

ECPAG

Rockville, MD

---

# Learning from Doing: A Workshop on Pharmacometric Heuristics

---

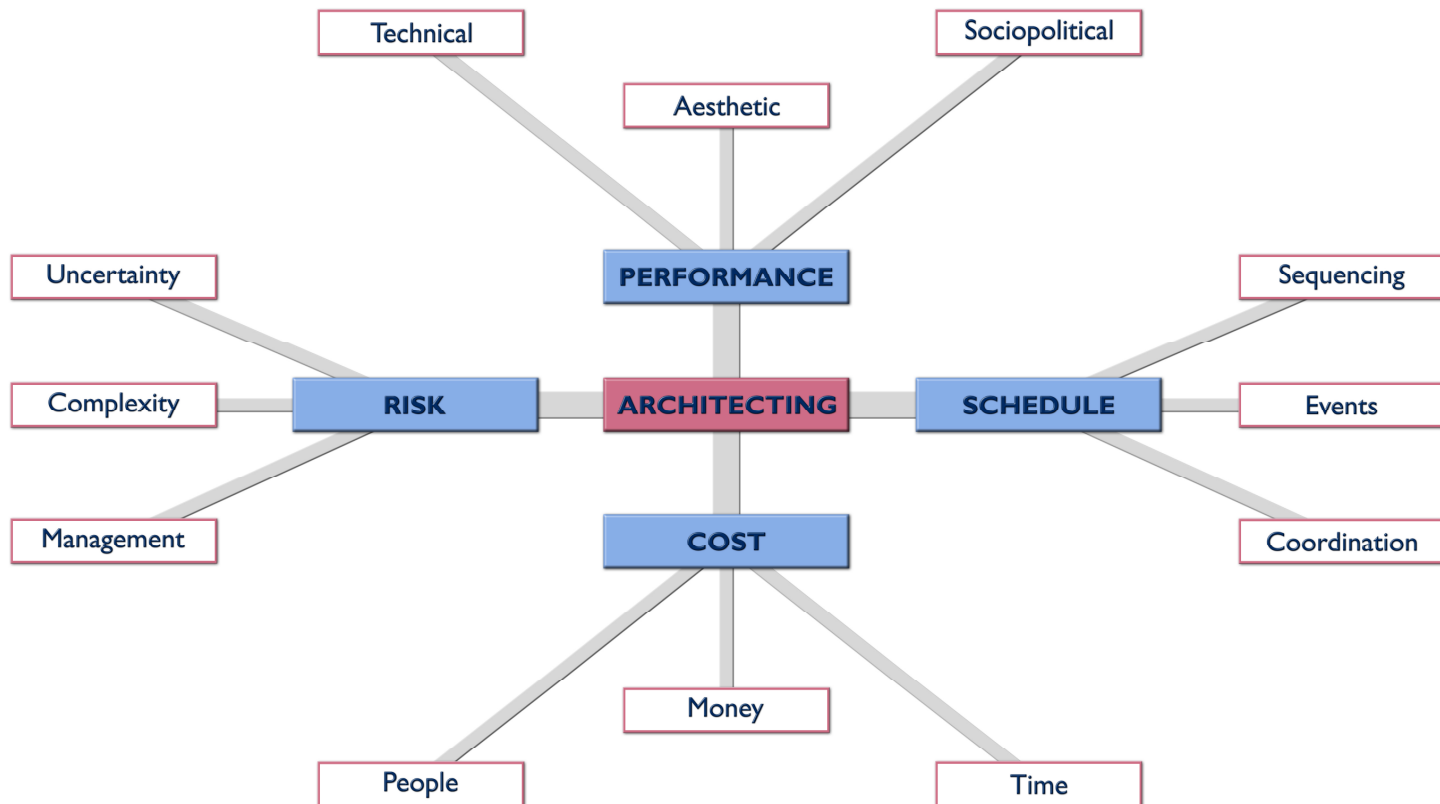
Ted Grasela, PharmD, PhD  
President and CEO  
Cognigen Corporation  
&

Adjunct Professor of Pharmaceutics  
Senior Fellow in Entrepreneurship  
University at Buffalo  
July 24, 2006



# Engineering a PHM Enterprise

## Scientist/Architect Skill Set



# Heuristics As Tools

---

- Greek origin, *heuriskein*, “to find a way” or “to guide” in the sense of piloting a boat through treacherous shoals.

