Research Methodology

Introduction

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Outline

- What is a research?
- Research activity: characteristics and requirements
- Types of research
- Significance of research
- Research methodology vs research methods
- Research process
- Measures of good research

What is a research?

- Is a way of thinking
  - Examines critically the various aspects of day to day professional work
  - Understand and formulate guiding principles that govern a particular procedure
  - Develops and tests new theories that contribute to the advancement of your practice and profession

- Is a habit of questioning what you do, examine observations to explain and find answers (objectively)

What is a research?...

- Why??
  - Humans possess the vital instinct of inquisitiveness which makes them probe and attain fuller understanding of the unknown.
  - This helps them harness and utilize the knowledge acquired to improve the whole spectrum of quality of life.

What is a research?...

- Why??...

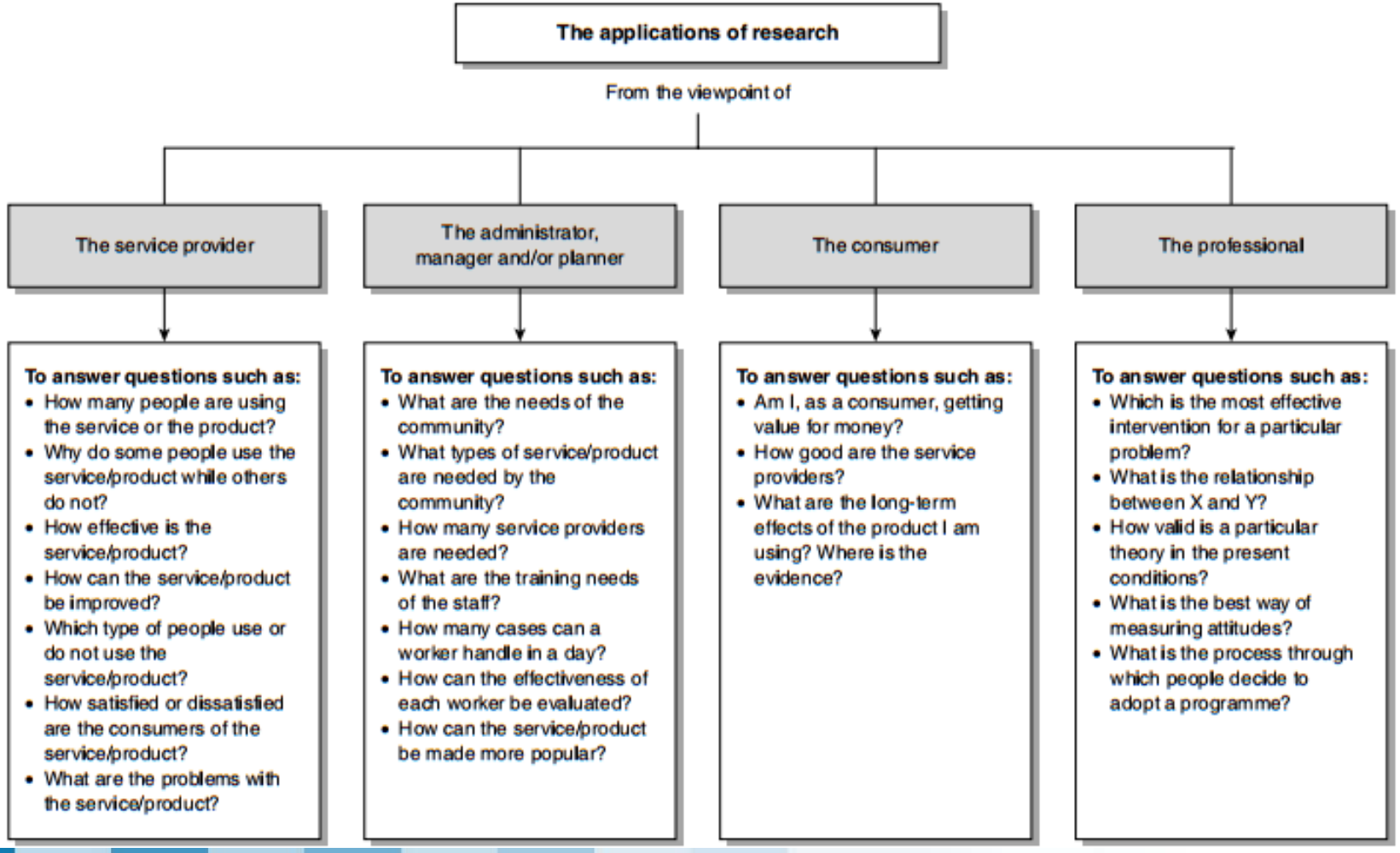
–Though there is a vast body of knowledge in almost every discipline in the forms of

