



**29**<sup>th</sup> Annual **INCOSE**  
international symposium

Orlando, FL, USA  
July 20 - 25, 2019

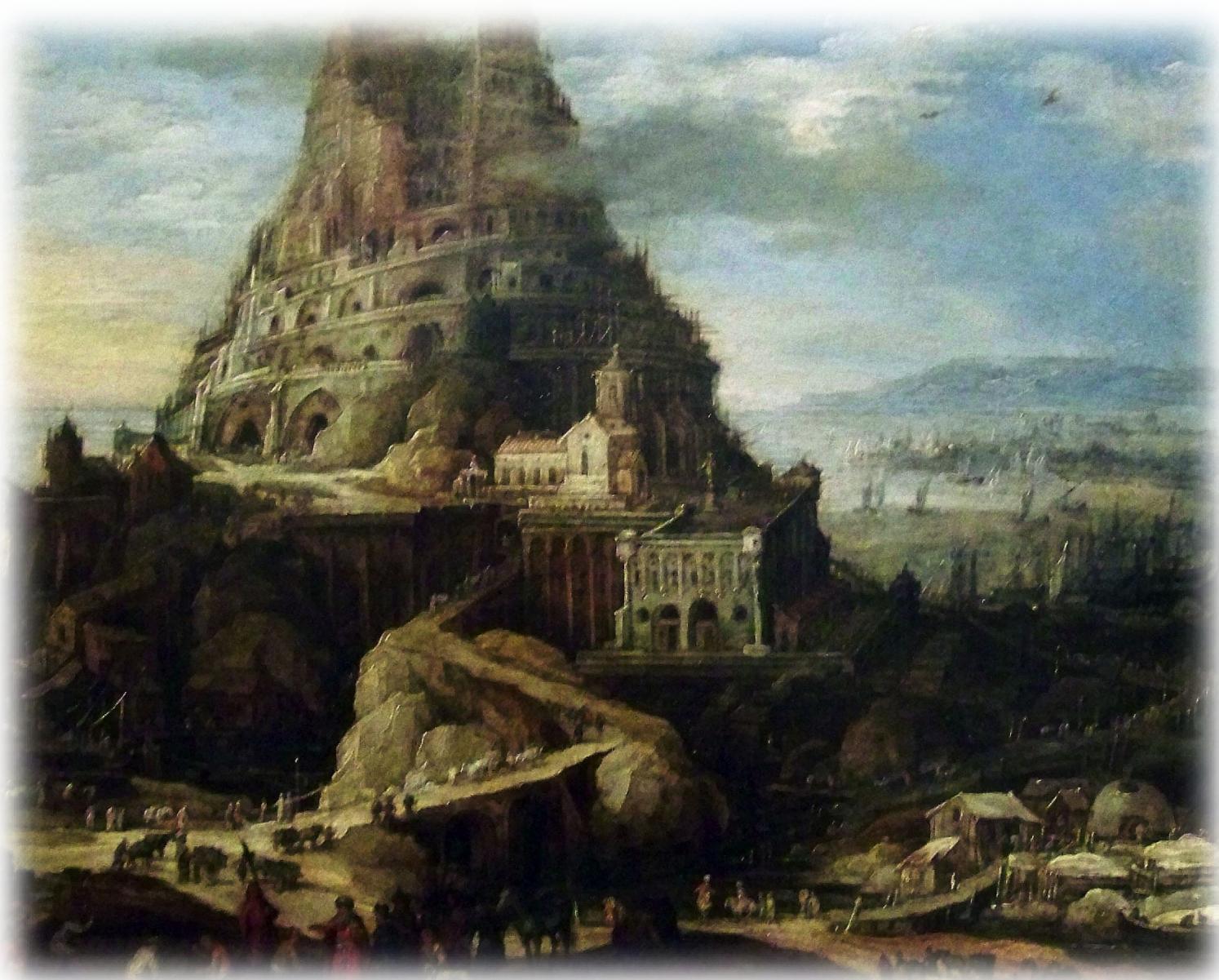
# Speaking in Tongues

[www.incose.org/symp2019](http://www.incose.org/symp2019)

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Media



**PROJECT:**  
Build a tower to  
reach God for direct  
access



**Stakeholder:**  
**GOD- Not**  
**interested in**  
**disrupting the**  
**culture by changing**  
**the relationship**

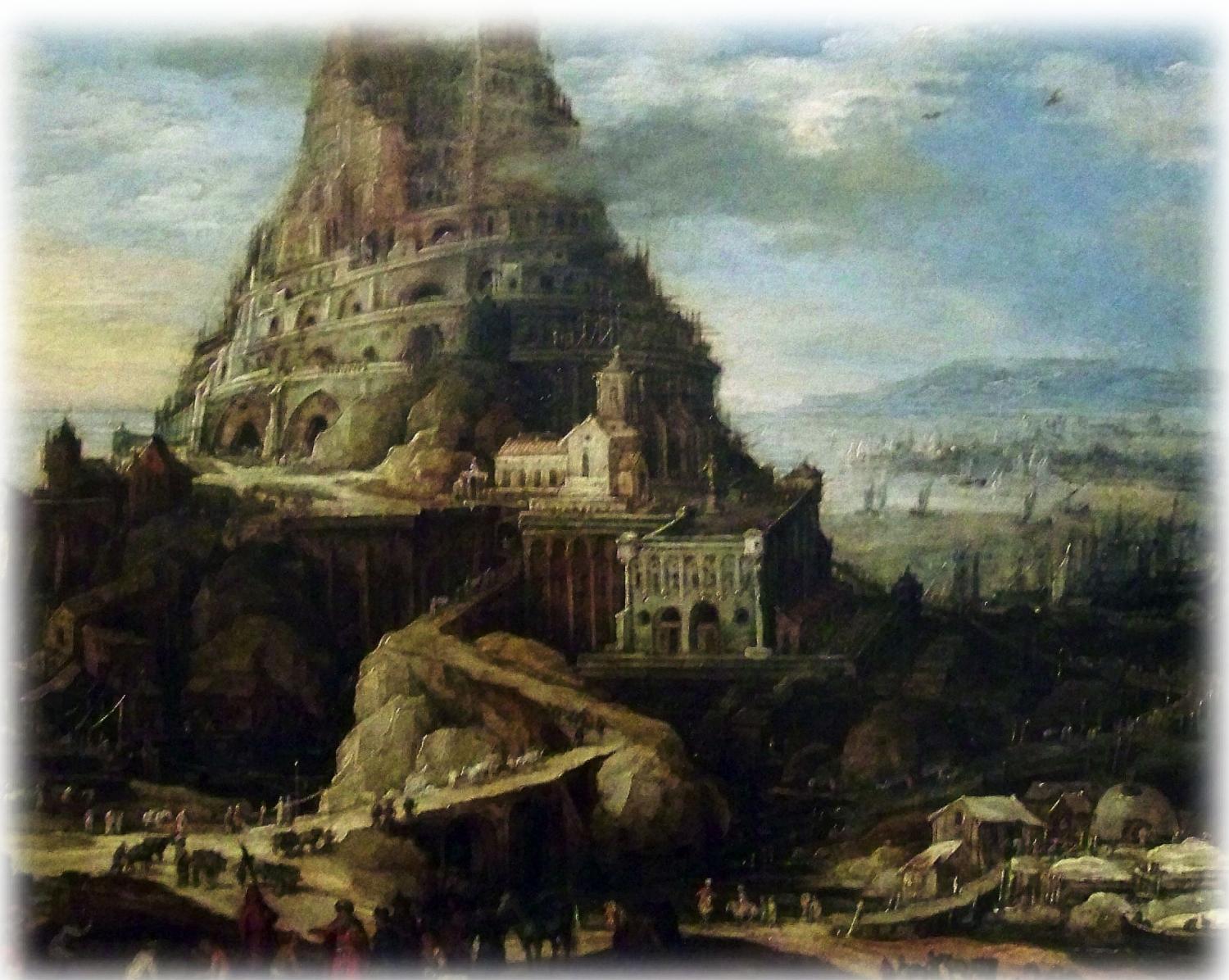


## Analysis of Alternatives

Fire (No)

