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Research Methodology

# Defining Research Problems

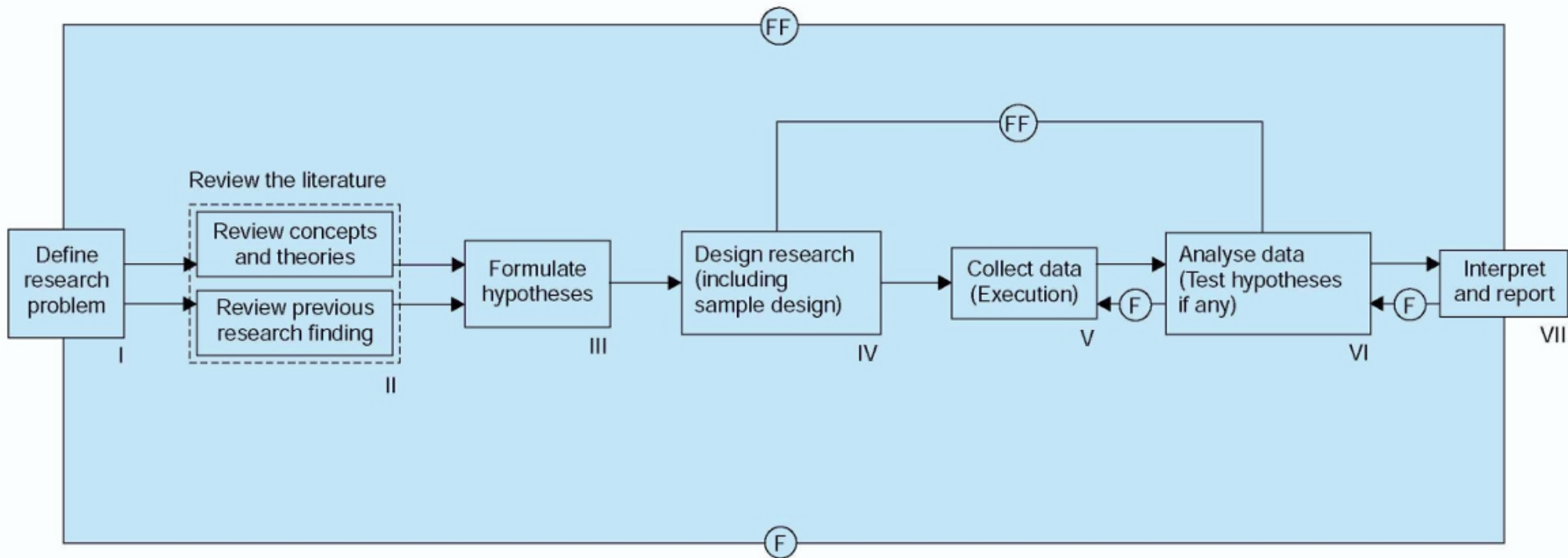


UNIVERSITY  
OF WOLLONGONG  
AUSTRALIA

# Research Process

- Research process consists of a series of steps or actions required for effectively conducting research. The following are the steps that provide useful procedural guidelines regarding the conduct of research

RESEARCH PROCESS IN FLOW CHART



Where (F) = feed back (Helps in controlling the sub-system to which it is transmitted)  
(FF) = feed forward (Serves the vital function of providing criteria for evaluation)

# What makes people to undertake research?

- 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 initiates research;
- Desire to get intellectual joy of doing some creative work;
- Desire to be of service to society;
- Desire to get respectability.

# Defining the research problem

- It is the first and most crucial step in the research process
  - Main function is to decide what you want to find out about.
  - The way you formulate a problem determines almost every step that follows.



# Defining the research problem

- Need of defining a problem
  - The definition of a problem sets the **direction** of the study.
  - The definition reveals the **methodology** or procedure of the study.

# Components of a research problem

- There must be **an individual or a group** which has some difficulty or the problem
- There must be some **objective(s)** to be attained at. If one wants nothing, one cannot have a problem
- There must be alternative **means** (or the courses of action) for obtaining the objective(s) one wishes to attain. This means that there must be at least two means available to a researcher for if he has no choice of means, he cannot have a problem

# Components of a research problem (cont.)

- There must remain **some doubt** in the mind of a researcher with regard to the selection of alternatives. This means that researcher must answer the question concerning the relative efficiency of the possible alternatives
- There must be **some environment(s)** to which the difficulty pertains

Kothari, C.R 2004, *Research Methodology: Methods and Techniques*, 2 edn, New Age International Publisher, India

# A research problem

is one which requires a researcher to find out the best solution for the given problem, i.e., to find out by which course of action the objective can be attained optimally in the context of a given environment.



# Identifying the research problem

- From the **literature review**, should have the understanding of state-of-the-art of the research area
- **Open problems**
- **Drawbacks** in previous work
- Need of a **new method** due to various reasons
- ...

# Criteria for defining the problem

1. Novelty.
2. Importance for the field represented and implementation.
3. Availability of data and tools.
4. Potentially solvable.
5. The result should have advantage over the existing methods
6. Availability of financial support.
7. Time factor.

## 1. Novelty and avoidance of unnecessary duplication

- The question of novelty or newness is not merely one of duplication of earlier investigations.
- Solving an open problem - It has not been solved according to the literature survey.
- Significant improvement over previous work.
- Non-trivial implementation of known theory
  - designing suitable experiment
  - solving implementation problem
  - matching the theory

2. Importance for the field represented and implementation
- Importance in choice of a problem involves - **significance for the field** involved and practical value in term of application and implementation of the results.
  - Scientific research in IT and computer science in general have an obligation to play a role on **social and economic impact**.