  - literature,
  - art,
  - culture and even on the
  - Internet (in electronic form)

humans still need much more knowledge and understanding to overcome ***existing and emerging challenging*** problems in society, business, technology, the environment, etc

What is a research?...

- Application of research
  - Can be viewed from different perspectives



What is a research?...

- Definition
  - The Advanced Learner's Dictionary of Current English lays down the meaning of research as
    - *"a careful investigation or inquiry specially through search for new facts in any branch of knowledge."*
  - The Merriam-Webster Online Dictionary defines research in more detail as

    "a studious inquiry or examination especially investigation aimed at
    - *the discovery and interpretation of facts,*
    - *revision of accepted theories or laws in light of new facts/observations, or*
    - *practical application of such new or revised theories or laws"*

What is a research?...

- Definition…
  - Research = re + search
    - re : again, anew or over again
    - search : to examine closely and carefully, to test and try, or to probe
  - Describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles (Grinnell 1993)
  - ‘research is a structured inquiry that utilises acceptable scientific methodology to solve problems and creates new knowledge that is generally applicable.’ (Grinnell 1993)

What is a research?...

- Definition…
  - Other authors define a research in more or less similar ways
  - Magraz defines it as follows:
    - *"A research is an instrument or means used to enrich knowledge, accelerate development, and enable individuals and society solve problems in a coordinated manner."*
  - D. Slesinger and M. Stephenson in the Encyclopedia of Social Sciences define research as
    - *"the manipulation of things, concepts or symbols for the purpose of generalizing, to extend, correct or verify knowledge, whether that knowledge aids in the construction of theory or in the practice of an art."*
  - Bulmer 1977
    - *'scientific research is a systematic, controlled empirical and critical investigation of propositions about the presumed relationships about various phenomena'.*

What is a research?...

- Undertaking a research study to find answers to a question, implies the *process* being applied
  1. is being undertaken within a framework of a set of philosophies
     - Philosophical orientation may stem from one of the several paradigms and approaches in research
       - Qualitative, quantitative, action or participatory, … + academic discipline you are trained
  2. uses procedures, methods and techniques that have been tested for their validity and reliability
     - Validity
       - Ensures that n a research study correct procedures have been applied to find answers to a question
     - Reliability
       - Refers to the quality of a measurement procedure that provides repeatability and accuracy
  3. is designed to be unbiased and objective

Research activity: characteristics and requirements

- Research is a process for collecting, analyzing and interpreting information to answer questions
- Characteristics of the process
- Controlled
  - Many factors affect an outcome
  - Implies that in exploring causality in relation to two variables, one would set up the study in a way that minimizes the effect of other factors affecting the relationship
  - Could mostly be achieved in physical sciences than social sciences
  - When you cannot control external factors, you attempt to quantify their impact