Flood (Not again)

Need something  
subtle but devastating



Plan:

Disrupt the project  
by destroying the  
ability to  
communicate



# Collaboration?

Commu  nication

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supranta





# Why are we concerned?

- 3 Vision 2025 imperatives-
  - Expanding the **APPLICATION** of systems engineering **across industry domains**.
  - Embracing and learning from the **diversity** of systems engineering **APPROACHES**.
  - Applying systems engineering to help shape policy related to **SOCIAL AND NATURAL SYSTEMS**.  
**(INCOSE 2014)**



# CHALLENGES

# Domains



Water



Healthcare

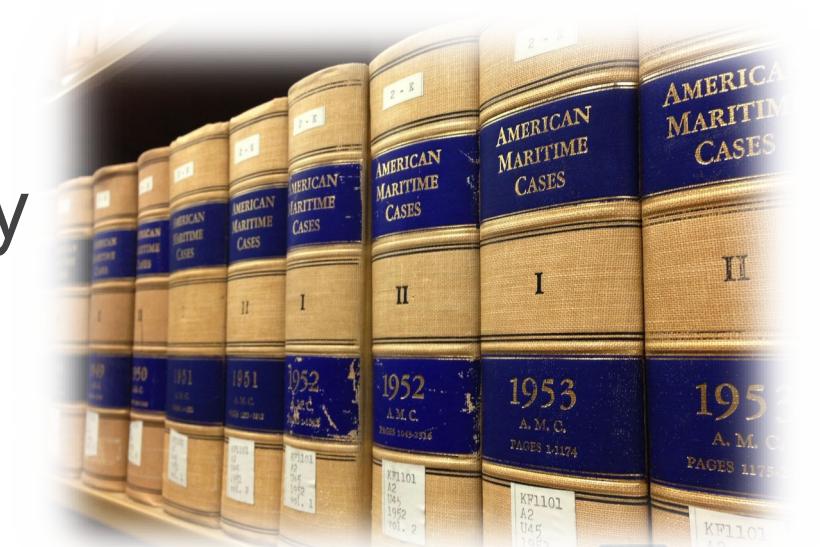


Agriculture

# Transportation

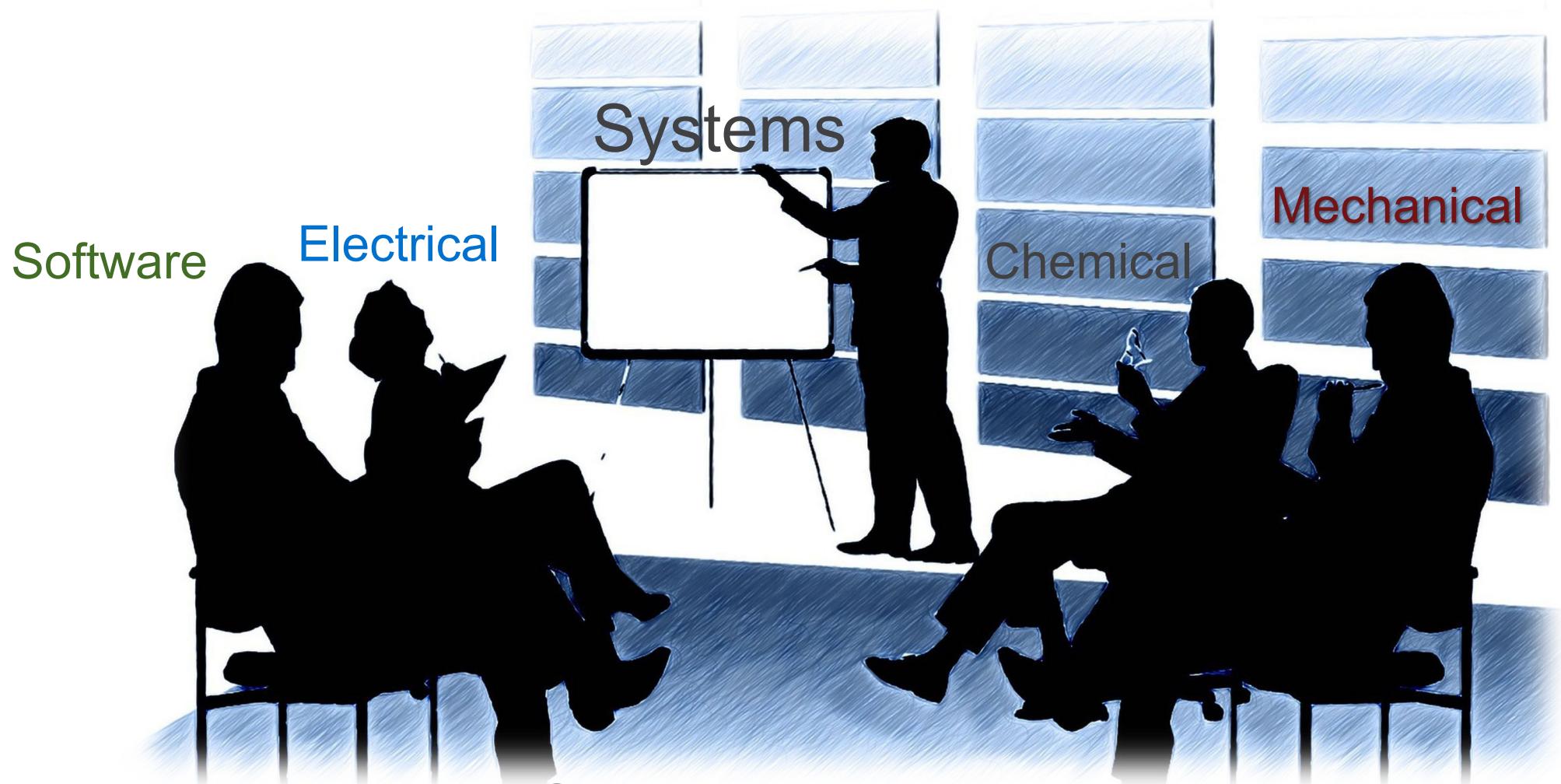


Policy





