

Unit-1

Research problem.

general Problem Solving.

Definition. \rightarrow what a situation is vs. what a situation should be.

- i) such difference is perceived, \therefore a problem exists with respect to a person or a group
- ii) what the solution should be indicates a liking or a preference
- iii) The reason for the problem is not known.
- iv) Decision making situation there may be many ways of solving the problem, using the gap or reducing the difference.

* First Aspect

\hookrightarrow Problem solving process begins with the recognition of a problem.

- * if the problem is not recognised, no effort will be made by the individual or the group to solve it and the problem continues.
- * Problem may be identified wrongly and irrelevant solution to the problem will be sought and problem continues.

* Second Aspect

\hookrightarrow Gap is not acceptable to the decision maker who feels the need for closing it, \therefore motivated to make problem solving efforts.

\hookrightarrow Necessary to understand new viewpoints.

\hookrightarrow different perceptions to the same problem \Rightarrow

different ownership of the problem.

Third Aspect:

If the reasons for the problem are not known - then an investigation or enquiry will be needed to gain understanding to gain understanding of the problem.

Research approach is needed.

→ several solutions may be available to the problem solver situations, choosing the one that best closes the gap is a problem.

Types of problems

- simple and complex
- well defined and ill defined
- Tame and Wicked.

1] simple and complex.

→ components and their interrelationships are transparent or are easily understandable.

Complex ones are those in which several simpler subsystems interact in ways that are difficult to comprehend.

* Complex problems in management are generally related to large systems where some mechanisms and some heuristic subsystems interact.

↳ Breaking down into smaller ones and then trying to solve them may not be appropriate. solns to the total system problem

have to ↳ interactions across boundaries of the subsystems will be explicitly considered.

↳ Approaches are supposed to concentrate on such problems (in OR) ↳ symbolic model of the system is generally attempted

↳ Restructuring may lead to oversimplifying assumptions

and to fit a specific model type to the problem and solve a wrong problem. (Weakness of OR)

2) Well defined and ill defined

→ when the problem solver is not sure of what the problem is, definition of the problem becomes difficult and it may have to be viewed from many different perspectives.

Eg: Technology idea → suitable product (fails)

We have to look into marketing, R&D, consumer requirements, technical manpower etc.

3) Tame and Wicked Problems

→ Determined according to some scale on which the whole problem solving may be rated.

Wicked problem may be one in which descriptions of the problem cannot be definite, derivation of solution is difficult, alternatives are too many, solutions cannot be evaluated, confidence in the appropriateness of the solution is low.

Eg: several tubs are available for power generation.

