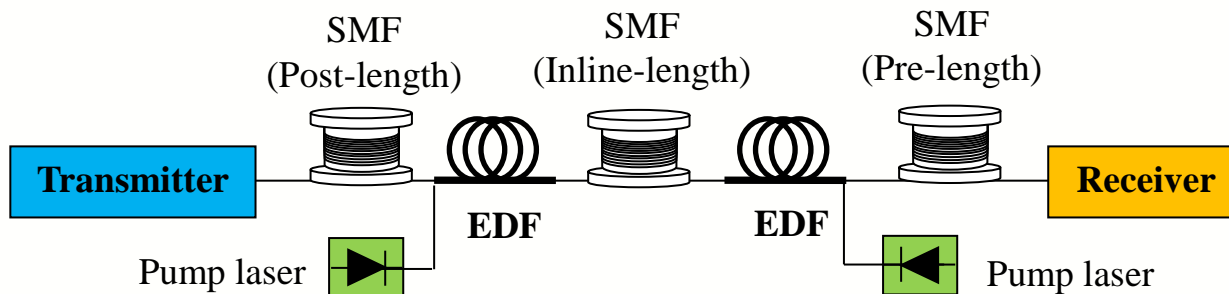
Flowchart Symbol

Symbol	Name	Function
	Start/end	An oval represents a start or end point
	Arrows	A line is a connector that shows relationships between the representative shapes
	Input/Output	A parallelogram represents input or output
	Process	A rectangle represents a process
	Decision	A diamond indicates a decision

Example: Research Method

DISCRETE EDFA

- ✓ Requires electrical source near the amplifier to drive the pump laser
- ✓ Unlimited numbers of pump laser
- ✓ Higher pump power due to lower propagation loss
- ✓ Offers high gain and low NF
- ✓ The pump power is solely to pump the EDFA only
- ✓ Has no limitation and more flexible in design