# Interdisciplinary Connections



Concurrent engineering



# Transdisciplinary

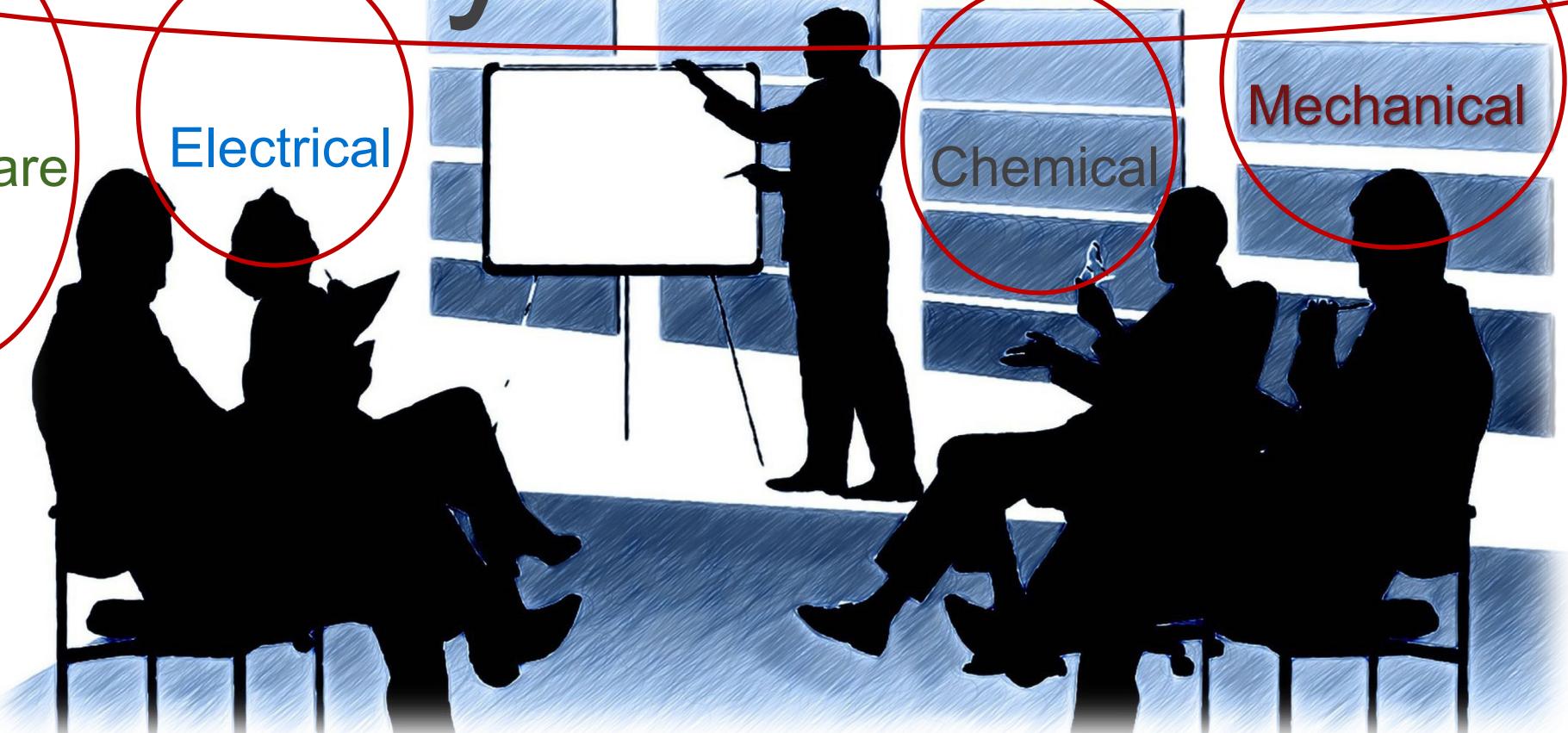
# Systems

Software

Electrical

Chemical

Mechanical



“crosses many disciplinary boundaries to create a holistic approach.”



# Solution:

- Make everyone speak SE – NOT!



# Not so much . . .

"You know, if these schools keep it up pretty soon no one will be able to read cursive . . . Uh, I mean hieroglyphics"



Arcane  
Esoteric

Standards can be counterproductive



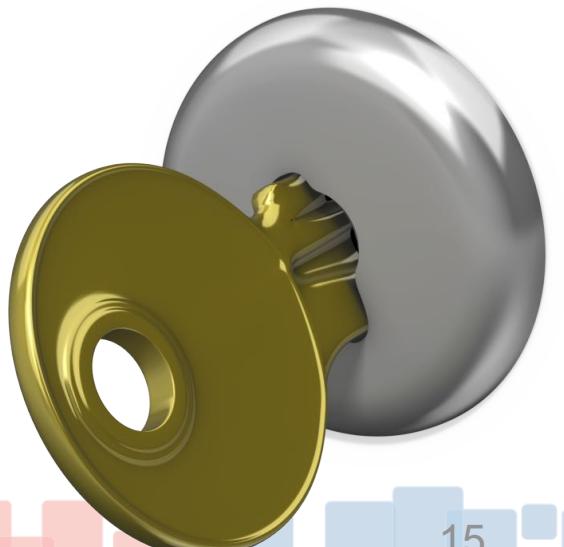
# Solution:

- Make everyone speak SE – NOT!
- Learn to translate!



# Translation

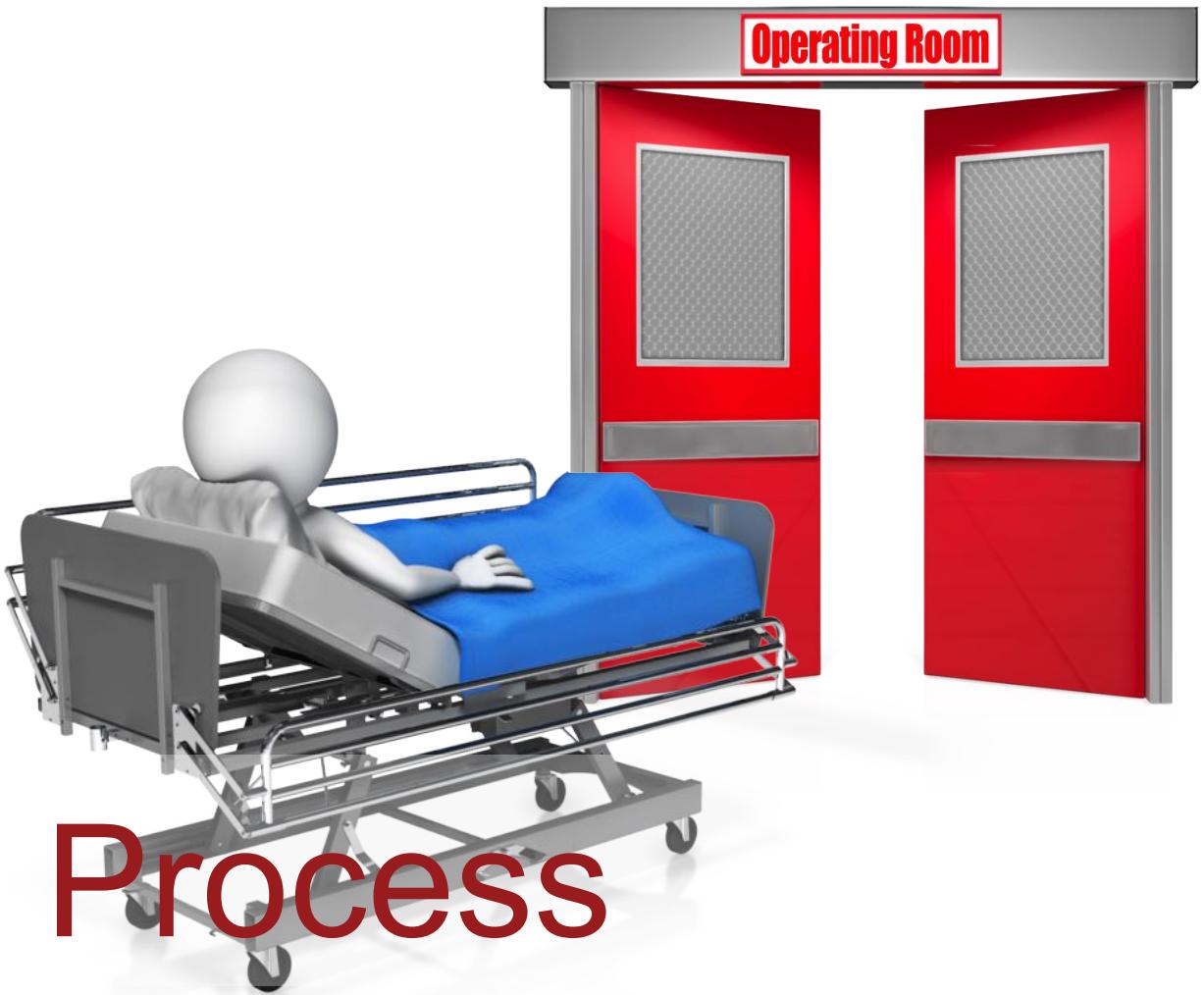
- Learn the language
  - Translate concepts
- Obstacles
  - SE heritage
  - Disciplinary indoctrination