Problem Solving Process

1. Identifying a Problem

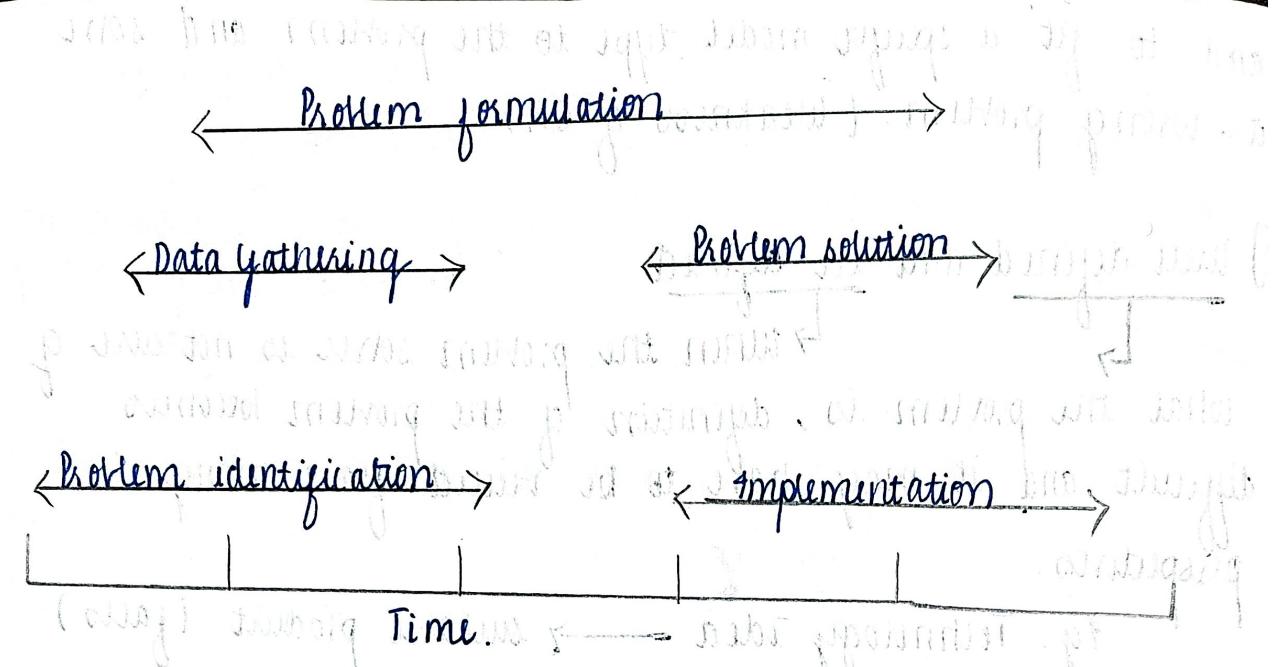
2. Data Gathering

3. Problem definition is made.

4. Ideas for problem solution

5. Ideas are evaluated and solutions using the most prominent ideas are obtained

6. The best solution is implemented



3 Approaches to Problem Solving.

* Logical Approach

* soft system Methodology

* Creativity approach.

Logical Approach

- Involves abstraction in which a problem is expressed mathematically, diagrammatically or descriptively.
- Approximation to reality
- Deductive reasoning proceeds to define relationships
- Breaking the problem into parts or sub problems can facilitate such an influential process.
- Sometimes it is easier to solve problem backwards from the final solution desired.
- Possible when objectives are clear but existing situation is not clear or easy.
- Each backward step leads to what is required at the beginning of the step in order to accomplish the condition.
- This process is continued until the present condition is reached.

Advantages

Ability to check whether an already an established standardised solution method is useful in solving the problem.

- A classical example is a standardized OR technique like linear prog., DP, inventory modelling.
- In general
 - ↳ easier to solve complex problems by simplifying assumptions.
 - * From solving the special problems one can proceed to solving more general problems by relaxing the assumptions one by one.
 - * Solving the general problems may be more complex.
- Transformation of the problem from one form to other in some other area which has already been solved.

A systematic and logical approach to search for new ideas is Morphological analysis (MA).

- ↳ Various attributes or features are listed (represented in the form of grid).
- 1. Break down the problem into parts
- 2. Generate several solutions for each part.
- 3. Combine solutions to find the total number of solutions.
- 4. Identify the feasible solutions by considering interactions between potential solutions.
- 5. Choose the best overall solution by analyzing and evaluating the gaps in the grid.

Applications

- * Explore new opportunity or develop new product ideas, manufacturing methods, markets or methods
- * Analyzing problem situations to identify the problem structure.
- * Potential Problem analysis

Soft System Approach

- A procedure for mathematical modeling of a complex system.
(Structural Modelling)

Process:

