# Reflective Practice and Knowledge Generation

## Combining multiple ways of generating knowledge to solve relevant problems
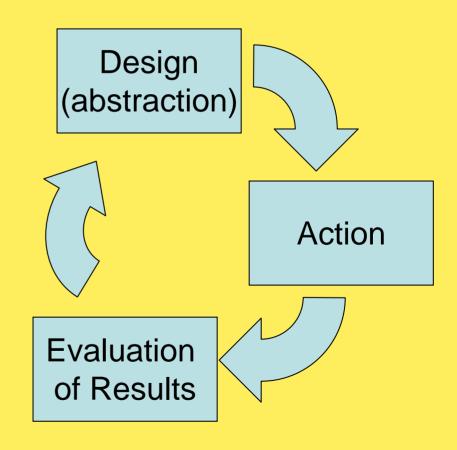
# Multiple Ways of Generating Knowledge

- Experimentation

- Speculation

- Imagination

- Story Circle

- Scientific Method

- Statistical Analysis

- Cycle SECI

- Modeling

- Method Delphi

- Reframing

- Conceptual innovation

- Design, etc.

# Experimentation

- The main purpose of the activity is to generate positive results (i.e., to make things work.)

- There may be abstraction but it is functional to the effort of design.

- Most of the technological advancement until the 17th century was achieved through experimentation

Design (abstraction) → Action → Evaluation of Results → Design (abstraction)

# Speculation

- When we are trying to think beyond our current knowledge frontier, we are speculating.

- The Theorem is a formal method of speculation developed by the Greeks.

- The core of the theorem is: If A then B; A is a hypothesis and B should be proved.

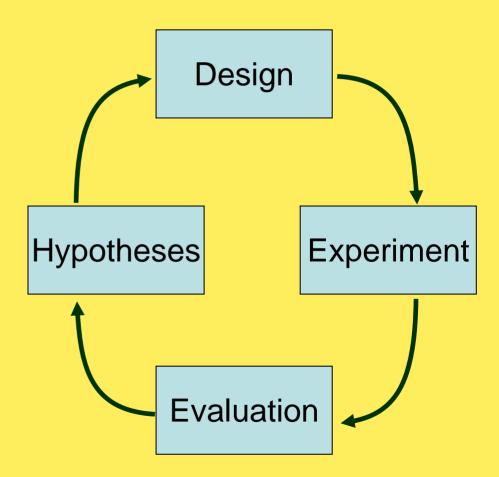- Speculation can be very important for generating hypotheses.

# Imagination

- Einstein: What would the world look like from the perspective of photon?

- Arthur Clarke: Stationary Satellites

- Julio Verne: Autos fueled by water

- Brainstorming in IDEO: 100 ideas/hour

# Scientific Method

- The purpose of the scientific method is to falsify theoretical Hypotheses through experience.

- It is possibly the single most important cognitive innovation in History.

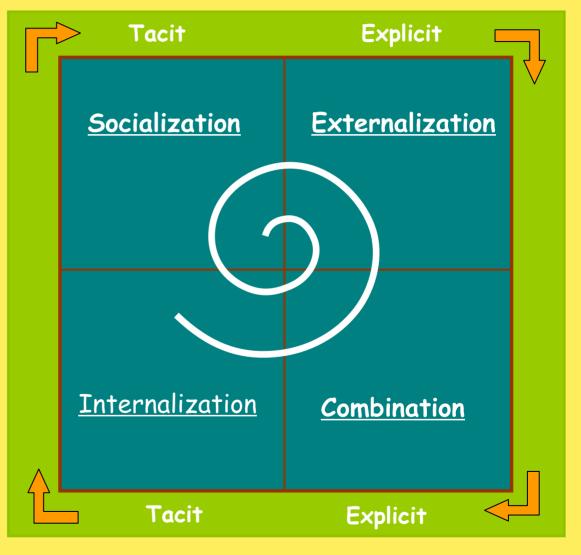Design → Experiment → Evaluation → Hypotheses → Design

# Statistical analysis

- It is a method for establishing the relation among variables, or verifying a model, based on the observation of samples of an "universe".

- The data results come from observation of reality without changing it.

- Statistical Analysis is key when it is not possible to experiment with the object of the research, such as human beings.

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# The Cycle SECI

The Cycle SECI was developed by Ikujiro Nonaka and Hirotaka Takeuchi as a way of generating knowledge by transforming it, from tacit knowledge to explicit and vice versa

| | Tacit | Explicit |
|---|---|---|
| | **Socialization** | **Externalization** |
| | **Internalization** | **Combination** |
| | Tacit | Explicit |

# Modeling

- Modeling can be used for two main purposes:
    - Theory validation
    - Forecasting
- In "*New Kind of Science*" and "*Mathematica*" Stephen Wolfram uses modeling for exploring patterns in nature.
- The importance of modeling will increase in the future.

# Reframing

- Reframing is a change in the logic of the description and the analysis of an object.

- The reduction of crime in New York City in the 80s was interpreted by the City's Mayor and by "*Freakonomics*" in very different ways.
  - For the Mayor it was a question of police strategy
  - For *Freakonomics* it was a consequence of the legalization of abortion (Roe versus Wade)

- Reframing generates very different understandings of the same issues.

# Conceptual Innovation

- Multiply XXVII by XXIII or 17 by 23
- The invention of the Scientific Method
- The work of Antoine Lavoisier, the creator of Chemistry as a science
- The idea of tacit dimension of knowledge of Michael Polanyi
- The work of Donald Schön creating the concept of "Reflective Practice"

# Design

- Designs are artifacts that contain great amount of knowledge embedded.

- Designs are generated in a dialogue with the situation and with stakeholders.

- Design process is an interaction between an idea (with values imbedded in it), the characteristics of the situation and the expectations of stakeholders.

- The knowledge contained in Designs is more visible for the "experts" in the same discipline.

- The capacity of reframing is decisive for the process of design.