Evaluating a Design

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- An Ongoing Process
  - Goals of each phase
  - Future directions in light of results
  - Logic within decision points for fallacies
  - Assumptions being made
  - Data drives everything
- Evaluation Checklist
  - Is the solution logical?
  - Are all the criteria and constraints satisfied?
  - Does the proposed solution solve the real problem?
  - Is this a permanent or temporary solution?
  - Have you challenged the assumptions and information provided?
  - Have you considered the potential problems?
  - Have you argued both sides? Both the positive and negative impacts?
- Engineering Research Design — A set of methods and procedures used in collecting and analyzing data deemed pertinent to understanding and acceptance of a solution's fitness for the resolution of a design problem
- Distinct Approaches
  - Applied
    - Moves towards finding a solution for an immediate problem
  - Fundamental
    - Concentrates on the pure formulation of a theory

  - Confirmatory
    * Seeks to test an apriori hypothesis
  - Exploratory
    * Seeks to form a posteriori hypothesis

- Two Types of Research Design
  - Quantitative — The objective empirical investigation of observable phenomena via outcome oriented statistical, mathematical, or computational techniques
    * Level of occurrence
    * Asks "how many?"
    * Studies the event
    * Objective
    * Discovery and proof
    * More definitive
    * Describes
    * Scalable
  - Qualitative — The subjective and holistic investigation to explain and gain understanding and insight pertaining to phenomena via ongoing observation and interaction with the subject
    * Depth of understanding
    * Asks "why that many?"
    * Studies motivation
    * Subjective
    * Enables discovery
    * Exploratory in nature
    * Interprets
    * Varies case to case

- Interview Protocols
  - Asking the right questions to get at the heart of an issue is a skill that sets critical thinkers apart from others
  - Two Basic Categories:
    * Convergent
      · These questions aim for a finite range of acceptably accurate responses
      · Seeking comprehension, application of information, or further defined analysis
    * Divergent

            - These explore different avenues, variations, alternate possibilities and scenarios
            - Correctness based more on logical projection, context, and conjecture

- Observation Protocols
    - Observation Aids
        - Tally Clickers
        - Video Data
            - Continuous
            - Time Lapse
        - Audio Data
            - General
            - Multi-location
        - System Tracking
            - Embedded tracking software
            - Screen recording
        - AI Programs
            - Analyzing the data
    - Observable Phenomena
        - Interactions
            - Interpersonal
            - Inter-technological
            - Combinations
        - Emotional Responses
        - Pre/Post
        - Lack of Activity