



**Nano**.gov

U.S. National Nanotechnology Initiative

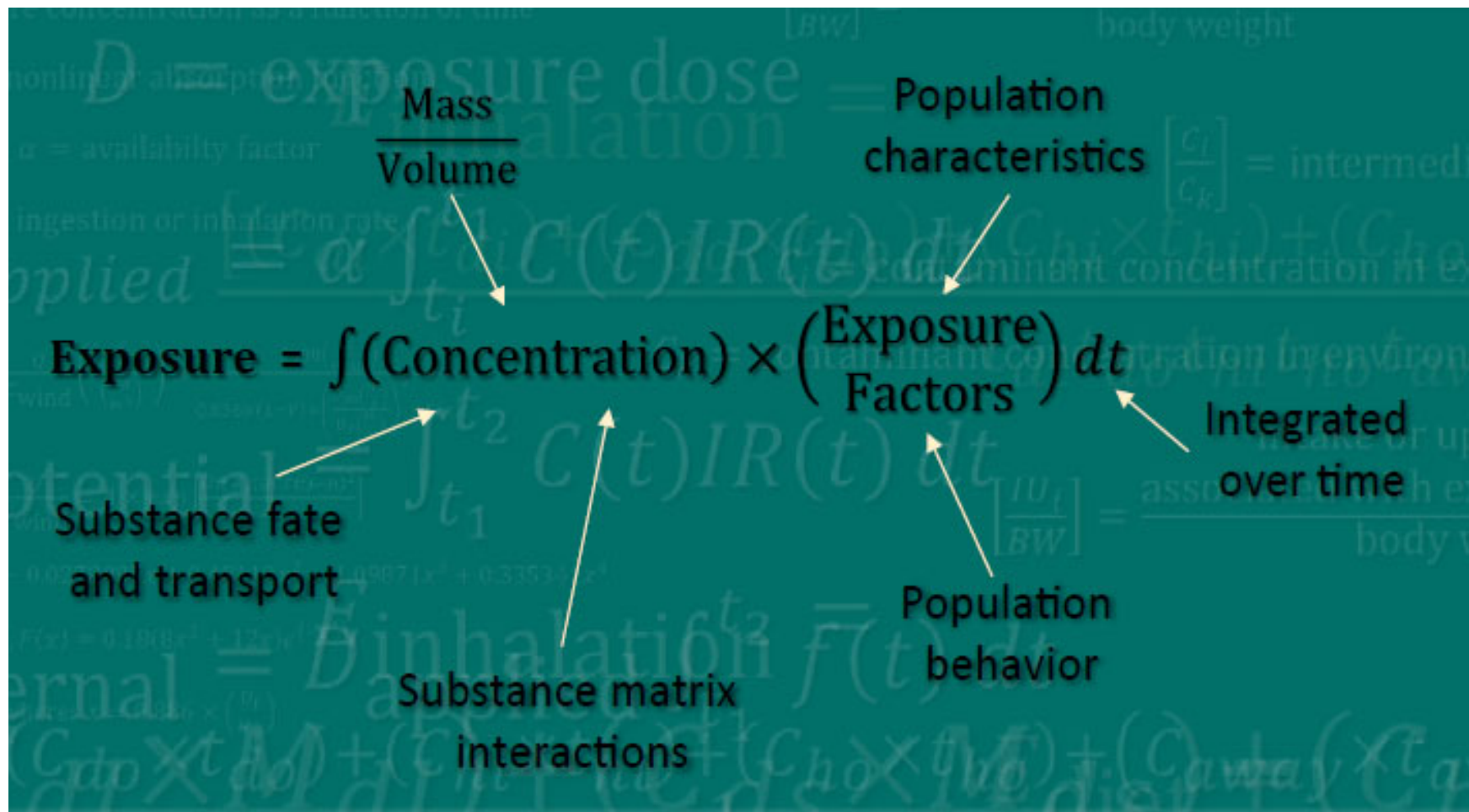
# Roundtable Discussion: Connecting the Pieces

Igor Linkov, Ph.D.