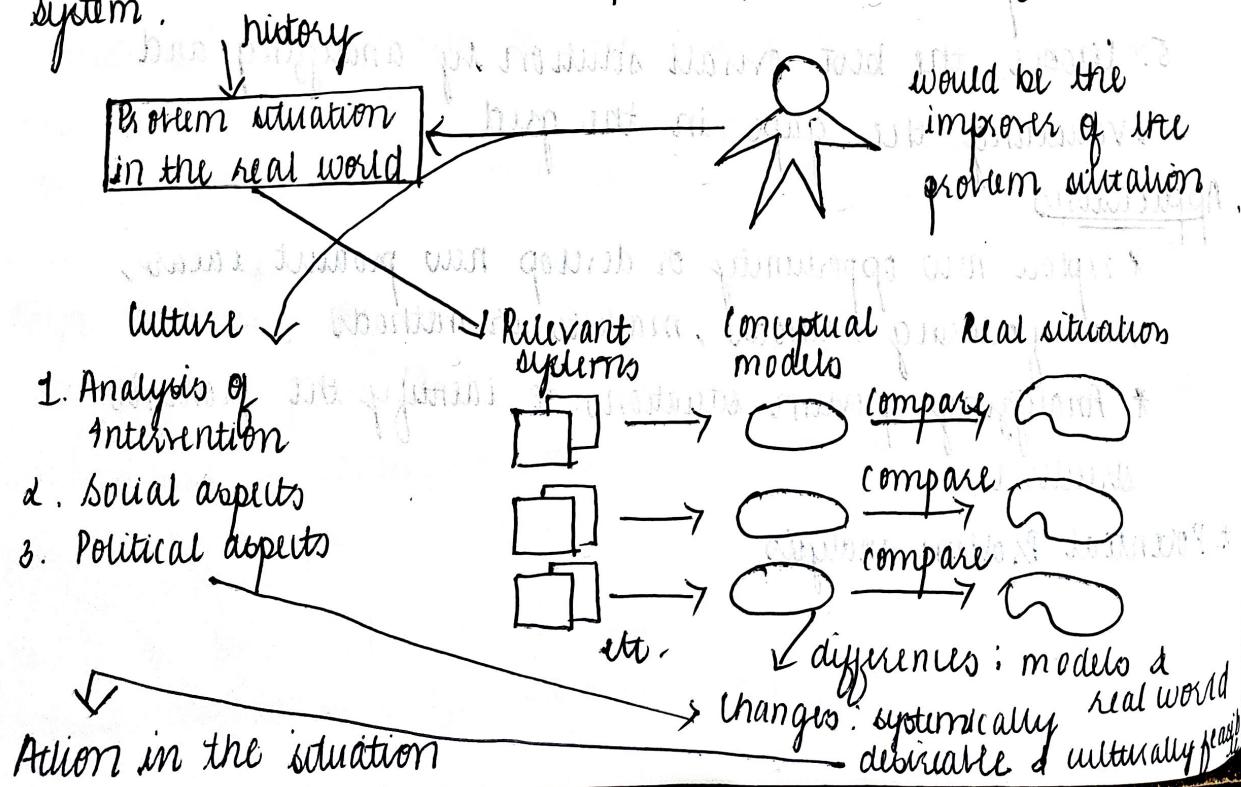
1. Observation: Observe the real world system.
2. Scenario Development: Develop a complete scenario based on the researcher's experience and comprehension.
3. Problem space extraction: Extract the problem space for detailed modelling.

soft system methodology (SSM)

Purpose: Aid in the structural modeling process by providing a qualitative understanding of the system.

Process:

1. Observation: Gather qualitative and descriptive details, including attitudes, reactions, opinions, factual data and reactions to interactions of existing problem solutions.
2. Module Description: Describe each human activity system involved in the problem situation as a separate module.
3. Model development: Develop a separate model for each system.



Creative Approach

- In research, one can learn its tools and techniques. One can become proficient in them and become a competent technician.
- But in order to enable one to make original contributions to one's field of research, one has to give oneself to it in a special way that is creativity.
- Creativity requires mental regimentation, a strong motivation and freedom of self-expression.
- Creativity ability exists in every individual and the exercise of experiments in creative works is probably the best way to develop it.

Thinking Processes in problem solving

- Logical thinking → cause-effect relationship
- Vertical thinking → similar to climbing ladder
- Critical thinking - evaluative or judgmental
- Analytical thinking - broken into parts, each part is examined (puzzle)
- Strategic thinking - (convergent thinking) specific overall route, see all angles.
- Lateral thinking - all diff angles, jump from one ladder to another
- Outcome thinking - attacked from the perspective of the desired soln.
- Creative thinking - coming up with new concept by rearranging the existing factors.
- Divergent thinking - diff associations with a problem & takes diff lines of arguments to arrive at diff solns.

L one makes rules based on an experience or hunch or insight in specific situations and applies them to similar situations.

Promotion of divergent thinking -
- promotes creative thinking
- promotes critical thinking
- promotes convergent thinking
- promotes lateral thinking

Kreative Thinking.

Important factors in developing creative thinking :-

1] Using systems and variables

a] Identifying assumptions

b] Finding Probability

c] Detracting changing relationships

d] Using systems and variables. (problems requiring creative solving)

1) changing the objectives may arise in a system

2) Broadening the system. A few of them are:-

3) simplification

4) Considering variables and constants.

- Any change in any item will affect all other items in the universe, which is a large system to a more or less degree.

- Since the universe is a very large system, its total analysis becomes impossible and over cumbersome. We, therefore, partition the universal system and simplify it in order to study it.

- This simplification act is a source of error.

- This error is generally recognised when simplified system are analyzed with existing tools.

- In a system, some factors vary some and some are constant.

- A factor that is constant with respect to one system may vary with respect to another since every factor in the universe belongs to more than one system.

- Visualising relationships is useful.

a] Identifying assumptions.

- Any object belongs to several systems.

