

# Shu Ha Ri for SE

Fred Robinson, ScD, ESEP  
The MITRE Corporation

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守

(Shu)

破

(Ha)

離

(Ri)

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# It's Elementary

- Introduction
- Shu Ha Ri for SE?
- Shu Ha Ri for Specialists
- Shu Ha Ri for Generalists
- Expertise out of Shu Ha Ri
- Shu Ha Ri in Academia
- What can we be through Shu Ha Ri?

# The BLUF of Shu Ha Ri for SE Mastery

If we make the mistake in thinking that “the path” towards expert level mastery for systems engineers is just like any other specialization...

Then, those who seek to approach such mastery may only succeed through...  
serendipity

# Why Shu Ha Ri for Systems Engineering?

- Mimicking ***traditional mastery*** paths *falls short* for systems engineering experts
  - Assumes **consensus** on the definition of the expertise (which **does not exist**)
  - Such a path **narrowly** reflects honing well-specified **specialized** talents to perfection
  - Westerner thinking (positivist, **reductionist**) presumes linearity and single-pass thresholds
- Experts in systems engineering are only identified by other experts, by **IKIWISI**
  - Experts in systems engineering solving wicked problems differ from others' kind problems
- Tacit knowledge, applied, enables **systems engineering experts** to better **address wicked** meta-disciplinary **problems**
  - Gained from *continual, iterative, diverse* paths to amass *knowledge*, our current reality
- **Measures** or tests of explicit knowledge **poorly approximate** actual **expertise**

*Shu Ha Ri may help to expose the “Dark Matter” of S.E....*

...from 15<sup>th</sup> century sword-making tradecraft



Shu

to learn the basics  
("follow" - to **know**)



Ha

to learn new tools and  
execute skills  
("seek" - to **do**)



Ri

to extend beyond just using the  
tools and demonstrating skills  
("leave" - to **excel**)

**FORGED IN FIRE**

# PEAK (Ericsson) Specialists, Kind Problems Expertise

Bloom, B. S. (1985b). Generalizations about talent development. In B. S. Bloom (ed.), *Developing talent in young people* (pp. 507-549). New York: Ballantine Books.