Example: Research Method

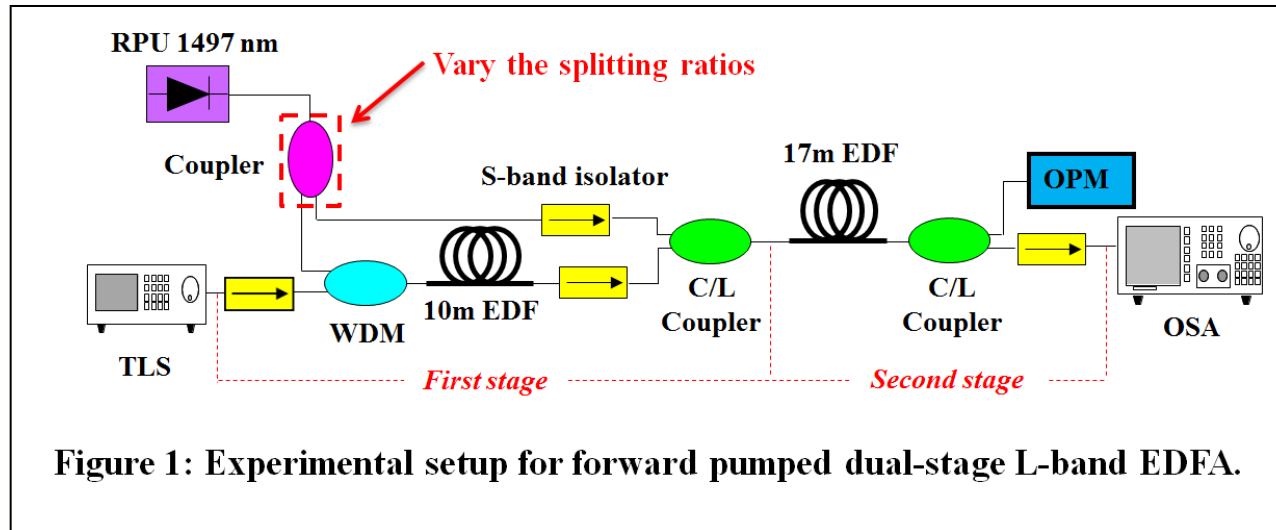
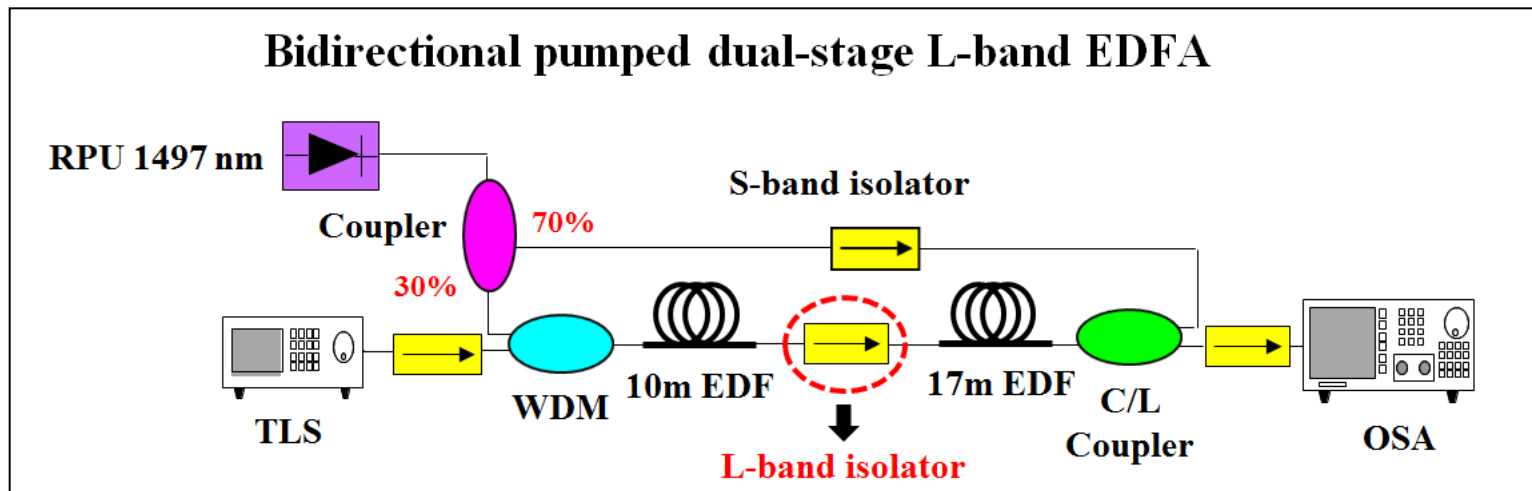
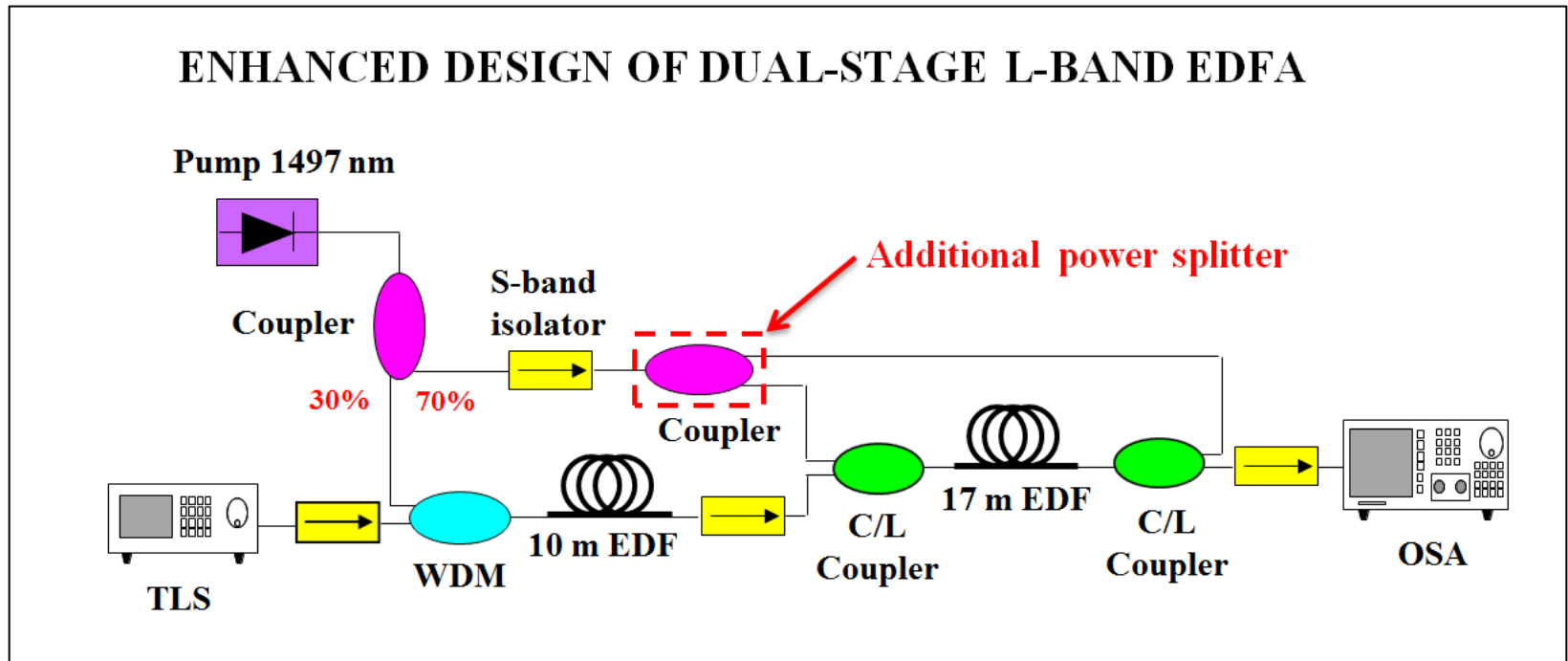