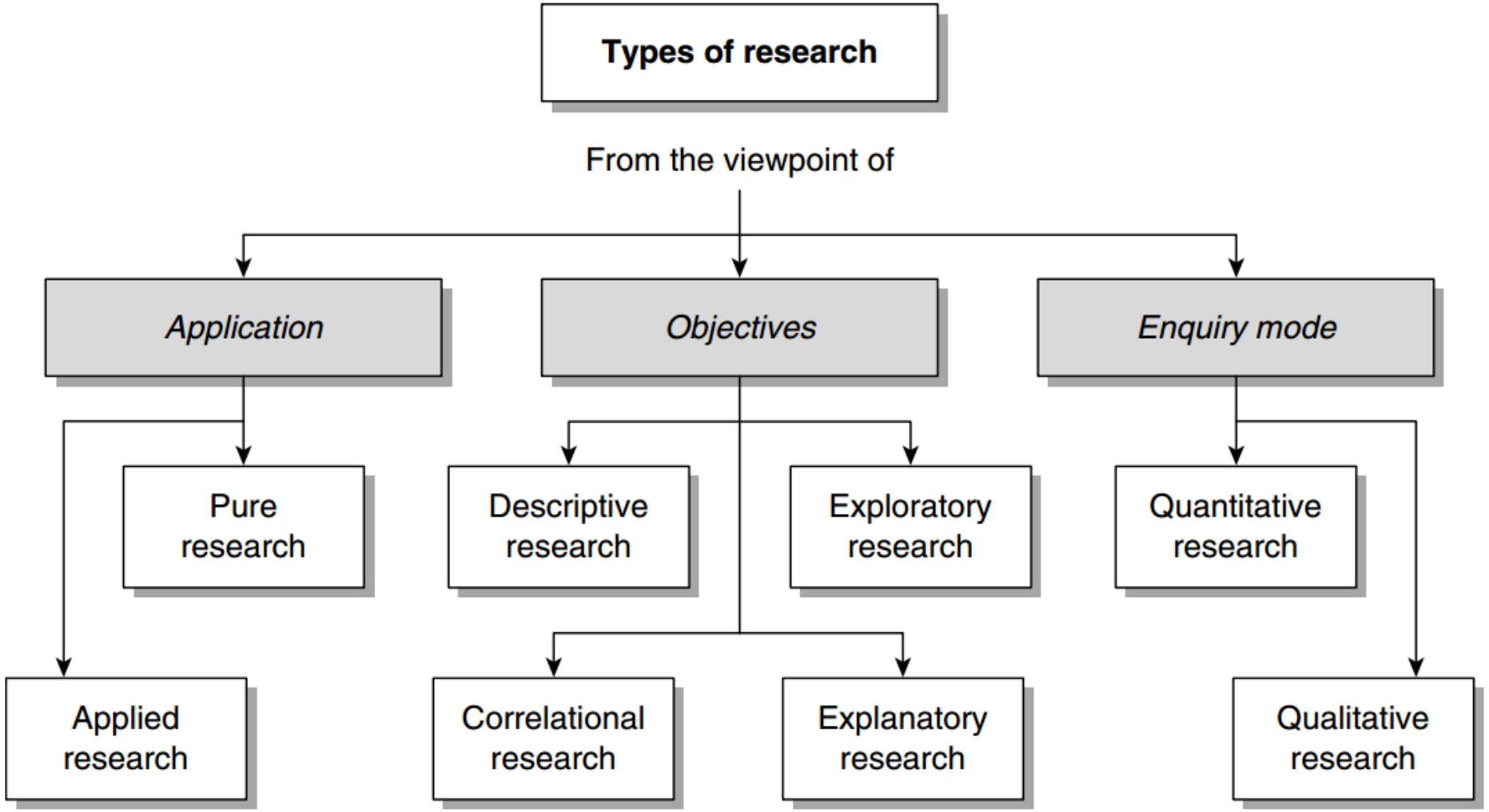
Research activity: characteristics and requirements…

- Rigorous
  - You must be scrupulous in ensuring that the procedures followed to find answers to questions are relevant, appropriate and justified
  - The degree of rigour varies markedly between the physical and the social sciences
- Systematic
  - Implies procedures adopted to undertake an investigation follow a certain logical sequence
- Valid and verifiable
  - Implies that whatever you conclude on the basis of your findings is correct and can be verified by you and others

Research activity: characteristics and requirements…

- Empirical
  - Any conclusions drawn are based upon hard evidence gathered from information collected from real-life experiences or observations
- Critical
  - The process of investigation must be foolproof and free from any drawbacks
  - The process adopted and the procedures used must be able to withstand critical scrutiny

Types of research



Types of research…

- Application perspective
  - Two broad categories
    - Pure Research
    - Applied research
  - Pure research
    - Involves developing and testing theories and hypotheses that are intellectually challenging to the researcher
    - Concerned with the development, examination, verification and refinement of research methods, procedures, techniques and tools that form the body of research methodology
    - May not have practical application at the present time or in the future

Types of research…

- Application perspective…
  - Applied research
    - Research techniques, procedures and methods that form the body of research methodology are applied to the collection of information about various aspects of
      - Situation
      - Issues
      - Problems
      - Phenomenon
    - Information is then used in various ways
      - Policy formulation
      - Administration
      - Enhancement of understanding of a phenomenon