*The Art of Systems Architecting,*  
Rechtin E and Maier MW

# Workshop Goals

---

- To learn how to develop heuristics
- To provide a taxonomy for how they might be organized according to need
- To point the way for their use in practice
- To provide a foundation for the continued development of future heuristics

# Heuristics vs. Guidelines

---

- Consider two contradictory statements
  - Look before you leap
  - He who hesitates is lost
- Not very useful when encountering a cliff while running for your life

# Examples of Widely Applicable Heuristics

---

- *Don't assume that the original statement of the problem is necessarily the best, or even the right one*
- *Simplify. Simplify. Simplify.*
- *Build in and maintain options as long as possible in the design and implementation of complex systems. You will need them.*

# Heuristics As Tools

---

- The life-cycle of a heuristic
  - We start with war - stories and anecdotes as a way of teaching new practitioners
  - Turn in enduring lessons that apply beyond the original context
  - And eventually become self-evident truths requiring no proof

# Criteria for Selection of a Heuristic

---

- The heuristic must make sense in its original domain or context
- A valid heuristic seldom comes from a poor report of the originating problem situation
- A strong correlation, if not a direct cause and effect, must be apparent between the heuristic and the successes or failures of a process
- The heuristic should be useful in solving or explaining more than the original problem from which it arose.
  - *Before the flight it's opinion; after the flight it's obvious*
  - *Before the NONMEM<sup>®</sup> run it's opinion; after the run it's obvious*



# Criteria for Selection of a Heuristic

---

- The heuristic should not be wrong or contradictory in other domains where it could lead to serious misunderstanding and error
- The heuristic should be easily rationalized in a few minutes or on less than a page
  - *If you can't explain it in five minutes, either you don't understand it or it doesn't work*
- The more obvious the heuristic is in its face, and the fewer limitations on its use, the better,
  - *A model is not reality*

# Criteria for Selection of a Heuristic

---

- The opposite statement of the heuristic should be foolish
  - *If it can fail, it will*
  - If it can fail, it won't
- The heuristic's lesson should have stood the test of time and earned a broad consensus
  - *The beginning is the most important part of the work (Plato, 4<sup>th</sup> century B. C.)*
  - *All serious mistakes are made in the first day (Robert Spinrad, 1988)*

# Other Considerations

---

- Heuristics can be more useful if used in a set
- A proposed action or decision is stronger if it is consistent with several heuristics rather than only one
- It seems desirable that an heuristic, taken in a sufficiently restricted context, could be specialized into a rule or decision algorithm

# Generating Useful Heuristics

---

- Humor (and careful choice of words) in a heuristic provide an emotional bite that enhances the mnemonic effect
- Use words that transmit the “thrill of insight” into the mind of the beholder
- For maximum effect, try embedding both descriptive and prescriptive messages in a heuristic
  - D: A plumbing job will require 3 trips to the hardware store
  - P: Never start a plumbing job on a Sunday night

# Generating Useful Heuristics

---

- Don't make a heuristic so elegant that it only has meaning to its creator, and thus loses general usefulness
- Rather than adding a conditional statement to a heuristic, consider creating a separate but associated heuristic that focuses on the insight of dealing with that conditional situation

# Applying Heuristics

---

- If it works, then it's useful
- Knowing when and how to use a heuristic is as important as knowing the what and why
- Heuristics work best when applied early to reduce the solution space

# Applying Heuristics

---

- Strive for balance – too much of a good thing or complete elimination of a bad thing make things worse, not better!
- Practice – practice – practice!
- Heuristics aren't reality either!

# A Taxonomy of Pharmacometric Heuristics

---

- Analysis Planning
- Data Assembly
- Exploratory Analyses
- Model Development
- Simulation
- Validation
- Presentation



# Workshop Assignment

---

- Form small groups each one focused on one element of the taxonomy
- Work within the group to identify a war-story that seems to have resonance with the group in your assigned element, e.g., Analysis Planning
- Develop one (or more) well-worded heuristic(s) that could serve as an enduring lesson for a new practitioner
- Review the heuristic tool list included in your handout for some examples
- Each group will be asked to share their best heuristic with the larger group
- We will vote on the best heuristic of the workshop

# Thank You

For more information contact:

Thaddeus Grasela, PharmD, PhD  
President and CEO

[ted.grasela@cognigencorp.com](mailto:ted.grasela@cognigencorp.com)

Phone: 716-633-3463 ext. 227