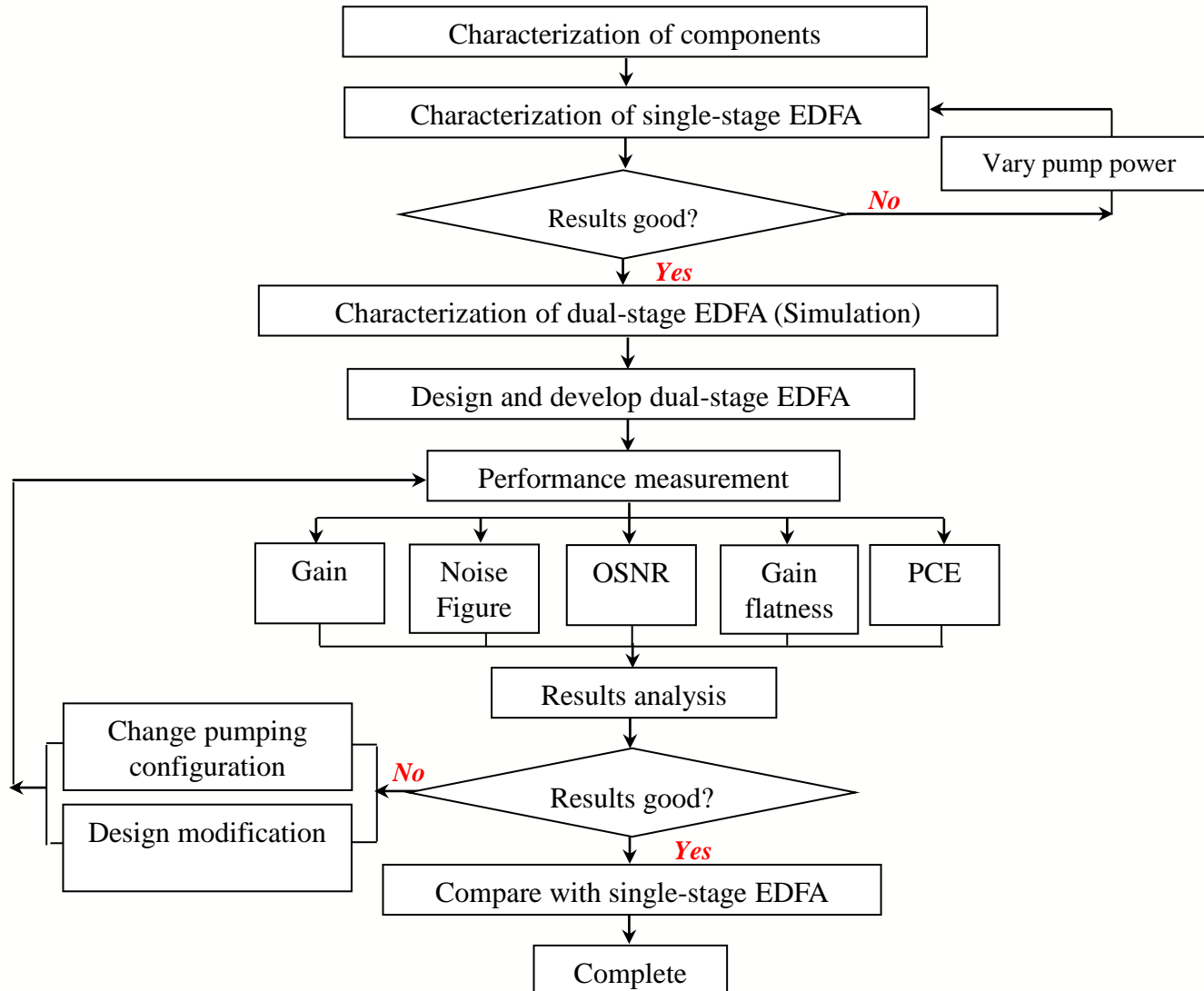
Figure 1: Experimental setup for forward pumped dual-stage L-band EDFA.