Types of research…

- Objectives perspective
  - Broadly classified as
    - Descriptive
    - Correlational
    - Explanatory
    - Exploratory
  - Descriptive study
    - Attempts to describe systematically a situation, problem, phenomenon, service or program
    - Provides information about living condition of a community, or describe attitudes towards an issue
    - Main purpose
      - Describe what is prevalent with respect to the issue/problem under study

Types of research…

- Objectives perspective…
  - Correlational study
    - Focus
      - discover or establish the existence of a relationship/ association/ interdependence between two or more aspects of a situation
  - Explanatory research
    - Attempts to clarify why and how there is a relationship between two aspects of a situation or phenomenon

Types of research…

- Objectives perspective…
  - Exploratory research
    - Objective
      - Explore an area where little is known or to investigate the possibilities of undertaking a particular research study
    - If the research is carried out to determine its feasibility it is called a feasibility study or a pilot study
    - Can also be conducted to develop, refine and/or test measurement tools and procedures
  - In practice most studies are a combination of the first three:
    - Descriptive, correlation and explanatory

Types of research…

- Modes of enquiry
  - Concerned about the process you adopt to find answers to your research questions
  - Classified as
    - Quantitative approach
    - Qualitative approach

  - Quantitative approach
    - Structured approach to enquiry
    - The research process: objective, design, sample and the questions you plan to ask are predetermined
    - Appropriate to determine the extent of a problem, issue or phenomenon

Types of research…

- Modes of enquiry…
  - Qualitative approach
    - Unstructured approach to enquiry
    - Allows flexibility in all aspects of the research process: objective, design, sample, and questions planned to be asked
    - Predominantly used to explore variation/diversity in a phenomenon, issue, problem, or attitude towards an issue

Types of research…

- Modes of enquiry …

Difference with respect to:	Quantitative research	Qualitative research
Underpinning philosophy	Rationalism: 'That human beings achieve knowledge because of their capacity to reason' (Bernard 1994: 2)	Empiricism: 'The only knowledge that human beings acquire is from sensory experiences' (Bernard 1994: 2)
Approach to enquiry	Structured/rigid/predetermined methodology	Unstructured/flexible/open methodology
Main purpose of investigation	To quantify extent of variation in a phenomenon, situation, issue, etc.	To describe variation in a phenomenon, situation, issue, etc.
Measurement of variables	Emphasis on some form of either measurement or classification of variables	Emphasis on description of variables
Sample size	Emphasis on greater sample size	Fewer cases
Focus of enquiry	Narrows focus in terms of extent of enquiry, but assembles required information from a greater number of respondents	Covers multiple issues but assembles required information from fewer respondents
Dominant research value	Reliability and objectivity (value-free)	Authenticity but does not claim to be value-free
Dominant research topic	Explains prevalence, incidence, extent, nature of issues, opinions and attitude; discovers regularities and formulates theories	Explores experiences, meanings, perceptions and feelings
Analysis of data	Subjects variables to frequency distributions, cross-tabulations or other statistical procedures	Subjects responses, narratives or observational data to identification of themes and describes these
Communication of findings	Organisation more analytical in nature, drawing inferences and conclusions, and testing magnitude and strength of a relationship	Organisation more descriptive and narrative in nature

Types of research…

- A different perspective on research approaches
  - Descriptive research vs analytical research
    - Descriptive research
      - Includes surveys and fact finding enquiries of different kinds
      - Purpose
        - » Description of the state of affairs as it exists at present
      - Mostly suitable for social sciences, business and management studies
      - No control over variables- one can only report what has happened or is happening
      - Survey researches including comparative and correlation techniques fall under this approach
    - Analytical research
      - Researcher makes a critical evaluation of the material by analyzing facts and information already available

Types of research…

- A different perspective on research approaches…
  - Applied research vs fundamental research
    - Applied research
      - Target is to find a solution for an immediate problem facing a society or an industrial / business organization
    - Fundamental (Pure) research
      - Concerned with generalizations and concentrates on the formulation of a theory
      - "Gathering knowledge for the sake of knowledge”
      - Focused towards formulation of theories that may have a broad base of applications either at present or for future
      - Examples
        - » Research concerning some natural phenomenon or related to pure mathematics

