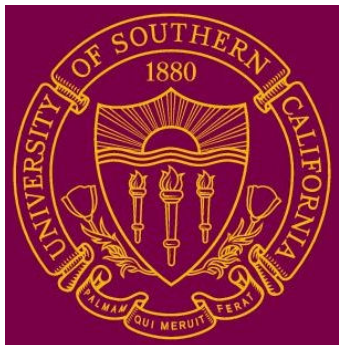




Challenges in the Development of Systems Engineering as a Profession

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Institute of
Technology**



Agenda



- **Professions**
- **Systems Engineering**
- **Central Questions**
- **Challenges**
- **Conclusions**
- **Q & A**



Professions





Definition



From the Merriam-Webster Online Dictionary,

Main Entry: profession

4 a : a calling requiring specialized knowledge and often long and intensive academic preparation b : a principal calling, vocation, or employment c : the whole body of persons engaged in a calling

Common Professions: Medicine, Law, Engineering(?)



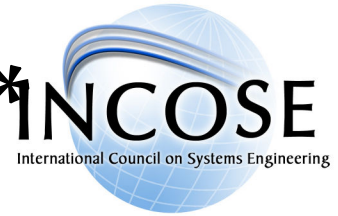
Initial Ideas



- **History of “Firsts”**
 - **First journal, conference, society etc...**
- **Different folks, different strokes**
 - **Power, social legitimacy etc...**
- **Adler and Kwon (2006): “engineering is a “semi-profession””**