Example: Research Flowchart



Example: Research Method



Research Planning

Research Activities	Sem. 1												Sem. 2												Sem. 3												Sem. 4	
	2016												2017												2018													
	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F													
eb	ar	pr	ay	un	ul	ug	ep	ct	ov	ec	an	eb	ar	pr	ay	un	ul	ug	ep	ct	ov	ec	an	eb														
Introduction																																						
Identify Problem	█	█	█	█	█																																	
Literature Review																																						
Review on Gain Enhancement Techniques for EDFA		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█																
Methodology																																						
Optimization and measurement								█	█	█	█	█	█	█	█																							
Results and Discussion																																						
Simulation Results												█	█	█	█	█	█	█	█	█	█	█																
Measurement Results																		█	█	█	█	█																
Results and Discussion																			█	█	█	█	█	█														
Writing	Chp. 1			Chp. 2						Chp. 3			Chp. 4			Chp. 5		Compile																				
Publication																																						
1 st Journal (1 st Author)	Abstract submitted on 11 November 2016 and accepted for oral presentation on 24 January 2017																																					
2 nd Journal (4 th Author)	The paper has been presented between 19 June 2016 and 21 June 2016																																					
Presentation																																						
Proposal Defence																																						
VIVA																								█														
Intellectual Property																																						
Distributed Pumping Technique	Copyright application on 20 March 2017																																					

Legend: █ Completed █ Future Work █ Additional Time

Task 1

Develop a research flowchart and describe the methods / instruments involve in this study

The End

RESEARCH METHODOLOGY

URSP 0013

INTRODUCTION

Lecturer:

Dr Nelidya Md Yusoff (nelidya.kl@utm.my)

Appreciation to : AP Dr Astuty Amrin

- **Presentation & publication of research finding**
- **Writing dissertation**
- **Writing a research paper**
- **Writing skill**
- **Seminar presentation**

Presentation & Publication of Research Finding

- **Why must publish?**
- **Which publication?**
- **What to publish?**

Why You Must Publish?

- **To benchmark our research findings**
- **To get response from others**
- **To disseminate new findings / knowledge**
- **To get good reputation**
- **To get better promotion**
- **To pass Ph.D./D.Eng./D.Sc. program**
- **To satisfy academic interest**
- **To develop intellectual tradition**

Which Publication?

- **Unpublished research report**
- **Specialized magazine**
- **Dissertation / Thesis**
- **Seminar proceeding**
- **Refereed journal**
- **Book**

What to Publish?

- **Research methodology**
- **Research data**
- **Research analysis**
- **Research experience**
- **Research review**
- **Research perspective**

Writing a Dissertation?

- **Level of dissertations**
- **Dissertation vs Research paper**
- **Formatting**
- **Examples of a good and a bad dissertation**

Level of Dissertations

- **Undergraduate dissertation**
- **Masters dissertation**
- **Doctoral dissertation**

Undergraduate Dissertation

- **Training basis**
- **No significant academic contribution**
- **Evaluation on:**
 - ✓ **Writing skill**
 - ✓ **Presentation**
 - ✓ **Sequence and formatting**
 - ✓ **Data analysis**

Dissertation vs Research Paper

Items	Dissertation	Research Paper
Size	± 200 pp	± 8 pp
Scope	Whole research	Portion of research
	1 Ph.D. =	4 research papers
	1 M.Sc. =	2 research papers
	1 B.Sc. =	1 research paper
Writer	Amateur	Professional
Writing	Relatively easy	Difficult
Presentation	Full research data	Simplified & selected
Format	University-based	Journal-based
Publication	Unpublished	Published

Formatting & Illustration

- **Follow the university's guideline**
✓ (UTM THESIS MANUAL)
- **Sequence of chapters**
- **Font, size, spacing, etc.**
- **Figure head**
- **Table head**
- **References**
- **Appendices**

Sequence of Chapters

Model A

- **Introduction**
- **Literature review**
- **Methodology**
- **Results**
- **Analysis & Discussion**
- **Conclusion & Recommendation**

Model B

- Introduction**
- Literature review**
- Methods & Materials**
- Results & Discussion**
- Conclusion**

List of References

- All references cited should be listed in the **List of References** at the end of the last chapter.
- List the references **alphabetically**. If more than one published materials by the same author are cited, these materials should be listed chronologically.
- For example, an article by Scholfield published in 1964 should be listed before the one he published in 1967.