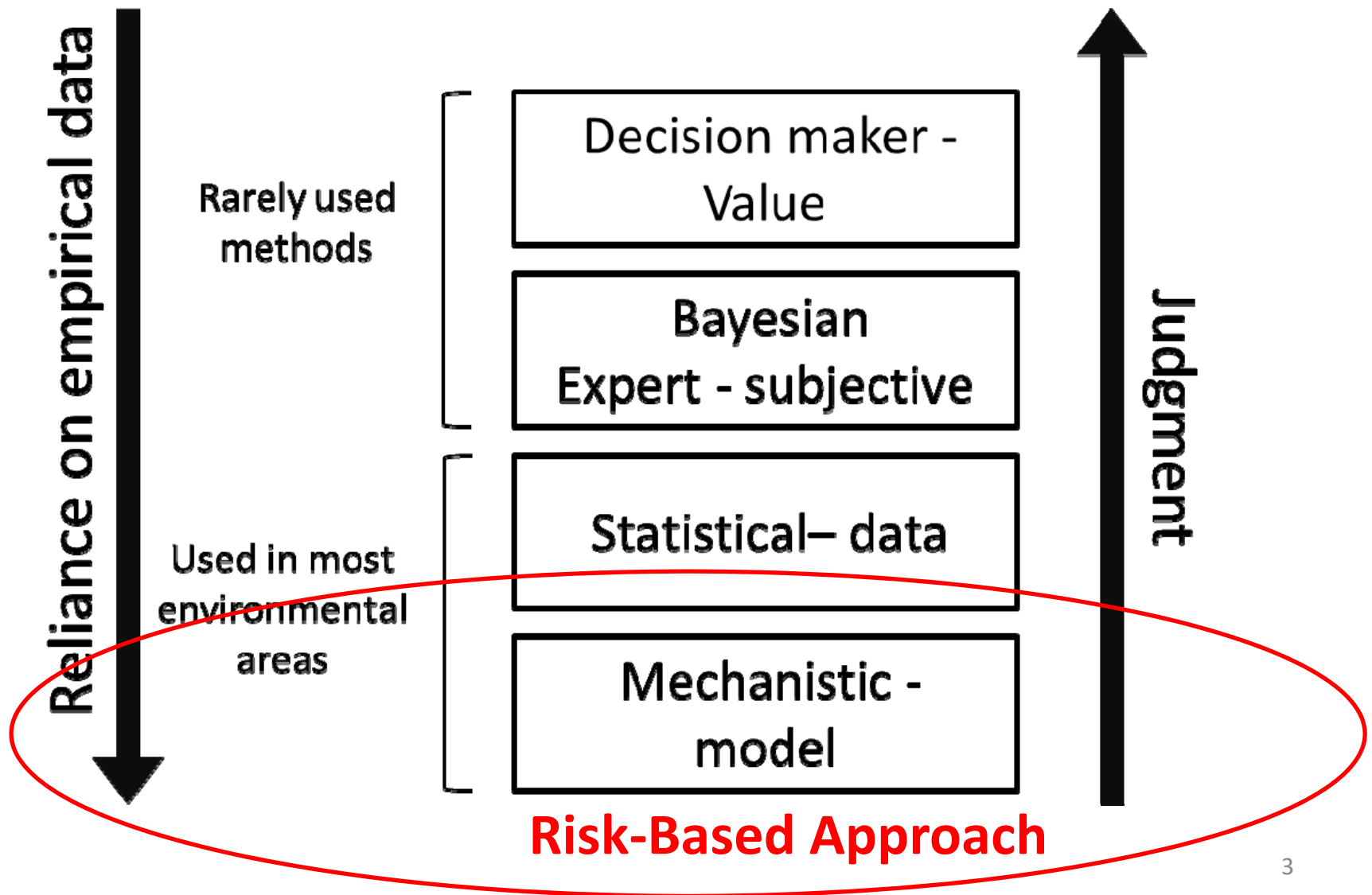
Risk and Decision Science Focus Area Lead, US  
Army Engineer Research and Development  
Center, Department of Defense

[Igor.Linkov@usace.army.mil](mailto:Igor.Linkov@usace.army.mil)