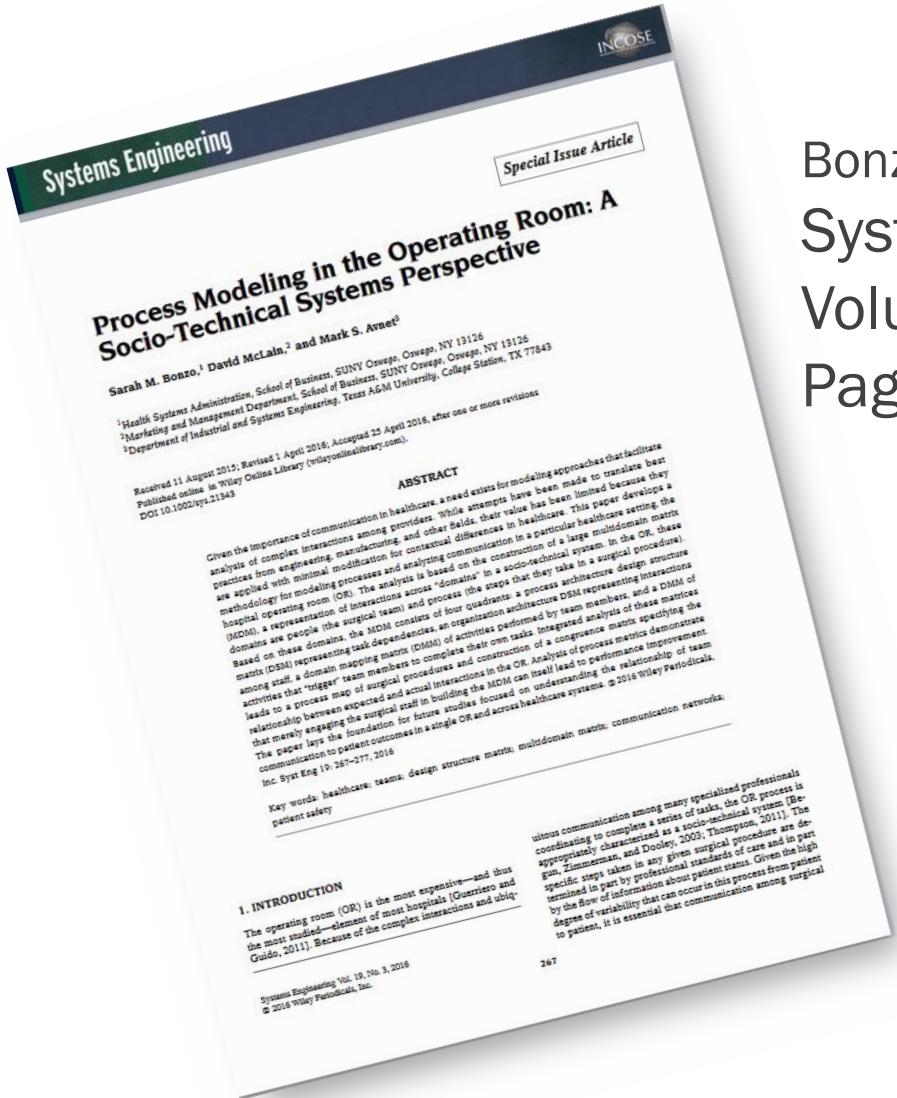


Example

# Perioperative Process



# Successful translation



Bonzo, S.; McLain, D.; and Avnet, M.  
Systems Engineering  
Volume 19, Issue 3, May 2016,  
Pages: 267–277

Using the design structure (DSM)  
and multi-domain (MDM) matrices  
to capture and analyze the  
operating room processes