Thesis Title

- The title should be **a short and snappy description** of the main topic of the thesis.
- Not more than **15 words**.
- **Redundancies** such as “An investigation of ...”, “A preliminary study of ...”, “Analysis of ...”, “On the ...”, “Theory of ...”, “Some ...” and “Toward a ...” must be avoided.
- Thesis title should not contain formulas, symbols or subscripts, Greek letters, or other non-alphabetical symbols; rather word substitutes are used.

No of Pages

- The maximum number of pages for a project report/dissertation/thesis are as follows:
 - 1. Bachelor Degree Project Report : 100 pages**
 - 2. Master's Report/Dissertation/Thesis : 200 pages**
 - 3. Doctorate Thesis : 300 pages**
- These limits include tables, figures and other illustrations in the text but do not include appendices.

References Style

- **Single Author :**

Veres, S. M. (1990). *Structure Selection of Stochastic Dynamic Systems*.

- **Multiple Author:**

1. Soderstrom, T., and Stoica, P. (1989). *System Identification*. United Kingdom: Prentice Hall International Ltd.

2. Luh, J. Y. S., Walker, M. W., and Paul, R. P. (1980b). Resolved-Acceleration Control of Mechanical Manipulators. *IEEE Trans. Automatic Control*. 25(3): 468-474.

References Style

- **Book:**

Theusen, G. J. and Fabrycky, W. J. (1984). *Engineering Economy*. (6th ed.)

- **Article in a book:**

Hussein, S. B., Jamaluddin, H., Mailah, M. and Zalzala, A. M. S. (2000). An Evolutionary Neural Network Controller for Intelligent Active Force Control. In Parmee, I. C. (Ed.) *Evolutionary Design and Manufacturing* (pp. 351 –362). London: Springer-Verlag.

References Style

- **Journal articles:**

Borman, W. C. (1993). Role of Early Supervisory Experience in Supervisor Performance. *Journal of Applied Psychology*, 78, 443 – 449. American Psychology Association.

- **Conference articles:**

Sheta, A. F. and De Jong, K. (1996). Parameter Estimation of Nonlinear Systems in Noisy Environments Using Genetic Algorithms. *Proceedings of the 1996 IEEE International Symposium on Intelligent Control*. 15-18 September. Dearborn, Michigan: IEEE, 360 - 365.

- **Thesis/Dissertation:**

Adnan bin Hassan (2002). *On-line Recognition of Developing Control Chart Patterns*. Doctor Philosophy, Universiti Teknologi Malaysia, Skudai.

References Style

- **Legislations:**

Malaysia (1983). *Perintah Monumen Lama dan Tapak Tanah Bersejarah*.

P.U.(A)41 1983

- **Standards:**

British Standards Institution (1990). *B.S. 764*. London: British Standards Institution

References Style

EndNote @ Mendalay

Writing a Research Paper

- **Basic considerations**
- **Finding a good topic**
- **Finding suitable literature materials**
- **Evaluating literature**
- **Presenting research methodology**
- **Compiling experimental data**
- **Analysis & discussion**
- **Formatting & illustrations**
- **A sample of research paper**

Basic Considerations

Research Paper

Before writing process

Which Publication?
Format
Guidelines
Page Allowed
Audience

Good paper?
The paper
The publication
The publisher

Steps in Writing
Single author?
Work distribution
Publication
procedure

Good Research Paper

- **Published in a flagship refereed journal**
- **Research findings are original**
- **Significant area of study**
- **Published at the right timing**
- **Minimum mistakes**
- **Methodologically sound**
- **Analytically sound**
- **Grammatically sound**
- **Clear diagram**
- **References are up-to-date & significant**
- **Correctly formatted**

Finding a Good Topic

Steps to a good topic:

1. **Choosing a topic that interests you**
2. **Doing preliminary research**
3. **Narrowing your topic**
4. **Deciding which type of research paper**

Step 1

1. **Choosing a topic that interests you**

Example:

“Internet of Things”

Step 2

2. Doing preliminary research

Search and **read read read:**

Perform intensive literature review

Step 3

3. **Narrowing your topic**

Create new topic:

“Internet of Things Challenges in Sudan”

Step 4

4. Deciding which type of research paper

- Research methodology
- **Research data**
- Research analysis
- Research experience
- Research review
- Research perspective

Finding Sources

- **Library**
- **Experts on the subject matter**
- **Internet (Online journals)**

Evaluating your Sources

- **Primary or secondary sources**
- **Evaluating your sources**
 - ✓ Relevant?
 - ✓ Reliable?
- **Checking for plagiarism**
 - ✓ Turn it In

Analysis & Discussion

- ✓ **Should be 50% of the paper**
- ✓ **Relate to the theoretical part**
- ✓ **Supported by graphs, tables, photo etc.**
- ✓ **Formula can be written**
- ✓ **But no calculation be shown**
- ✓ **Analysis on experimental data:**
 - **Compare with theory**
 - **Compare with numerical results**
 - **Compare with other works**
- ✓ **State the importance of the findings**

Formatting & Illustrations

- **Follow the guideline prepared by the publisher**

- **Principles:**
 - ✓ **To help to clarify your written explanation**
 - ✓ **Simple presentation**
 - ✓ **Easy to understand**
 - ✓ **Related to the theoretical derivation**
 - ✓ **< 10 (graph + table etc.)**

Writing a Research / Project Proposal

	Contents
1. Introduction	<ul style="list-style-type: none">i. The problem statementii. A rationale for research – Statement of the research objectivesiii. Hypothesisiv. Definitions of termsv. Summary including a restatement of the problem

Writing a Research / Project Proposal

Contents

2. A review of the relevant literature

- i. The importance of the question being asked
- ii. The current status of the topic
- iii. The relationship between literature and problem statement
- iv. Summary including a restatement of the relationships between the important variables under consideration and how these relationships are important to the hypothesis proposed in the introduction.

Writing a Research / Project Proposal

Contents

3. Method

- i. Participants (including a description and selection procedures)
- ii. **Research design**
- iii. Data collection plans
 - a) Operational definition of all variables
 - b) Reliability and validity of instruments
 - c) Results of pilot studies
- iv. **Proposed analysis of the data**
- v. Results of the data

Writing a Research / Project Proposal

	Contents
4. Implications and limitations	
5. Appendices	<ol style="list-style-type: none">i. Copies of instruments that will be usedii. Results of pilot studies (actual data)iii. Human experimentation approvaliv. Participant permission formv. Time line

Why do you need to write research Reports / Papers / Thesis

1. It is obvious that every research needs good and proper documentation.
2. To share research results with other researchers.
3. To obtain some form of degree.
4. To get views for improvement.
5. To get recognition.
6. For appraisal purposes.

The Body of Technical Paper

- 1. Title Page** - The title of the manuscript, the authors listed in order of their contribution (and not necessarily alphabetical order) along with their institutional affiliation (for each author if different)
- 1. Abstract** – a one sentence statement of the purpose, a description of the participants used in the research including the number, their age, gender, ethnicity, special conditions, and other identifying characteristics, the results, any conclusions being offered.

3. Text including the Introduction, Method, Results and Discussion

INTRODUCTION

- a. This would normally consist an Introduction section.
- a. A good **introduction** orients the reader to the importance of the problem by providing a sufficient background material.
- a. This is not the place for an extensive historical review.
- a. It should mention only the most important works that have been done and illuminate the importance studies.
- a. Basically, your goal is to provide the reader with sufficient information to understand and appreciate the importance and scope of the problem.

3. Text including the Introduction, Method, Results and Discussion

METHOD

- a. This could be divided into several sections and sub-sections (if needed).
- a. The method section of the manuscript describes how the study was conducted.
- a. This information is reported in sufficient detail so that any one can refer to this section and duplicate the study exactly as it was originally done.

3. Text including the Introduction, Method, Results and Discussion

RESULT

- a. The Results section where the reader can find what statistical techniques were used to analyze the data and what the result of the analysis were.
- a. [This is not the place for a presentation of the actual results of the analysis, but for only information about how the analysis was done.]
- a. This depends also on the type of paper.

3. Text including the Introduction, Method, Results and Discussion

DISCUSSION

- a. The Discussion section is where the author of the manuscript is free to explore important relationships among what has been done in the past, the purpose of the study, the stated hypothesis, and the results of the current study.
- a. Now it is time for an evaluation of what has been done and a “measuring up” to see if the reported results fit the researcher’s expectations.
- a. Most technical papers combined the Results and Discussion sections.