- When we study the change in an object, we may wrongly assume that a particular system which is active is causing it.

e.g.: Job shop.

- It is impossible to isolate a system so that it contains only items that influence it.
- No amount of facts can substantiate a assumption.
- Single fact can refute it.
- Creative thinking is a rich field for confirming or disproving the basis for the assumptions underlying the accepted system.

Handling Probability

- Refers to the likelihood of the relationship being true.
- Refers not to the existence of the relationship but to its correct identification.
- Include areas where the relationship has not been established.

Detecting changing relationships.

- Relationship change with time but time is not involved in the change.
- Many relationships change as the one's experience of it change.
- Experience should be viewed with caution.
- Ignorance helps in thinking creatively in relatively well known areas.

A creative thinker should:

CASE STUDIES ARE MENTIONED. FROM MANAGEMENT RESEARCH METHODOLOGY PG NO. 54-55

- a) constantly examine the relationship to be sure that it is not changing.
- b) identify as sources of errors
- c) synthesize and put together relationships in a new combination.

Barriers to Creativity

- Absence of pathways in brain is a barrier to creative thinking.
→ can be overcome by recognising the difficulty and studying the subject deeply.
- Incorrect data, incorrect direct sensory impressions, incorrect associations cause pathways as barriers.
- Incorrect thought patterns.

Creative Problem solving Process (P1IV)

1. Preparation - Problem is investigated in all directions
2. Incubation - individual is frustrated, exhausted, is not constantly thinking about the problem and is relaxed
3. Illumination, thinking about the problem and is relaxed
4. Verification → idea occurs along with psychological factors like emotional release.

validity of
idea is tested
and evaluated

clarity of ideas and feeling of insouciance
immediately precede it and accompany
its appearance.

Systematic
thinking

Degree of

Intuition

Low

Psychic
fustication

High

Development of creativity

Most people are creative to some extent and possess many of the traits that are given below:

- Independence
- Curiosity
- Intuitiveness
- Unconcern for social norms
- Sensible risk taking
- Introversion
- Wide span of interests
- Cognitive flexibility
- Self acceptance

Guidelines to develop creativity

* Principle of deferred judgement

- All the problems that are implicit in a problem situation should be considered
- Problem sensitivity has to be developed.

- Evaluation should not take place while enumerating all problems.

Group Problem Solving Techniques for Idea Generation

* Brainstorming.

* Delphi Method

* Brainstorming.

- group process in which members usually from different backgrounds, respond to a central question or theme.
- emphasis is on generating large number of ideas while deferring criticism and evaluation.

Origin: Developed by Osborne in 1963

Purpose: Useful for solving new problems or finding fresh perspectives on existing problems.

Group composition: Typically consists of 6-10 members, with half being experienced participants and rest from diverse backgrounds.

Session structure:

- * Introduction to the subject
- * Warm up activities to encourage participation
- * Clear and concise problem statements to focus ideas.

Principles:

Defy judgement and criticism

Encourage freewheeling ideas

Build on and improve others' ideas.

Techniques: Using "who what when how where" questions.

Expanding, contracting or modifying the problem.

Forcing relationships among unrelated items.

Morphological analysis

Encouraging wild ideas

Reverse brainstorming to anticipate problems

Evaluation: Ideas are later assessed by a panel of experts.

Goal: Generating as many ideas as possible, increasing

the chance of finding original solutions.

Delphi Method

Definition: The Delphi method is a survey technique to achieve consensus among anonymous participants using controlled feedback.

Purpose: It applies expert opinion to solve problems, identify problems or make predictions.

Process: Involves structured, interactive questionnaires.

Functions as a remote conferencing procedures.

Applications: Determine a range of alternatives
Explore assumptions leading to different judgements.

Fields: Widely used in physical sciences, social sciences, business administration, engineering and technical forecasting.

Key features:

Anonymity: Ensures unbiased input without pressure from dominant individuals.

Interaction: Experts participate through a series of polling.

Controlled feedback: Opinions are refined through multiple rounds.

Statistical responses: Results are analyzed for consensus.

Polling: Typically involves 3-4 rounds of questionnaires, starting with open ended questions.

Goals: To achieve group consensus on priorities or divergent opinions.

Problem generation: May use a single poll for generating ideas as consensus isn't the main focus at this stage.

Formulation of Research Problems

Approaches to Management research problem.