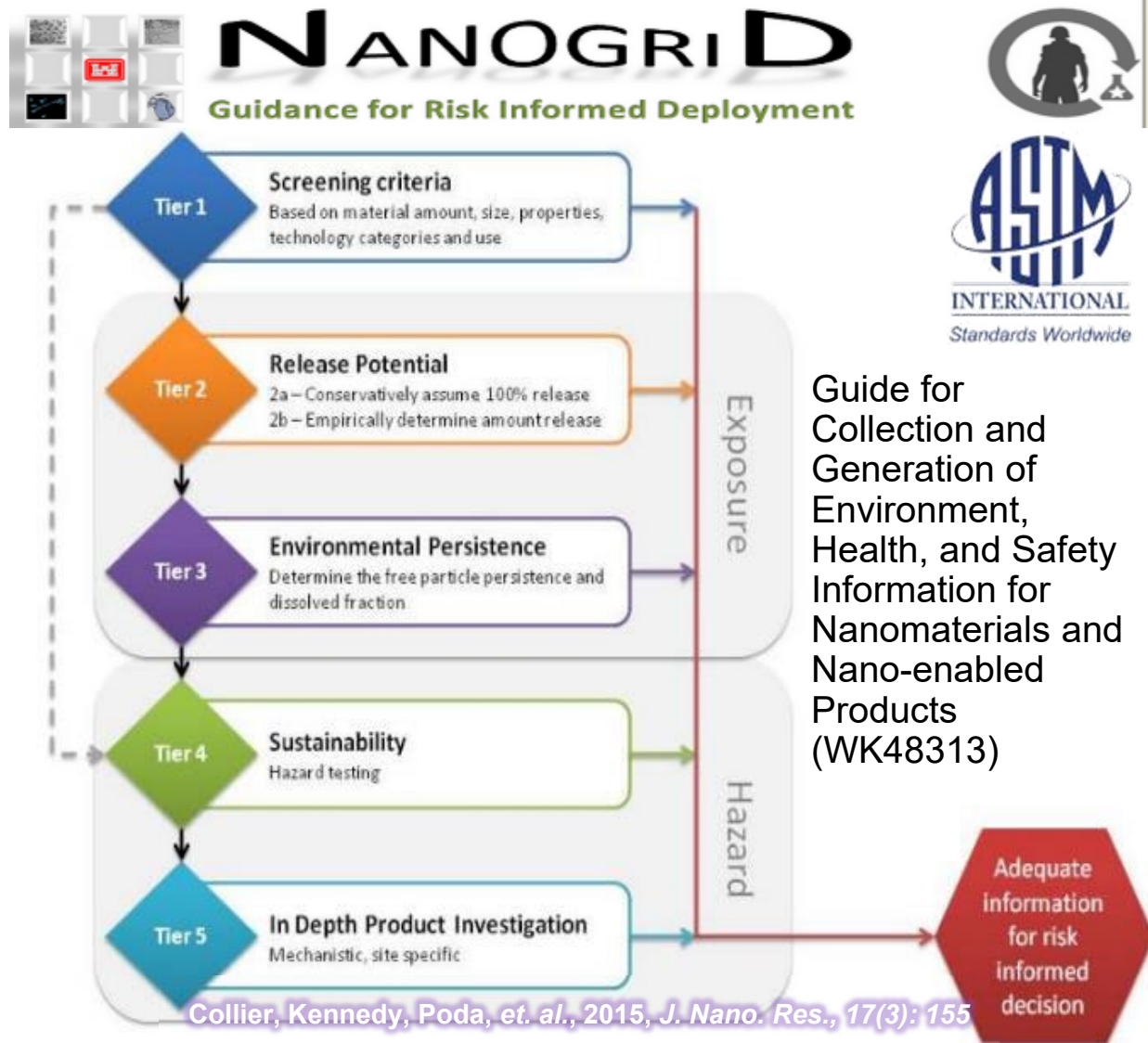
## What did we Learn at QEEN 1?