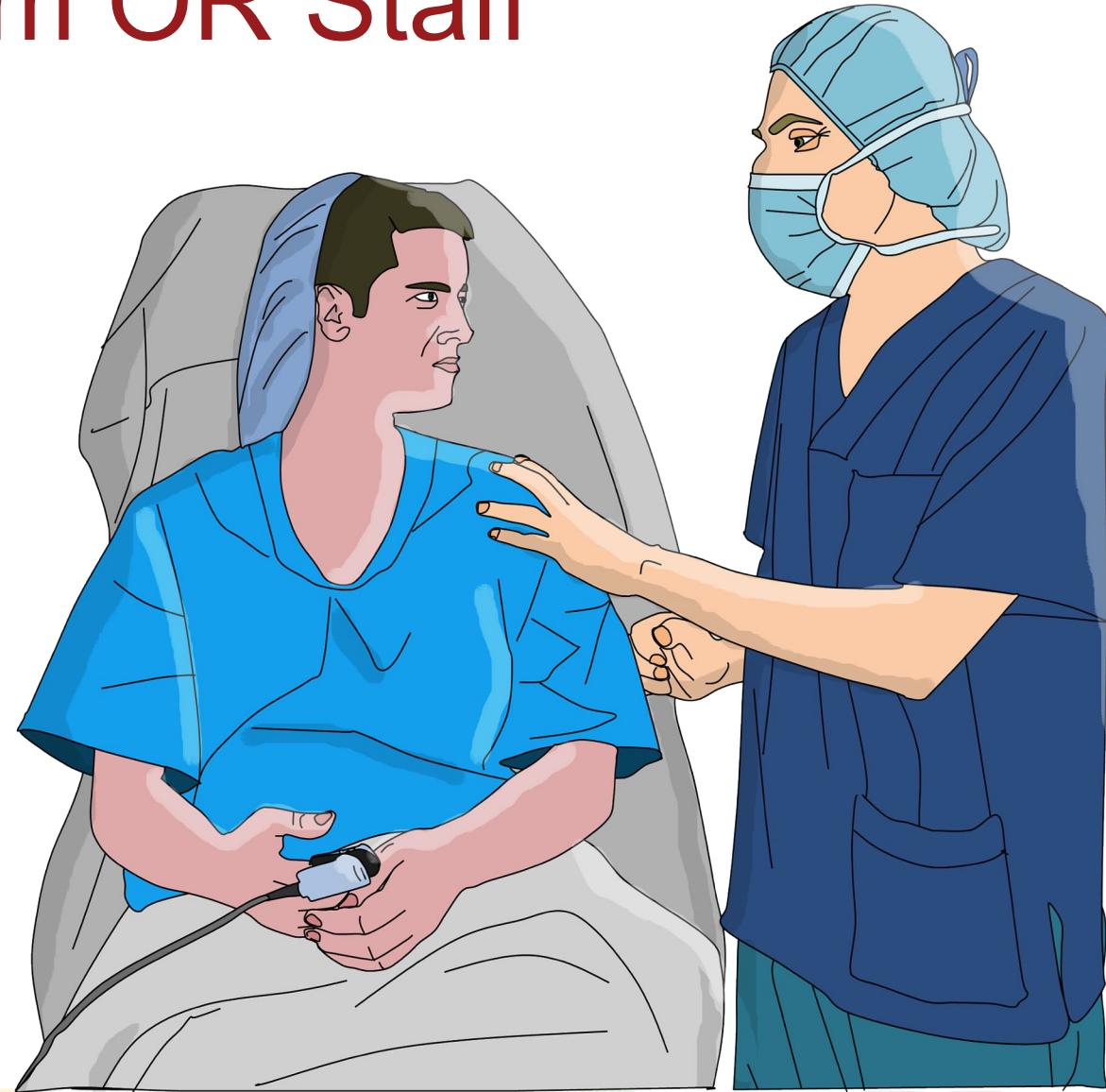
# Recognizing the Problem

“While attempts have been made to translate best practices from engineering, manufacturing, and other fields, their value has been limited because they are applied with minimal modification for contextual differences in healthcare.”