- i) A manager is in need of solving an organisational problem that he cannot solve by himself
- ii) A mature researcher is cognitively aware of research problems in his field of research and any signal through conversations, discussions, conferences or reflection may trigger an idea for research
- iii) A fresh scholar of research is systematically introduced to the process of research through research training program courses and literature review in an area of interest to him.

Management Problem posed to a researcher.

- * A manager or decision maker recognizes a problem but it usually acts as a symptoms.
- * A researcher, internal or external must analyze and identify the real problem.
- * The researcher, similar to a doctor, gathers information, diagnosis the issue and formulates research problem.
 - * Eg: A production manager struggles with delivery schedules, prompting the researcher to ask questions about capacity, production control rules and scheduling.
- * Classical two stage approach is taken:
 - Exploratory stage: conducts a quick feasibility study through interviews and study analysis
 - System study: investigates the entire organisation identifying problems across subsystems to formulate the correct research problem.

- * The research problem is often expressed as a statistical or mathematical model
- * If existing knowledge is insufficient, the researcher reviews literature and forms hypotheses.
- * If a method from the literature is available, it's applied directly. If modifications are needed, the researcher adapts it creatively to fit the system.
- * Various methods are evaluated and the best solution is selected. If no solution is available, developmental research creates new alternatives.

Eg: EOQ - Economic Order Quantity Model

EOQ minimizes ordering and holding costs for inventory management.

Adjustments to the EOQ model can include transportation costs, truckloads and variable costs. These modifications make the model more applicable to real world scenarios like transportation logistics.

Model equation:

The basic EOQ equation is:

$$TVC = (hQ)/2 + (O(d/Q))$$

$$Q = \sqrt{(2Od)/h}$$

where O = ordering cost/order

d = demand for item

h = holding cost/unit

A modified equation accounts for transportation costs and order quantities less than a truckload resulting in a different optimal quantity (QN^t)

Model Modification:

Researchers frequently adjust models like EDQ to account for factors such as transportation, ensuring better applicability in specific industry contexts.

Investigation of a Idea by an Experienced Research.

- Stray stimuli, critical reviews or unsatisfactory solutions can spark new research ideas or concepts for experienced researchers.
- Suggestions from previous researchers or analogies from unrelated areas can also lead to new research ideas.
- The researcher observes phenomena related to the problem and uses their research experience and cognitive ability to define the problem.
- A theoretical framework is developed around the identified problem.
- The researcher constructs a hypothesis based on observations and experience
- A thorough search and review of existing literature related to the problem and hypothesis are conducted.
- Relevant data is collected for the research problem.
- The researcher investigates the problem through rigorous logical or statistical analysis using collected data.

Initiation of a Novice/Student to Research.

- Research ideas originate from a guides suggestions or literature review
- literature review help identify research gaps
- Novice researchers follow two steps: forming a tentative hypothesis or model and conducting a pilot study

- This pilot study tests the validity of the hypothesis, variables, measures and data collection instruments
- Modifications are often made based on pilot study findings
- After refining the theoretical framework, the student develops the research design.

[check out fig 4.2 of Management Research Methodology Pg: 90 (g PDF)]

EXPLORATION FOR PROBLEM IDENTIFICATION

- Research problems are rarely presented clearly, they often start as vague difficulties without clear solutions.
 - Initial problems may be based on hunches and are often expressed in general terms, especially in management or scientific settings.
 - Researchers must rigorously question problem statements, review existing research to check for overlaps or differences and determine if the problem is new or a modified version of an existing one
- Identifying research problems involves several methods:
- * Scanning of earlier research literature to find knowledge gaps
 - * Observing and studying the phenomena
 - * Discussions with experts
 - * Attending conferences and seminars
 - * Brain storming sessions
 - * Creatively reflecting on the problem after intense questioning and critical enquiry

literature surveys

- literature survey/review is a critical analysis procedure, not just listing bibliographies.
- it involves reflective thinking, critical analysis and comparison of research material, considered part of descriptive research.
- In academic research, the literature survey integrates new knowledge and often helps formulate the research problem.
- The literature review checks if a problem has been researched before, is new or needs a modified approach
- Four aspects of a literature review:
 - * choice of literature
 - * search for literature sources
 - * study of literature
 - * organisation of literature
- Researchers gain focus by studying extensively, then conducting a more selective, focused review based on their research topic.
- Researchers must selectively study books, journal articles, bibliographies and methods relevant to their topic.
- Universities libraries may provide basic resources, but researchers often need to look up specific articles using indexes and periodicals in specialized areas
- Start with recent journal issues and go backwards for efficient literature locations; note down references for research reports