# Ways to Connect the Pieces: Bottom-Up

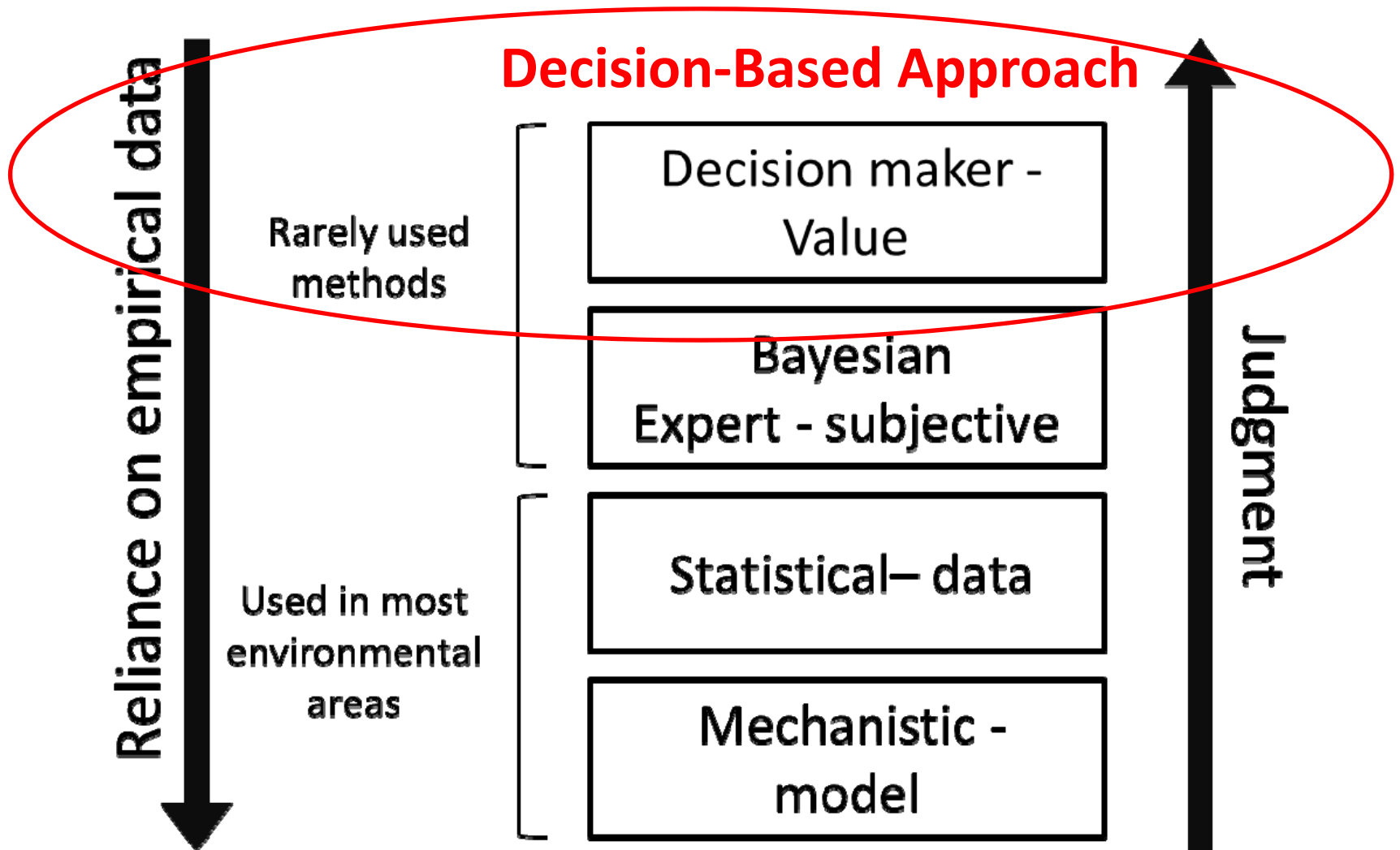


# Bottom-Up Risk Based



# Ways to Connect the Pieces

## Top-Down



# Nano Prioritization Tool

- Numerous stakeholders across the globe are concerned with safety of nano-enabled consumer products (a **30-fold increase** from 2005 to 2015)
- Even the largest stakeholders do not have the resources to perform a formal risk assessment for every nano-enabled consumer product

## Cosmetic products

(improved cleansing and absorption)



## Food packaging

(reduce moisture & bacteria)



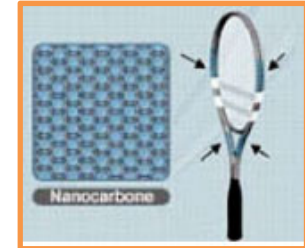
## Children's toys and blankets

(antimicrobial protection)