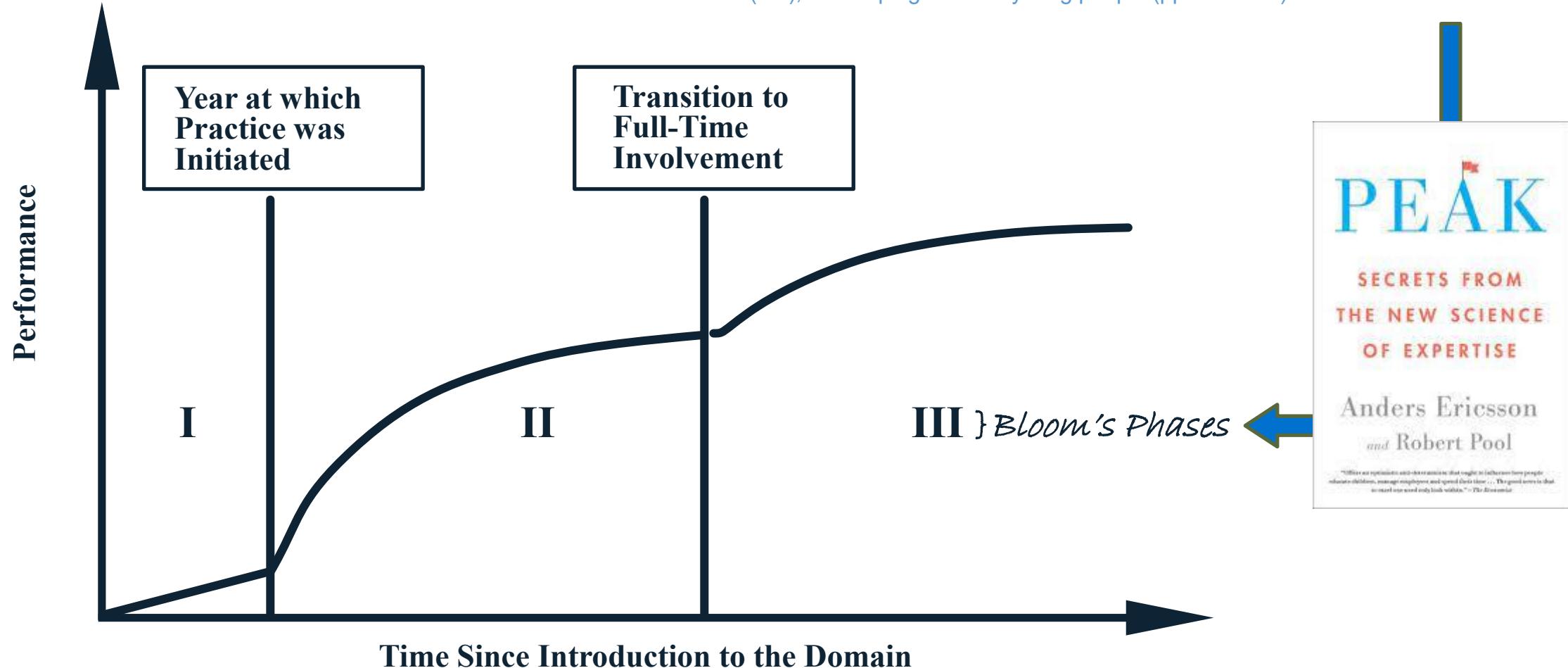
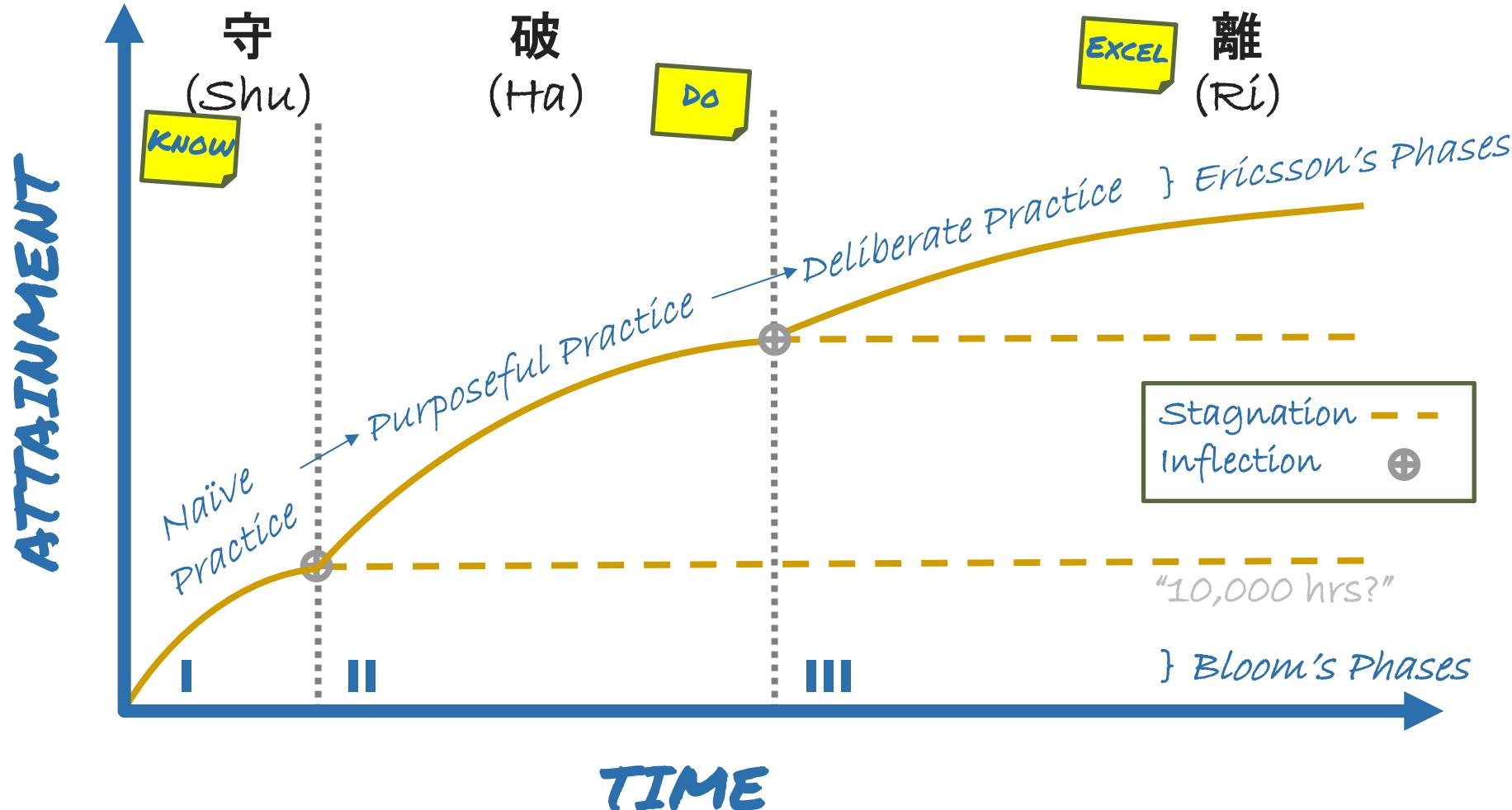
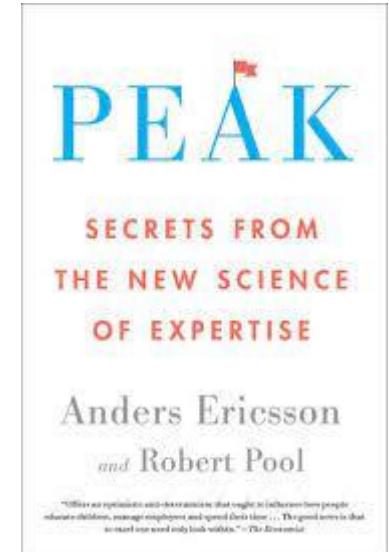