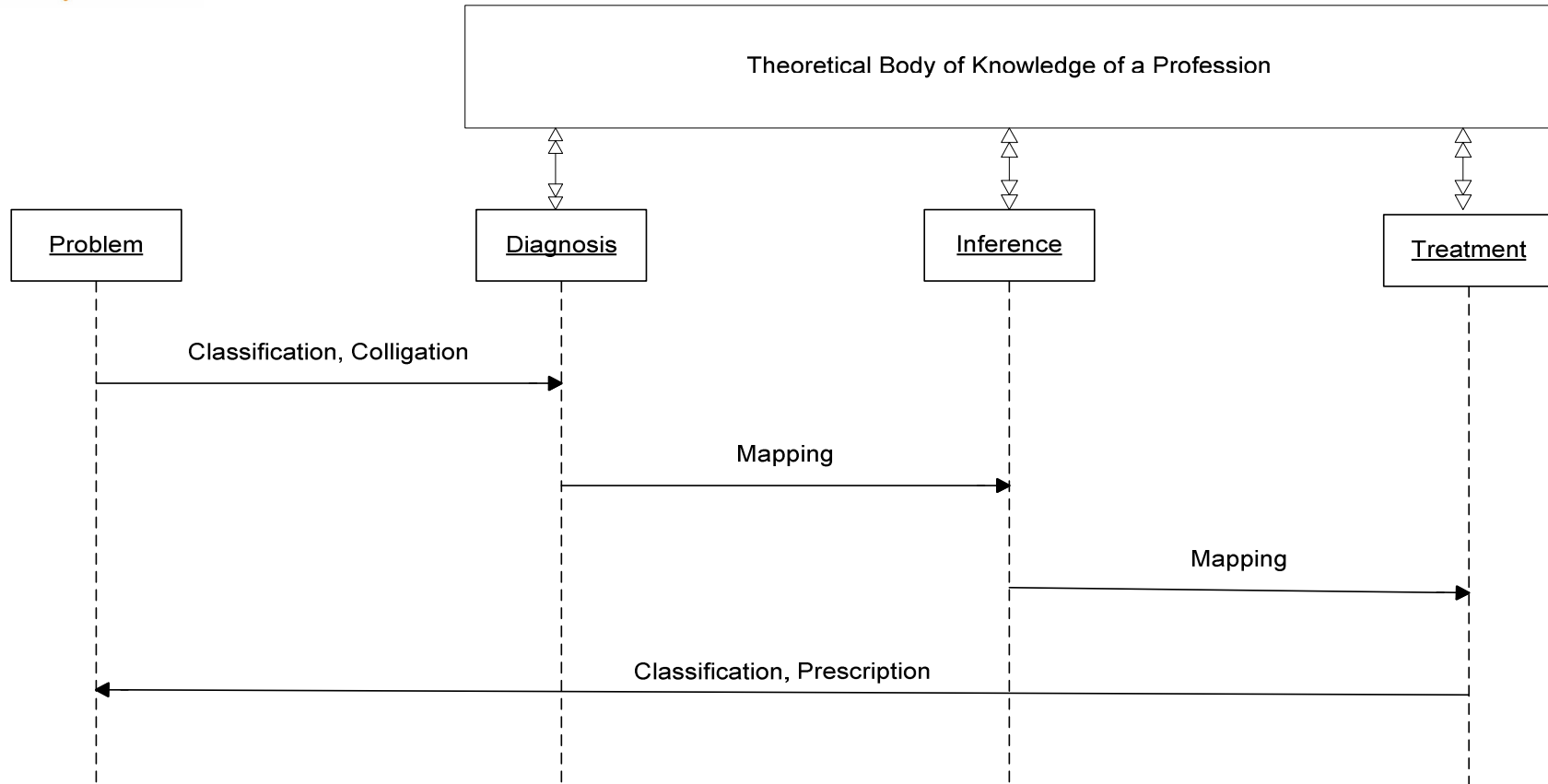


*“System of Professions”** INCOSE

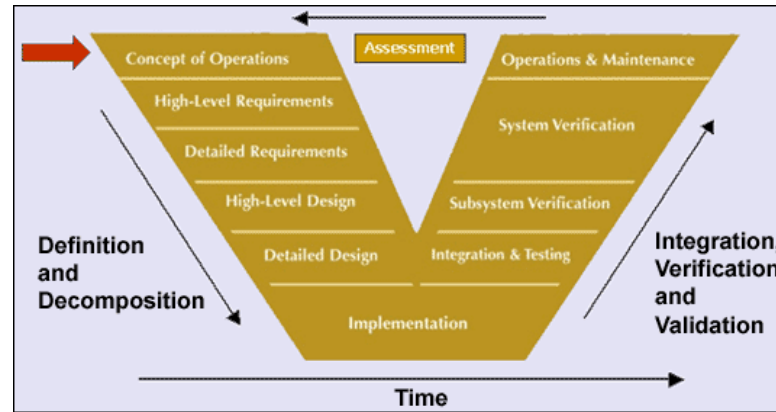


- **Professionalization**
 - Nature of the problem
 - Competition between professions
 - Body of knowledge
 - Abstraction in practice
- **History of IEEE**
 - Radio vs. Power engineers

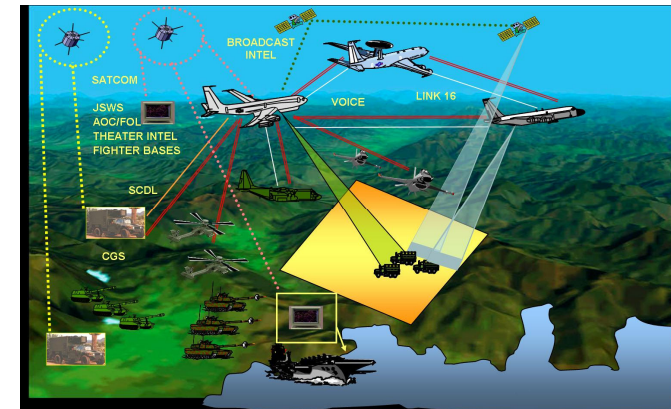
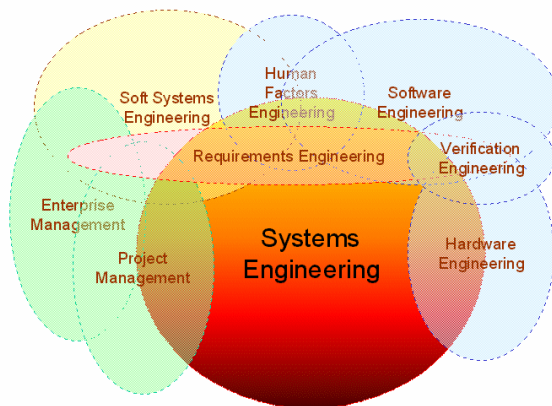
*Abbott, A., (1988), *System of Professions: An Essay on the Division of Expert Labor*, University of Chicago Press.