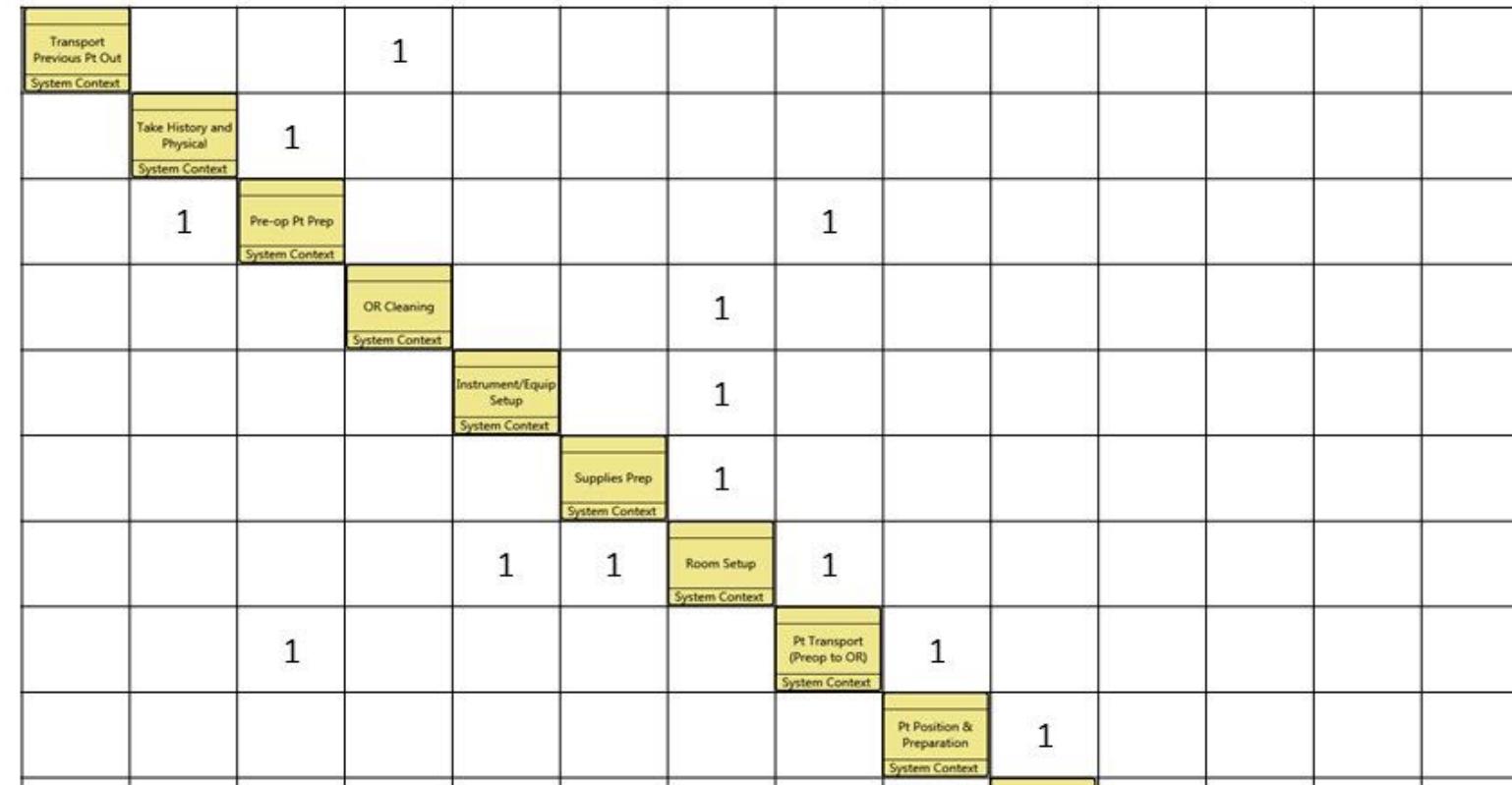
# Gather data from OR Staff

Collect in OR

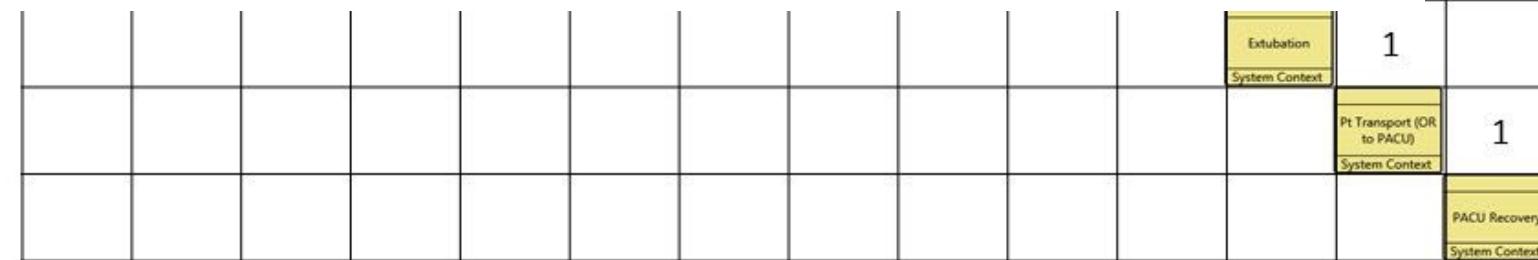




# DSM Process

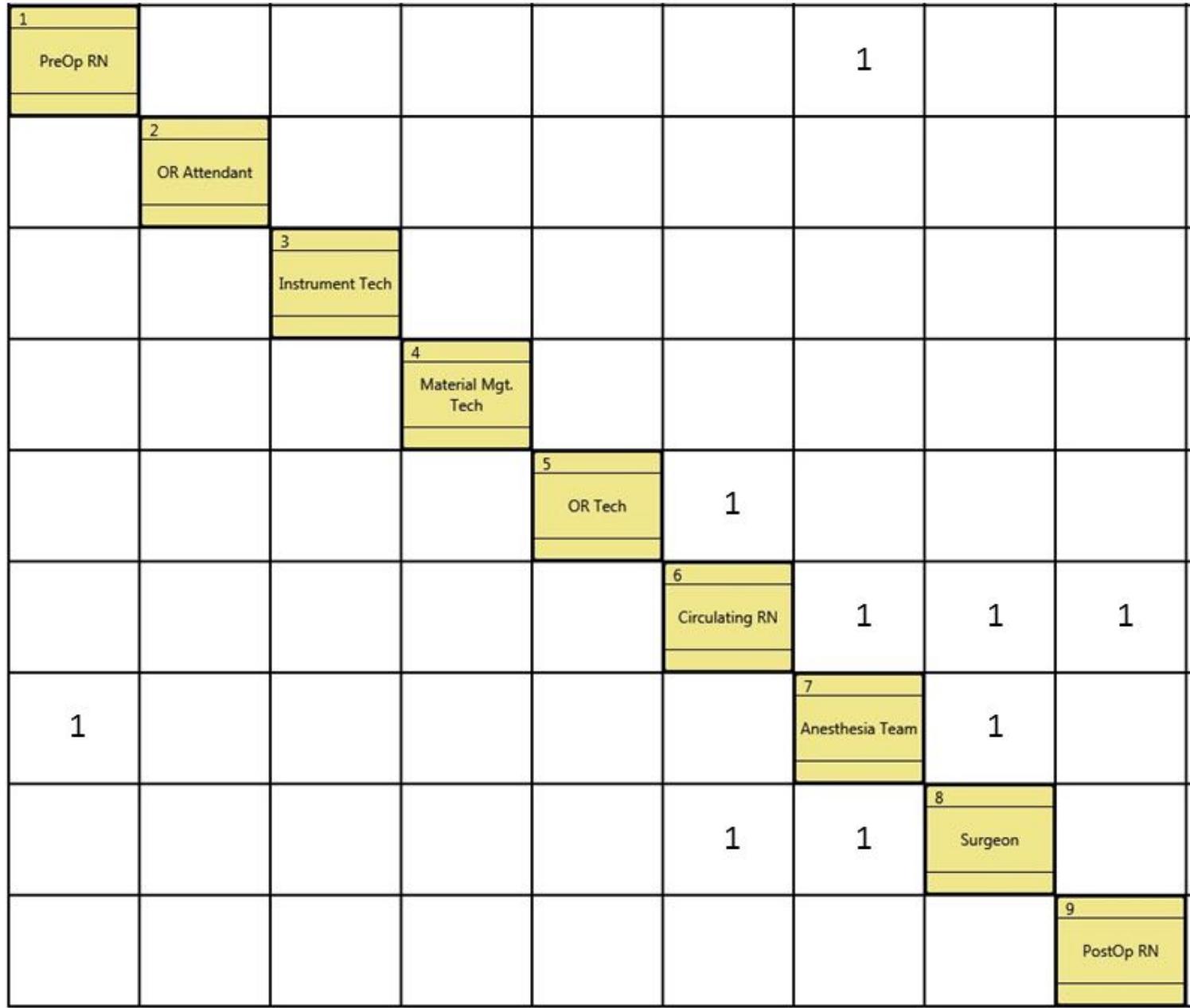


# Translate to Industrial Engineer



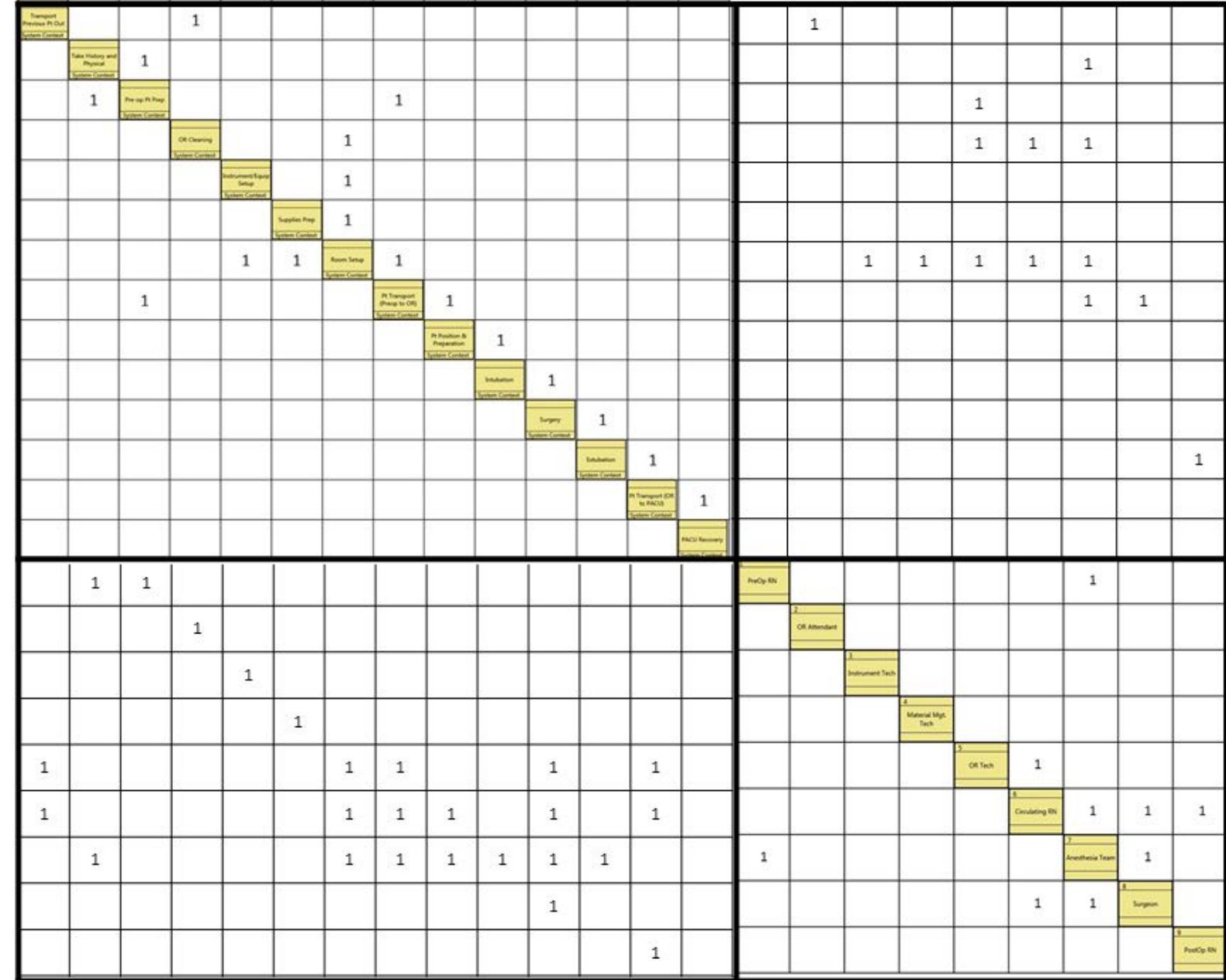
Source: Process Modeling in the Operating Room: A Socio-Technical Systems Perspective, Bonzo, McLain and Avnet (2016)