Types of research…

- A different perspective on research approaches…
  - Quantitative vs qualitative
    - Quantitative research
      - Applicable to phenomena that can be expressed in terms of quantity
      - Could be further classified as
        - » Inferential (survey)
        - » Experimental
        - » Simulation
    - Qualitative research
      - Concerned with qualitative phenomenon
      - Important in behavioral sciences
        - » Aim: Discover the underlying motives of human behaviour
      - Example
        - » Investigating the reasons for human behaviour

Types of research…

- A different perspective on research approaches…
  - Conceptual vs experimental (or Empirical)
    - Conceptual research
      - Related to some abstract idea(s) or theory
      - Generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones
    - Experimental (empirical) research
      - Relies on experiment or observation alone, often without due regard for system and theory
      - It is a data based research
      - Conclusions are capable of being verified by observation or experiment
      - Necessary to get at fasts first at their source, and actively engage to stimulate the production of desired information
        - » First there has to be a working hypothesis or guess as to the probable results
        - » Work to get enough facts (data) to prove or disprove the hypothesis
      - Appropriate when proof is sought that certain variables affect other variables in some way

Significance of research

- Different perspectives
  - To students who are 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;
  - To professionals in research methodology
    - Research may mean a source of livelihood;
  - To philosophers and thinkers
    - Research may mean the outlet for new ideas and insights
  - To literary men and women
    - Research may mean the development of new styles and creative work
  - To analysts and intellectuals
    - Research may mean the generalizations of new theories

Research methodology vs research methods

- Research methods
  - Refers to methods/techniques that are used for conducting research
  - Can be classified as
    - Methods concerned with the collection/acquisition of data
      - Used when existing data is not sufficient to arrive at the required solution
    - Methods used to establish relationships between the data and the unknowns
      - Consists mathematical/statistical techniques
    - Methods used to evaluate the accuracy of the results obtained

Research methodology vs research methods…

- Research methodology
  - Is a way to systematically solve the research problem
  - A science of studying how research is done scientifically
  - Contains various steps that are to be adopted by a researcher in studying the research problem along with the logic behind them
  - Researcher needs to know not only the methods but also
    - Which method is relevant and what they mean, indicate and why
    - Assumptions underlying various techniques

  => Research method is part of research methodology

Research process

- Finding a research advisor/guide
  - Most important for the scholar
  - *What to look for in a potential (ideal) research advisor/guide?*
    - Has research interests in common with the scholar
    - Has a national or international reputation among researchers
    - Has grant support for research
    - Has successfully directed students in the past
    - Has a reputation as a fair and reasonable advisor
    - Has a high probability of staying at the university
    - Is someone scholars like and admire
    - Has an active research group

Research process…

- Finding a research advisor/guide…
  - *How to find an advisor/guide?*
    - Before any scholar come to the university, he/she should have made sure that some faculty members are active researchers in area of interest to him/her
    - Measure candidate advisors
      - Science citation index, publications, reading articles
    - Scholar should get to know potential advisors by
      - Taking courses from them
      - Attending seminar talks given by them
      - Seeing them in their offices to talk about their research interests
    - Scholar should talk to other students and faculty members about various candidate advisors
    - *Don't be discouraged by a ``no''--try a different advisor*

Research process…

- Finding a research advisor/guide…
  - *Advisor-advisee relationship*
    - Best analogy for the relationship between an advisor and a student
      - Parent and child
        - » At the beginning child has little independence
        - » As child grows, independence develops
        - » Adolescence, adulthood…
    - Working style
      - Some do regular meeting – force student to synthesize the week's accomplishments
      - Some rely on chance encounters in the hall
      - Some do weekly group meetings
      - Some expect students to attend seminars or journal clubs
    - When some scholars feels that he/she is floundering, he/she should ask for extra meetings, should send frequent email message asking for pointers
    - As in any relationship, conflicts should be faced and discussed

Research process…

- Finding a topic and beginning research
  - The characteristics of an ideal topic are to some extent incompatible
    - The subject should be timely vs. the subject/field could be too crowded
    - Joint research vs. independent research
    - Research is often unclear at first on how the ideas will develop vs. having a multilayer plan of research is valuable
    - Scholar should enjoy subject and wants to spend the next few years with it vs getting advisor who is willing to do the same