The Diagnosis-Inference-Treatment Mechanism



Systems Engineering





Initial Ideas



“What we’ve got here is failure to communicate.”
Cool Hand Luke (1967)

- **Post-Second World War**
 - **Bigger, larger, more complex systems**
 - **Management of technical effort**
 - **Response of engineers**
 - **Several definitions/views**



Current Ideas



- **Post-INCOSE**
 - **Customer requirement**
 - **More university programs**
 - **Greater industry involvement**
 - **Annual conference and journal**
 - **Several definitions/views?**
- **More communication failures?**



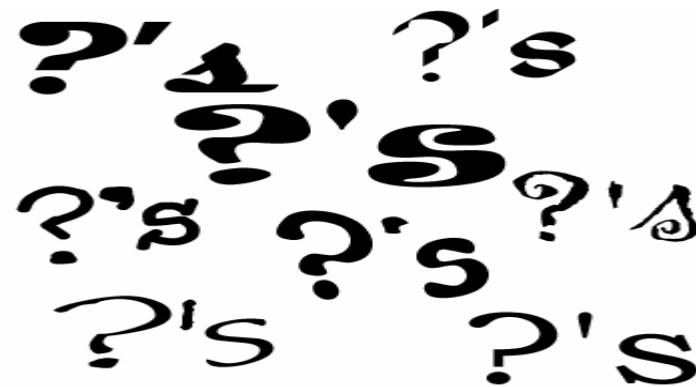
The Organization



- **The hierarchy of Systems Engineering**
 - **Micro**
 - **Specialty/Discipline Engineer**
 - **Meso**
 - **Senior Systems Engineer**
 - **Macro**
 - **Program Manager**
- **Every engineer does Systems Engineering**
 - **Caveat: There is something unique in what every engineer does!**



Central Questions





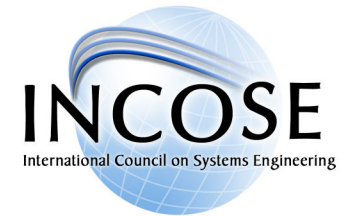
Central Questions



- What is a Systems Engineering problem?
- What are the characteristics of *this* Systems Engineering problem?
- How does a System Engineer *know* what the characteristics are?

State of the Art?

	Rechtin (1991)	Vee Model (Forsberg & Mooz 1995)	SE Standards (ANSI/EIA 1999, ISO/IEC 2002)	Maturity Models (CMMI 2002)	COSY SMO (Valerdi et al 2003)	DoD Architecture Framework (DOD AF 2004)	GUTSE ¹ (Friedman 2004)	Ontologies (Honour & Valerdi 2006)	VBS SE ² (Jain & Boehm 2006)
Observation	◆				◆		◆		◆
Classification	◆				◆		◆	◆	◆
Abstraction	◆				◆	◆			◆
Quantification & Measurement				◆	◆				
Symbolic Representation			◆						
Symbolic Manipulation		◆							
Prediction					◆				



Challenges



Challenges



- 1. The problem space in systems engineering remains undefined**
- 2. Lack of a coherent body of knowledge of Systems Engineering**
- 3. The compounding effect of the lifecycle perspective**



More Challenges



4. **Inability to falsify (overarching) theories of Systems Engineering**

5. **Lack of standard of proof in Systems Engineering**



Conclusions



Final Thoughts



- **Engineering as a Profession**
 - History of pragmatic problem-solving
 - Problem solving preceding theoretical development
 - Pragmatic usefulness, must not be lost in the quest for theorizing.



Q & A