3. Text including the Introduction, Method, Results and Discussion

CONCLUSION

- a. This section sums up the whole paper by summing up the purpose and findings reported in the manuscript.
- a. It is here that you will find any statement as to what contribution might have been made by the current research and how well the original question was answered.
- a. This section could also be the place where the implications and limitations of the current study are discussed as are suggestions for future research.

REFERENCES

- a. The references are a list of sources that were consulted during the course of the research and the writing of the manuscript.
- a. References can be anything from a book to a personal communication, and all references have to be entered in the reference list in a particular format.
- a. The way the references are written in the text and also in the references section very much depend on the style/format of the journals or conferences.

5. Appendices

APPENDICES

a. An appendix usually contains information that is not essential for understanding the content of the manuscript but it is important for getting a through picture of what happened.

a. Usually, an appendix will contain original data or drawings.

6. Author Note

AUTHOR NOTE

- Author notes include any ancillary material that is important to understanding the content of the manuscript but does not belong in any of the previous sections.

7. Footnotes

FOOTNOTES

- Footnotes are used to elaborate upon references or some other technical point in the manuscript.

8. Tables

- Tables are text arranged in columns or rows, and are most often used in the results section.

9. Figure Captions

- A figure caption identifies each of the figures with a number and a title.
- A figure caption should have enough description of the figure you are presenting.

10. Figures

- Here is where the actual figures for the manuscript are physically placed.
- Every figure must be explained in the text.

Differences between Undergraduate & Postgraduate Research

	Undergraduate	Postgraduate
1. Time	Shorter period	Longer period
2. Outcome	Emphasis is not on developing of new algorithms	More algorithmic /mathematical
3. Novel	No	Yes
4. Analysis	Analysis need not necessarily be substantial	More detailed analysis

The Differences in Research at University

Research

	Research
1. PhD	More algorithmic, development of new techniques, extension of existing new techniques, and/or novel applications.
2. Master by Research	Mainly novel applications, applications of relatively new techniques or algorithms, comparisons of techniques.
3. Master by Course	Case studies, mostly similar to Bachelor projects with more analysis.
4. Bachelor	Application of existing techniques, case studies, software or circuit design to implement existing techniques.

Presentation

Presentation

Effective Presentation Based on:

- **The speaker** (speaking style, motivation, credibility)
- **Message** (content, style, structure)
- **Audience** (e.g., age, gender, education, career)
- **Channel of Communication** (verbal, nonverbal, pictorial)
- **Feedback** (reaction, response)
- **Noise** (coughing, talking, ventilation)
- **Setting** (room, projector, screen)

Preparation

- Research the audience
- Devise the presentation channels
- Organize presentation aids
- Check the setting
- Rehearse/Mock up

The Message: Structure

INTRODUCTION

- An opening message (e.g. quote, statistics)
- Objective
- Introduce the subjects

The Message: Structure

BODY

- Describe your **approach and methods**
- Present the results
- Focus on your main **points or ideas**
- **Discuss the implication** or results for the discipline of study

The Message: Structure

CONCLUSION

- **Summary**
- **Question & answer**



The Audience

- A** : **Analysis: who are they? How many?**
- U** : **Understanding: knowledge?**
- D** : **Demographics: age, sex, education?**
- I** : **Interest: why are they there?**
- E** : **Environment: where will I stand?**
- N** : **Needs: what are their needs?**
- C** : **Customised: specific needs? Presentation aids?**
- E** : **Expectations: what to learn?**

The Channel of Communication

Verbal

- Tone of voice, variations in pitch

Non-verbal

- Gestures, facial expressions, body movement, posture

Pictorial

- Diagrams, charts, graphs, pictures



Organize Presentation Aids

- **I**ntegrate into your style..
- **M**oves the presentation on..
- **P**rofessional appearance..
- **A**ppropriates to the moment..
- **C**ommunicates to the audience..
- **T**echnically sound.

Check the Settings

- What are the facilities available
- Visit the venue & room
- Test the facilities
- Change the environment ?