Research process…

- Finding a topic and beginning research…
  - Getting research ideas
    - Becoming an active reader and listener
      - Change from the passive mode of learning that traditional lecture courses encourage to an active and critical learning style
      - Canonical questions to ask while reading technical material, evaluate piece of software, or listen to a research talk
        - » *From where did the author seem to draw the ideas?*
        - » *What exactly was accomplished by this piece of work?*
        - » *How does it seem to relate to other work in the field?*
        - » *What would be the reasonable next step to build upon this work?*
        - » *What ideas from related fields might be brought to bear upon this subject?*

Research process…

- Finding a topic and beginning research…
  - Getting research ideas…
    - Exposing yourself to research
      - Set aside some time every week for trying to generate research ideas
        - » Read at least the abstracts from the premier journals in one's field
        - » Choose one or two articles and read them in depth and critique
        - » Attend a research seminar or colloquium series, listen and critique
      - Maintain a log and ask the canonical questions

Research process…

- Finding a topic and beginning research…
  - Getting research ideas…
    - Directed study
      - Which comes first: the thesis advisor or the thesis topic
        - » Both ways work
      - Do independent study course (possible after selecting the topic with advisor)
    - Formulating the research problem
      - At the beginning, the scholar must single out the general area of interest he/she wants to study
        - » 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

Research process…

- Finding a topic and beginning research…
  - Getting research ideas…
    - Formulating the research problem…
      - Formulation of a general topic into a specific research problem constitutes:
        - » Scientific enquiry
        - » Understanding the problem thoroughly
        - » Rephrasing the problem into meaningful terms from an analytical point of view
      - Once a topic that looks feasible is identified
        - » The scholar should be aware of all of the literature in the area
        - » The scholar should keep reading and listening, and keep distinct in his/her mind what is different between his/her work and others
          - Becarefull not to claim credit for other people's idea
          - The scholar should not let other people's frame of mind limit his/her creativity

Research process…

- Finding a topic and beginning research…
  - Getting research ideas…
    - Formulating the research problem…
      - Two types of literature reviews
        - » Conceptual literature
          - Concepts and theories
        - » Empirical literature
          - Studies made earlier which are similar to the one proposed

        => Knowledge as to what data and other materials are available for operation purposes

Research process…

- Finding a topic and beginning research…
  - Getting research ideas…
    - Extensive literature survey
      - Extensive literature survey doesn't guarantee anything
        - » One has to be an active reader and listener
      - It is impossible to "finish a literature review and then start research"
      - Once the problem is formulated, a brief summary of it should be written down
      - Extensive literature survey connected with the problem
        - » Similar earlier researches should be carefully studied

Research process…

- Finding a topic and beginning research…
  - Getting research ideas…
    - Choosing an idea
      - Scholar should make a list of open problems and possible projects that are of interest to him/her, and discuss them with potential advisors
    - Stay active
      - After deciding the initial focus, the scholar should continue a routine of
        - » Reading journals
        - » Technical reports
        - » Attend seminars
      - At this stage, the scholar could ask one more question (canonical question)
        - » *How can these ideas help the scholar solve his/her research problem?*

Measure of good research

- Criteria
  - The purpose of the research should be clearly defined and common concepts be used
  - The research procedure used should be described in sufficient detail
  - The procedural design of the research should be carefully planned to yield results that are as objective as possible
  - The researcher should report with complete frankness, flaws in procedural design and estimate their effects upon the findings

Measure of good research…

- Criteria …
  - The analysis of data should be sufficiently adequate to reveal its significance and method of analysis used should be appropriate
  - 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
  - Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity

Measure of good research…

- Quality of a good research
  - Good research is
    - Systematic
      - The research is structured with specified steps to be taken in a specified sequence in accordance with the well defined set of rules
      - Does not base on guessing and intuition in arriving at conclusion
    - Logical
      - Research is guided by the rules of logical reasoning and the logical process of induction and deduction
    - Empirical
      - Research is related to one or more aspects of a real situation and deals with concrete data that provides a basis for external validity to the research results
    - Replicable
      - Results are verifiable by replicating the study