- Dissertation Abstract International helps locate their research
- Microfilms provide in depth information on methodologies and analysis
- Many university offer computer search libraries and online resources for literature searches
- Organising research literature: divide it into general literature problem specific literature and critical literature review close to the research problem.
- General literature should be quickly browsed for relevance problem specific literature should be studied intensely for gaps and methods.
- A critical review involves detailing methods, merits, shortcomings and difficulties of closely related studies to help formulate the research problem
- Summaries, critiques and detailed notes should be organized systematically for use in thesis / report development
- Presenting literature review: sequence from general to specific with general literature summarized briefly and specific literature detailed and critically evaluated
- A Taxonomy may help classify problems and identify existing solutions or the need for new problem definitions

META ANALYSIS

- * Meta analysis is a systematic and statistical examination of several previous research studies to combine findings or synthesize research.
- * It uses a range of statistical methods similar to those used for analyzing collected research data such as data location, analysis level, sample size, types of subjects, dependent variables and validation methods.
- * Meta analysis integrates research efforts using statistical analysis and sophisticated measurement techniques, moving beyond simple narration or description.
- * This approach, as defined by Glass (1981), is distinct from primary research; it analyzes and provides a more comprehensive understanding of a research topic.
- * Many reviews of research are often incomplete or lack critical examination of methods, research designs or findings. Meta analysis aims to overcome these shortcomings.
- * Meta analysis applies data analysis to quantitative summaries of similar studies and focuses on generalizations rather than insignificant features.
- * It uses empirical analysis rather than opinions or judgements providing a broader perspective ("forest" rather than "trees")
- * The process includes searching for literature and incorporating unpublished studies to avoid publication bias, which can skew generalisations.

- * Meta-analysis involves describing, classifying and coding research studies and making use of statistical significance tests, chi-square methods, standardized mean differences and pooled standard deviation estimates.
- * Techniques used in meta analysis include multivariate data analysis, univariate analysis, multiple linear regression, ANOVA, inferential statistics, non parametric methods and Monte Carlo simulation.
- * Modifications to estimates, coefficients and scores in meta analysis need careful considerations to ensure accurate findings.

System study

System study involves understanding and analysing the problem identification process within an organisation.

It aims to improve the system, determine theories of system development and advance science.

The study is directed towards four major aspects:

* The decision system

* System objectives

* Environmental system

* Action options for executives

Objectives of system study

1. Understanding problem, environment and information flows:

- Analyzing how information flows are used by decision makers and how transactions occur between the organisation and its environment.

2. Feasibility of Problem Solving Approach: Evaluating the practicality of specific approaches to solve identified problems.

Steps in system study

- Formal definition of the system.
- * Develop root definitions for the entire system and its sub systems.
- * Identify various world views of the system and select the most relevant one.
 - Detailing Features of system influences:
 - * Analyze influence from higher systems (e.g. nature of the product, demand, competition, statutory constraints)
- Division into Major sub system:
 - * Break the system into sub system and develop root definitions for each.
 - Detailing activities of each sub system.
 - * Analyze each activities to understand how it is performed, the resources required and its performance level.
 - Developing the Total information Flow system.
 - * Use data from previous steps to create a comprehensive information flow system for decision making, employing systems analysis techniques for representation.
 - Expanding Activities for Detailed Information Models:
 - * Break down each activity further for detailed understanding of the information model.

Errors in Problem identification

1. Environmental problems
2. Technical deficiencies
3. Manager bias
4. Type III errors

→ solving the wrong problem

Reducing Type III error

- * Reductionist Approach
- * Systems Approach
- * Dialectical Approach.

Hypotheses generation

Introduction

The identification and formulation of research problem is one of the most difficult phase of research faced by a student.

1. Categories of research problems:

- * Hypothesis testing / predicting: Focuses on using empirical data to develop or extend theories.
- * Mathematical Models: Involves decision making environments.

2. Research challenges

- * Formulating the research problem is complex, particularly as theories develop and variables increase.
- * Higher level of abstraction in research lead to more complex hypotheses and sophisticated research designs.

3. Key features of a theoretical framework (Sekaran, 2000):
1. Clearly identify and label relevant variables
 2. Define relationships between variables
 3. Indicate if relationships are positive or negative based on previous research
 4. Provide a rationale for expected relationships.
 5. Use a schematic diagram to visualize theorized relationships