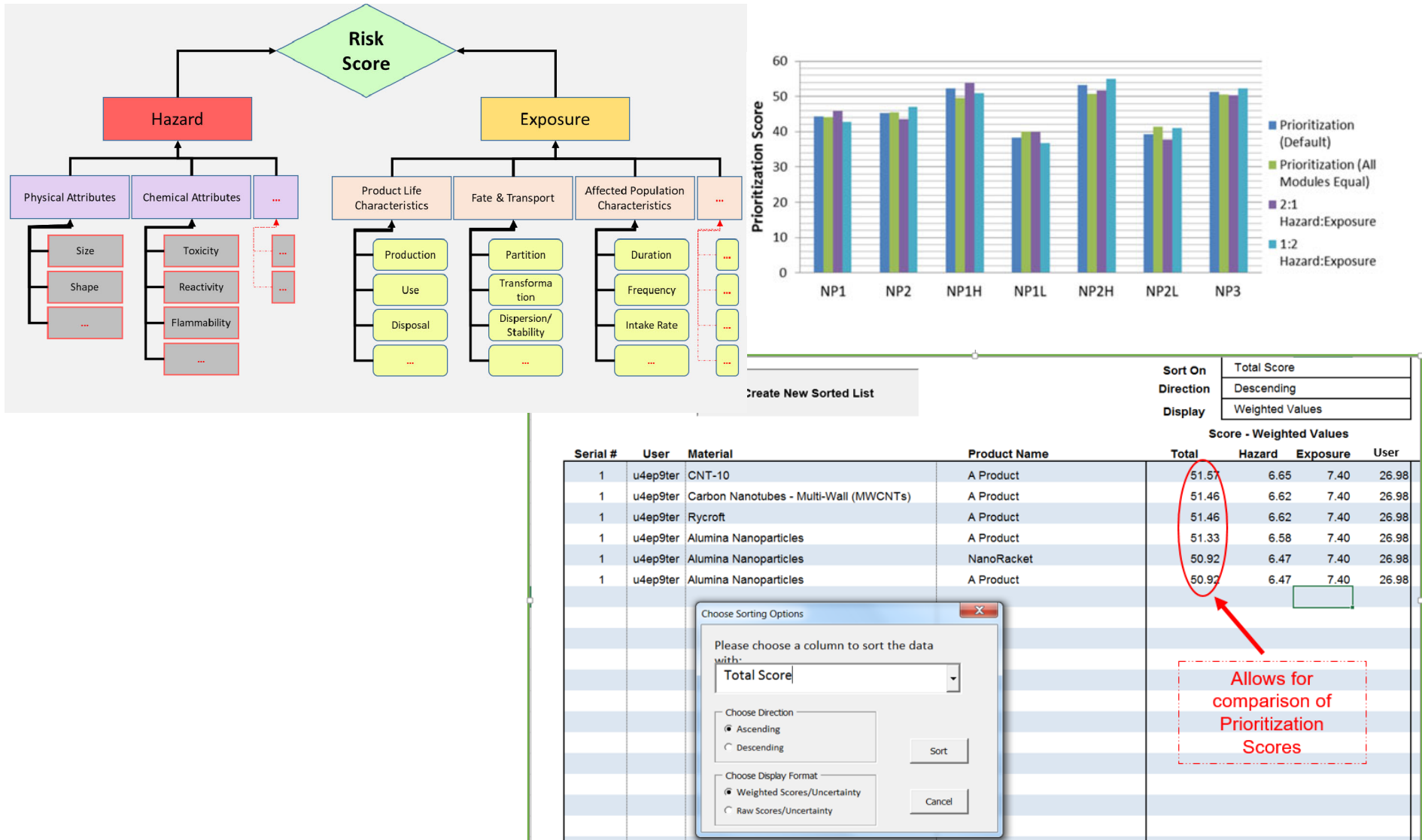
## Polymer composite materials

(lighter and more durable)



- Stakeholders need the ability to screen and prioritize a diverse array of nano-enabled consumer products in order to prioritize research into risks, triage reported safety concerns, and **allocate limited resources more efficiently**