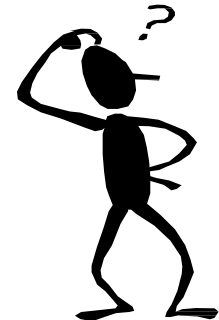


How to Rehearse

- **Devise the presentation**
- **Practice in your head**
- **Say it out loud**
- **Do it in front of the mirror**
- **Use a recorder or video**
- **Try it in front of other people**
- **Rehearse it on site**

Ways to Make Your Body Speak

- **Build self-confidence by being yourself**
- **Let your body mirror your feelings**
- **Build self-confidence through preparation**
- **Use your everyday speaking situations**
- **Facial expressions**
- **Eye contact**
- **Your appearance**
- **Walking patterns**



How to Gesture Effectively

- **Respond naturally to what you think, feel, see.**
- **Create the condition for gesturing, not to gesture.**
- **Suit the action to the word and the occasion.**
- **Make your gesture convincing.**
- **Make your gestures smooth and well-timed.**
- **Make natural, spontaneous gesturing a habit.**

How to Remember Material

- **Memorizing**
- **Reading from complete text**
- **Using notes/Prompts**
- **Using visual aids as notes**

Effective Prompts

- **Keywords**
- **Pictures**
- **Mind maps**
- **Logos**

Using Computer LCD Projectors

- Read LCD projector manual
- Practice setting the equipment
- Set up well in advance
- Check the LCD projector bulb life
- Bring a spare bulb and cables
- Check your colour combinations
- Check your font sizes

How to Reduce Anxiety and Stage Fright

- Know the room – become familiar with the place
- Arrive early and walk around the room, the speaking area
- Stand at the lectern, speak into the microphone
- Walk around where the audience will be seated
- Walk from where you will be seated to where you will be speaking
- Know the audience
- Know your material
- Practice your speech or presentation and revise it
- Learn how to relax
- Sit comfortable with your back straight

Summary – Criteria for Success

- **Does not exceed the allocated time**
- **The subject is well introduced**
- **Clear scope and objectives**
- **Focused on no more than 3 major points**
- **Implications for the discipline of study**
- **Ideas are brought to closure**
- **Overheads/slide/screen are clearly visible**
- **Presented in clear voice**
- **The speaker is enthused by his topic**

Tips for Effective Oral Presentations

- **A new design or a fresh idea is only the beginning**
- **Effective communication of ideas is as important as the idea itself.**
- **Three basic elements: You, the idea, and the audience.**

Tips for Effective Oral Presentations

- **Three basic elements: You, the idea, and the audience.**
- You are the expert.
- Your appearance, manner, and words should project authority.
- Ideas should be organized in such a way that they will be easy to understand.
- Planning and practicing your presentation before hand and including visual aids will make it more effective.
- You should know your audience, anticipate their questions, and monitor their understanding.

Tips for Effective Oral Presentations

- **3 stages of preparation: Plan, practice, and present.**
- **A well-organized presentation** comes across as natural because the ideas are organized and presented in such a way that they are easily understood; an unplanned talk is often tedious and difficult to follow.
- **Practice makes perfect.**
- Practicing allows you to discover problems before they matter.
- Be prepared for devastating equipment failures and audience disinterest.
- Then, if things go better as you present, you will feel confident with your level of preparedness.

Tips for Effective Oral Presentations

- **3 stages of presentation: Introduce, substantiate, and summarize.**
- Tell them what you are going to tell them.
- Oral communication limits the pacing of the audience's exposure to information.
- A thorough introduction to the ideas you are presenting helps the audience to keep up with your pace.
- Important ideas should be supported with data or examples.
- Visual aids can be very effective in giving the audience a clearer understanding of what you are saying.
- Tell them what you told them. The audience will remember your conclusions/summaries best.

Tips for Effective Oral Presentations

- **3 non-content factors: Posture, voice, and attitude.**
- Dress professionally, face the audience, move about (but not mechanically), breath deeply, and relax.
- Project your voice to the audience.
- Speak at a steady pace, pausing before and/or after important points.
- Talk to the audience, not at them.
- Make regular eye contact with them.
- Try to project yourself as relaxed and confident.
- You are not personally on trial, but your general attitude will determine if and/or how the ideas you have are received.

Tips for Effective Oral Presentations

- **Slides and/or Handouts**
- Slides and/or handouts can be very useful in facilitating the transfer of ideas from you to the audience.
- But they should not distract from the content of your talk. Keep visual aids simple.
- One slide, for instance, should have a short heading followed by one piece of information (a graph or table) or one group of related ideas (no more than five bullets with no more than ten words per bullet).

Presentation Outline (1st Stage Evaluation)

- **Introduction/Project Background**
- **Problem Statement**
- **Objective**
- **Scope of Study**
- **Significance of Study**
- **Literature Review**
- **Research Methodology**
- **Expected Results**
- **Conclusions**
- **Project Milestones**
- **References**