### 3. Availability of data and method

- Data collection
- The data under consideration must meet certain standards of accuracy and verifiability.
- Suitable method or tool
- In scientific research, the method might have to be developed in research.

## 4. Potentially solvable

- Based on your knowledge in the field and literature review, you set your aim realistically.
- Experience plays a role on your decision making. You might consult your project supervisor.
- Related to many other issues such as availability of data, suitable method, duration of project, financial support, etc.

5. The result should have advantage over the existing methods
  - Leading to significantly new result
  - Significant improvement
6. Availability of financial support.
  - For a large project, you need financial support for equipment, assistants, etc.
7. Time factor.
  - Realistic time frame for the project
  - Correctly estimate the project size

# How to state a problem

- Description of the general nature of the problem.
  - e.g. describe why it is a problem; why it is significant; how it contributes to the body of knowledge
- Statement of limitations of the technique employed.
- Importance-value or significance of the study.
- It should be stated “clearly and unambiguously in question form.”



# Example

**“Why is productivity in Japan so much higher than in India?”**

Ambiguities: what sort of productivity is being referred to?

With what industries the same is related? With what period of time the productivity is being talked about?

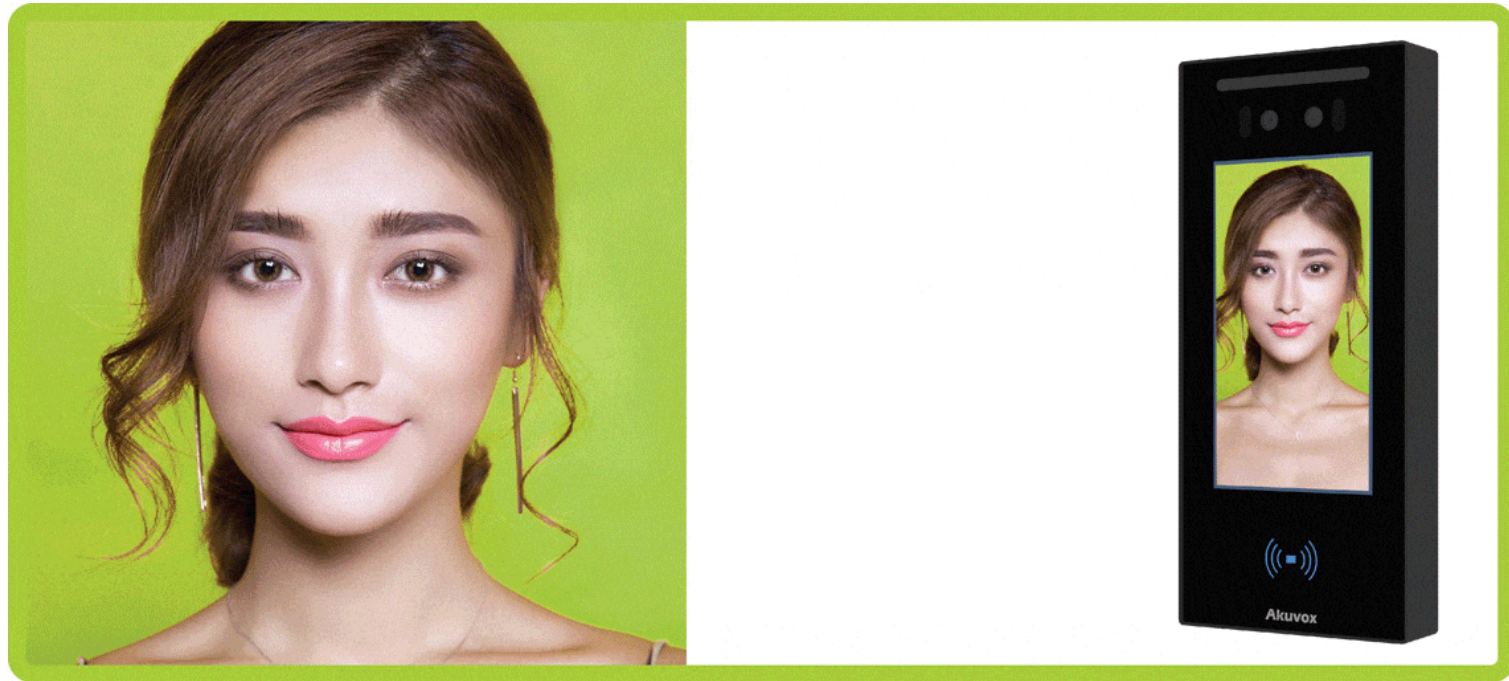
**“What factors were responsible for the higher labour productivity of Japan’s manufacturing industries during the decade 1971 to 1980 relative to India’s manufacturing industries?”**

**“To what extent did labour productivity in 1971 to 1980 in Japan exceed that of India in respect of 15 selected manufacturing industries? What factors were responsible for the productivity differentials between the two countries by industries?”**

Kothari, C.R 2004, *Research Methodology: Methods and Techniques*, 2 edn, New Age International Publisher, India

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# Exercise



# process



**Figure:** Face Recognition Process

What features are extracted from the input to **detect** faces?

What problems make it difficult to extract them?

How are these features used to detect faces?

Methods/algorithms?

# process



**Figure:** Face Recognition Process

How is the detected face tracked?

What features are tracked and how are they tracked?

Methods/algorithms? Once tracked what features are used for recognition?

# process



**Figure:** Face Recognition Process

How are these features extracted?

What difficulties are encountered in extraction? Are there work  
arounds? How are these features used in **face recognition**?

Methods/algorithms?

# Research problem

How are the detection algorithms and methods evaluated?

How are the tracking algorithms and methods evaluated?

How are the recognition algorithms and methods evaluated?

What databases are used for evaluation?

These are just questions arising from brainstorming exercise!