# Application Example

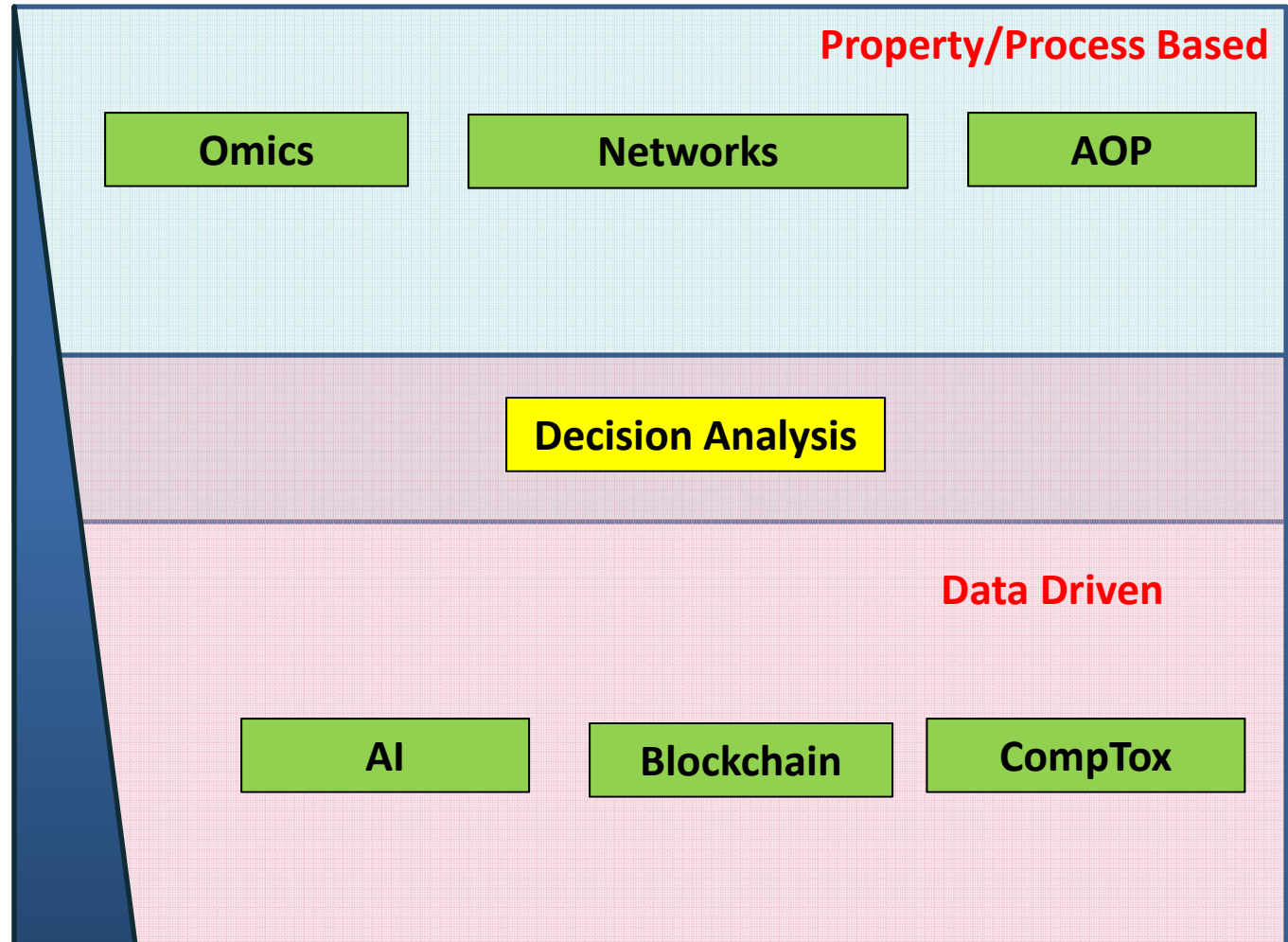


# Approaches to Bringing Pieces Together

Simplified process models, Less Data Intensive

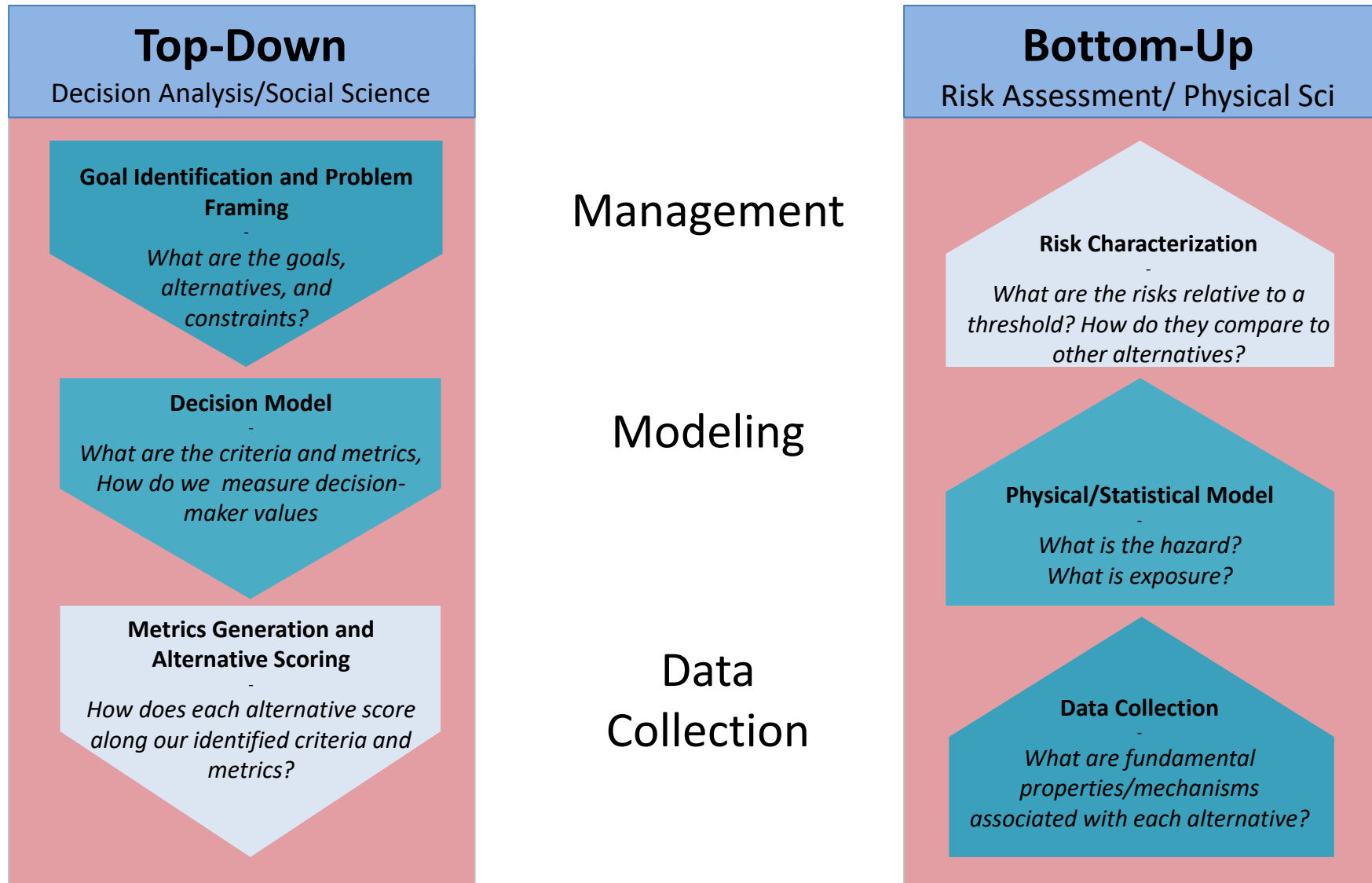
Expert- or data-driven weights

Complex Data Intensive





# Data-Driven Integration



## Panel:

- **Ben Trump (Army/ORISE) – Risk and Governance, Top-Down**
- **Will Boyes (EPA) and Mark Wiesner (Duke)- Risk-Based, Bottom-Up**
- **Wu-Sheng Shih (Brewer) – Safety by Design, Integration**