# DSM Staff



Source: Process Modeling in the Operating Room: A Socio-Technical Systems Perspective, Bonzo, McLain and Avnet (2016)

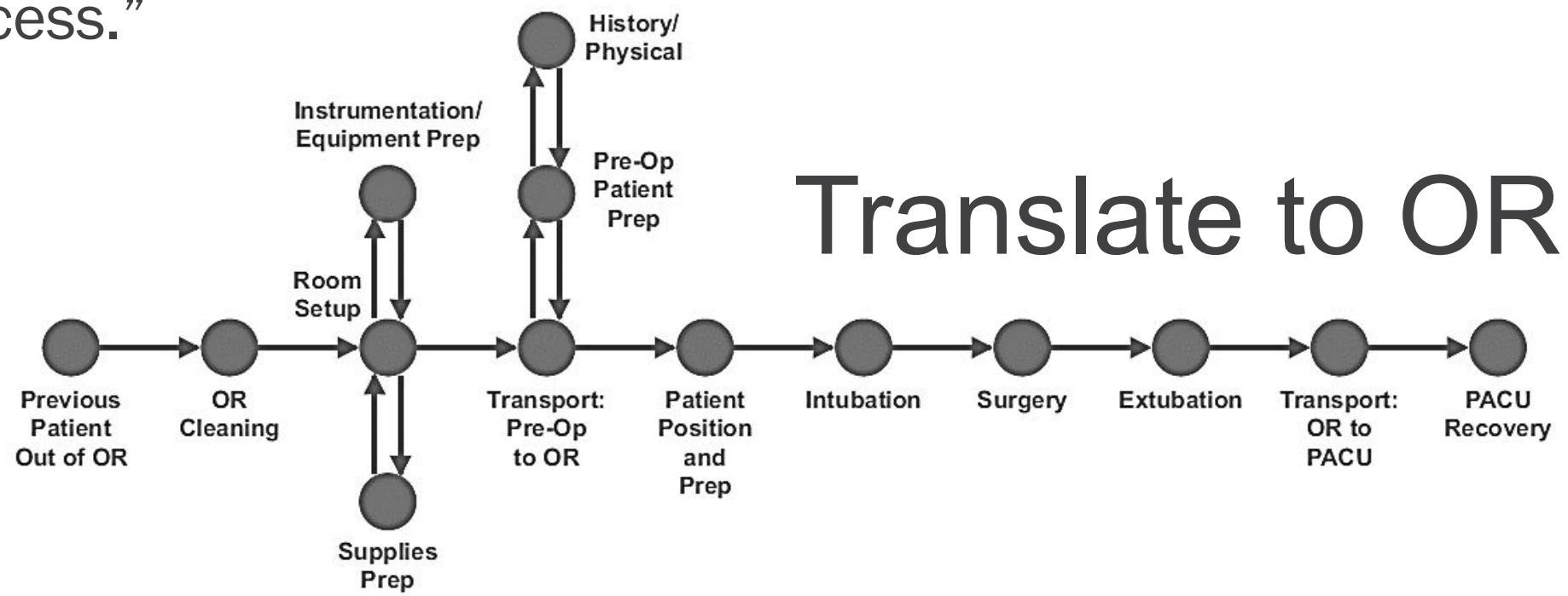
# MDM Staff Process



Source: Process Modeling in the Operating Room: A Socio-Technical Systems Perspective, Bonzo, McLain and Avnet (2016)



“While the DSM provides a valuable tool for visualizing complex processes, it actually is **not the most intuitive means** of graphically displaying dependencies in simpler systems like this one. A network representation of this process is shown (below). As is apparent from this figure, this graphical format more effectively communicates the actual process.”



# Value Add



“Analysis of process metrics demonstrate that merely engaging the surgical staff in building the MDM can itself lead to performance improvement.”

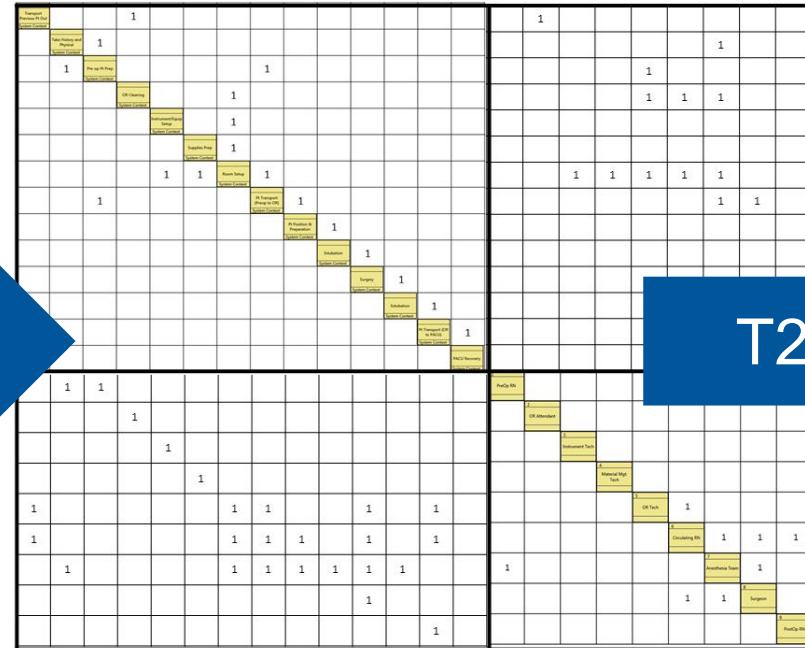


# Two translations

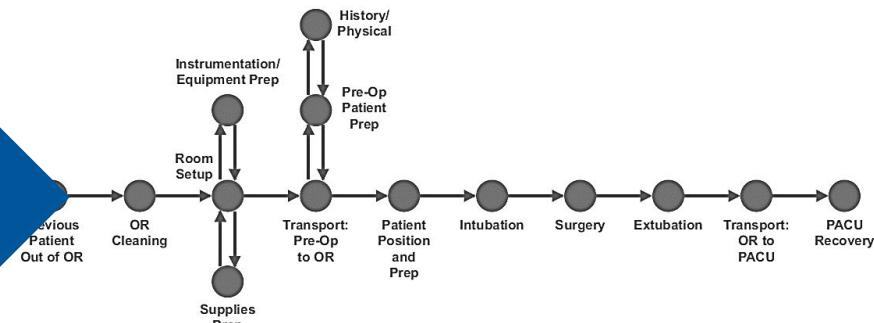


OR Staff

## Industrial Engineers



T2

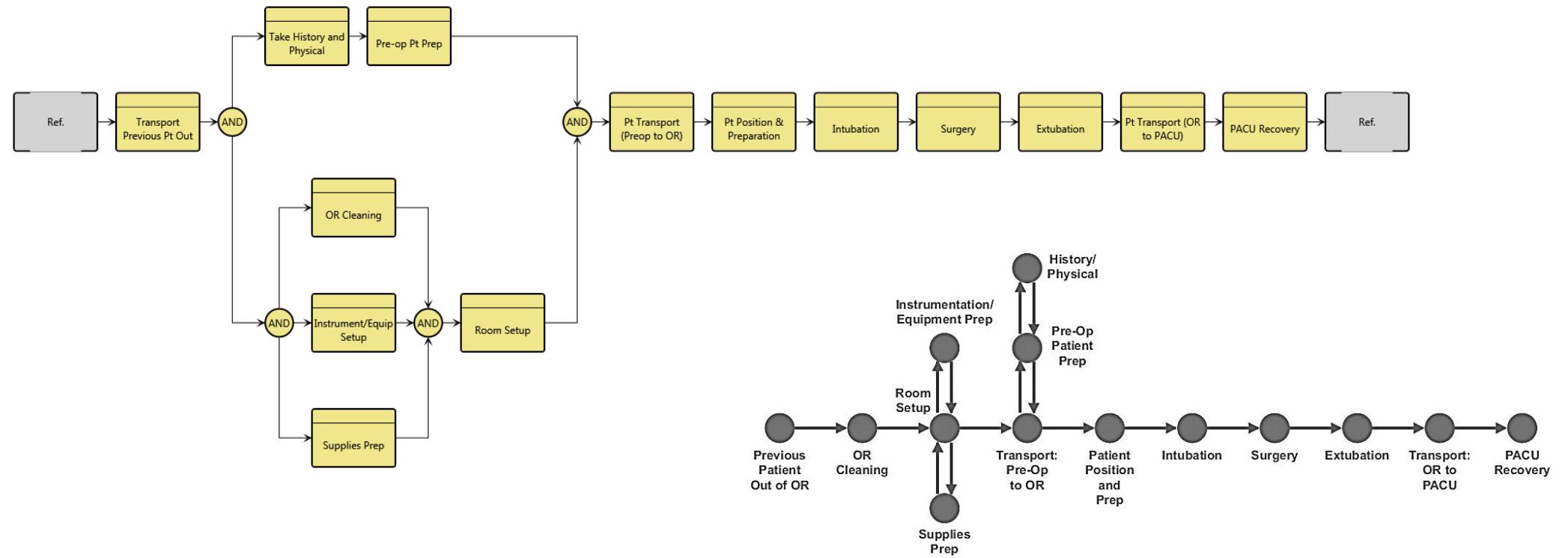


OR Process Owners

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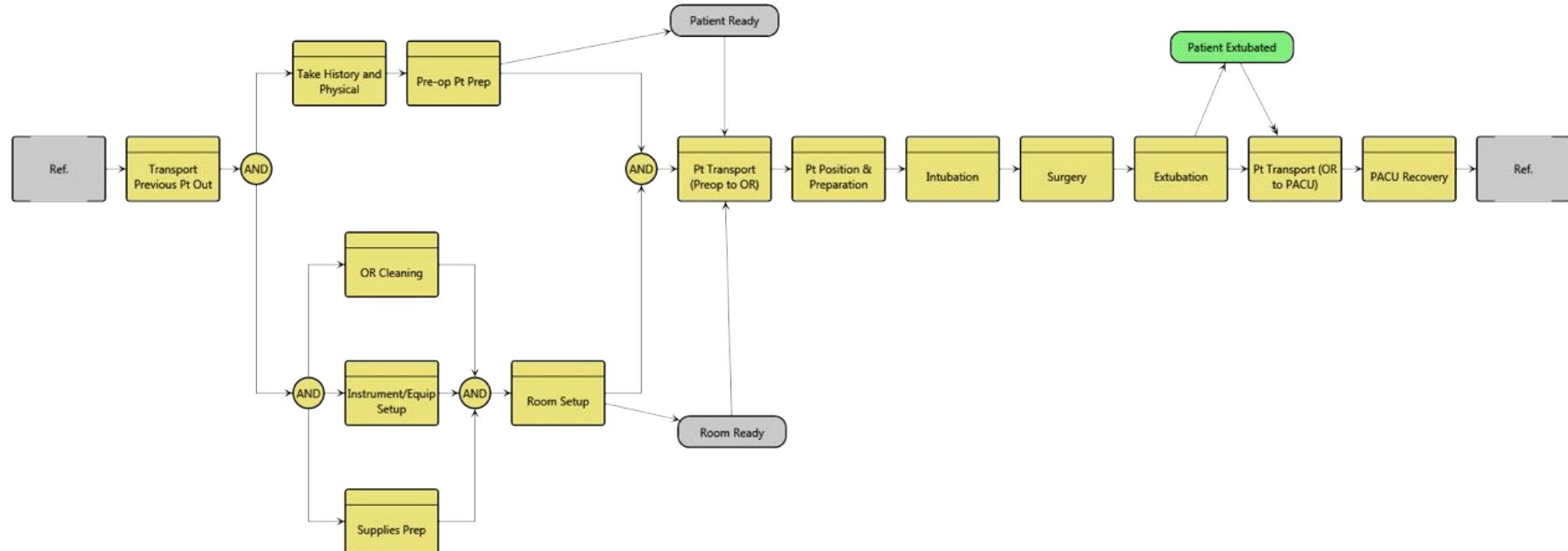
# Translation #3- IE to SE model





# SE Value-add

Data flows (communication)  
Resources



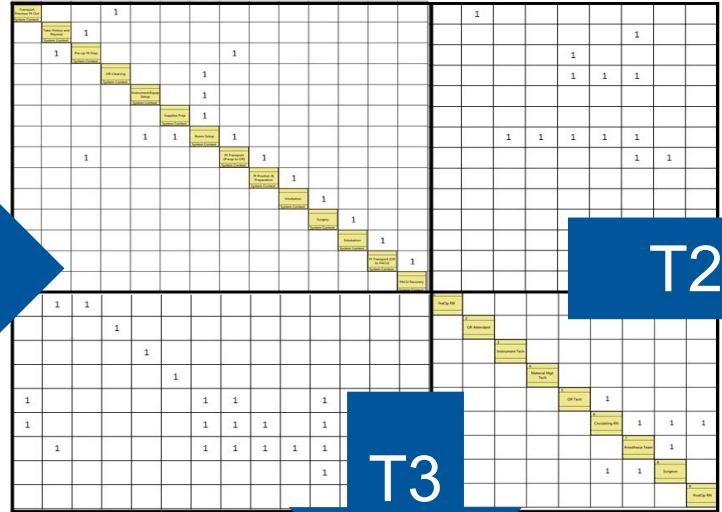


# Three translations



OR Staff

Industrial Engineers



OR Process Owners

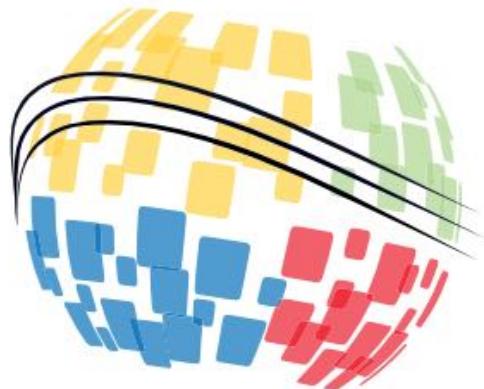
Systems Engineers





# Summary

- Communication & collaboration
- Across disciplines AND domains
- Translation is key
- Responsibility is ours!



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