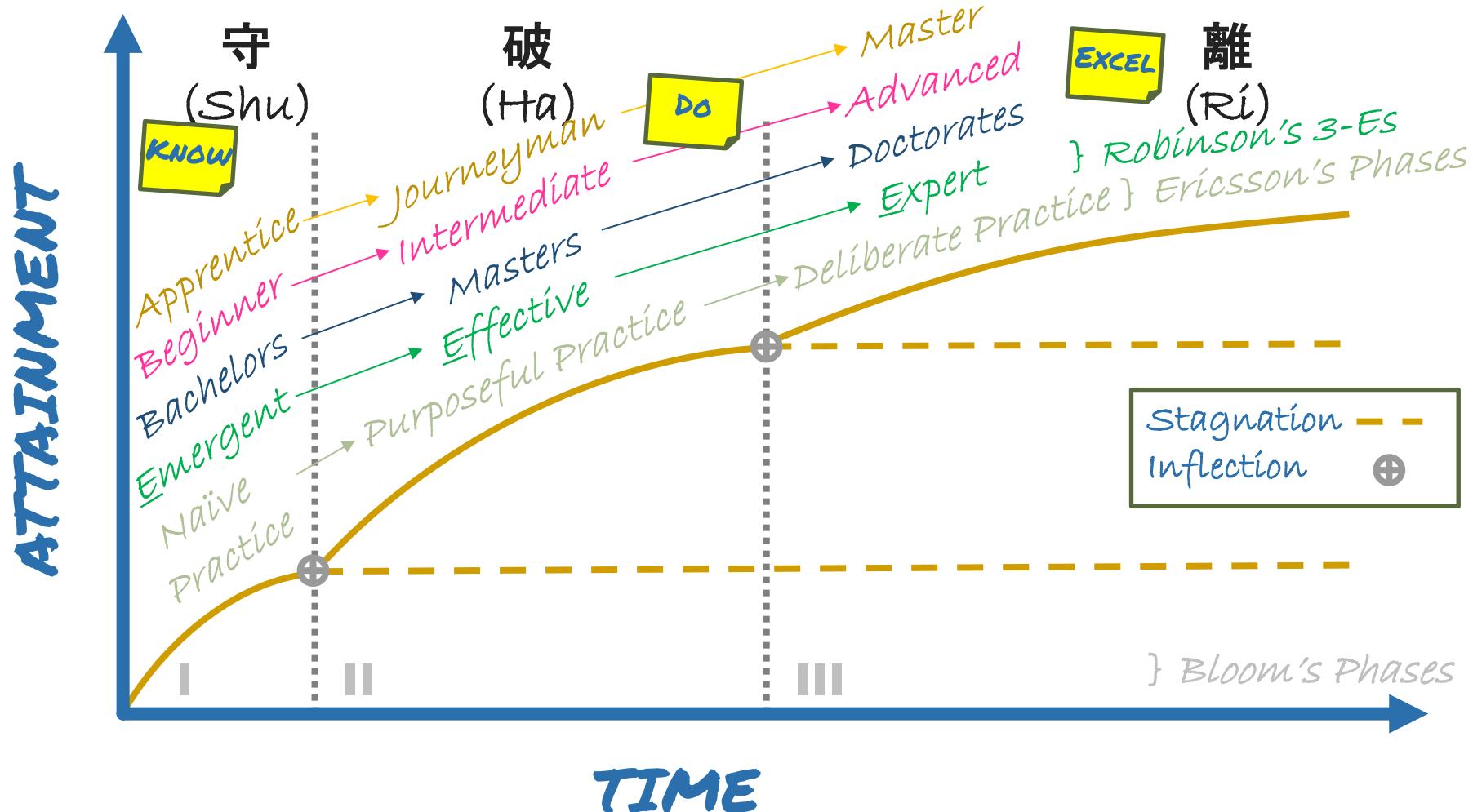


Figure 1. Three phases of development toward adult expertise

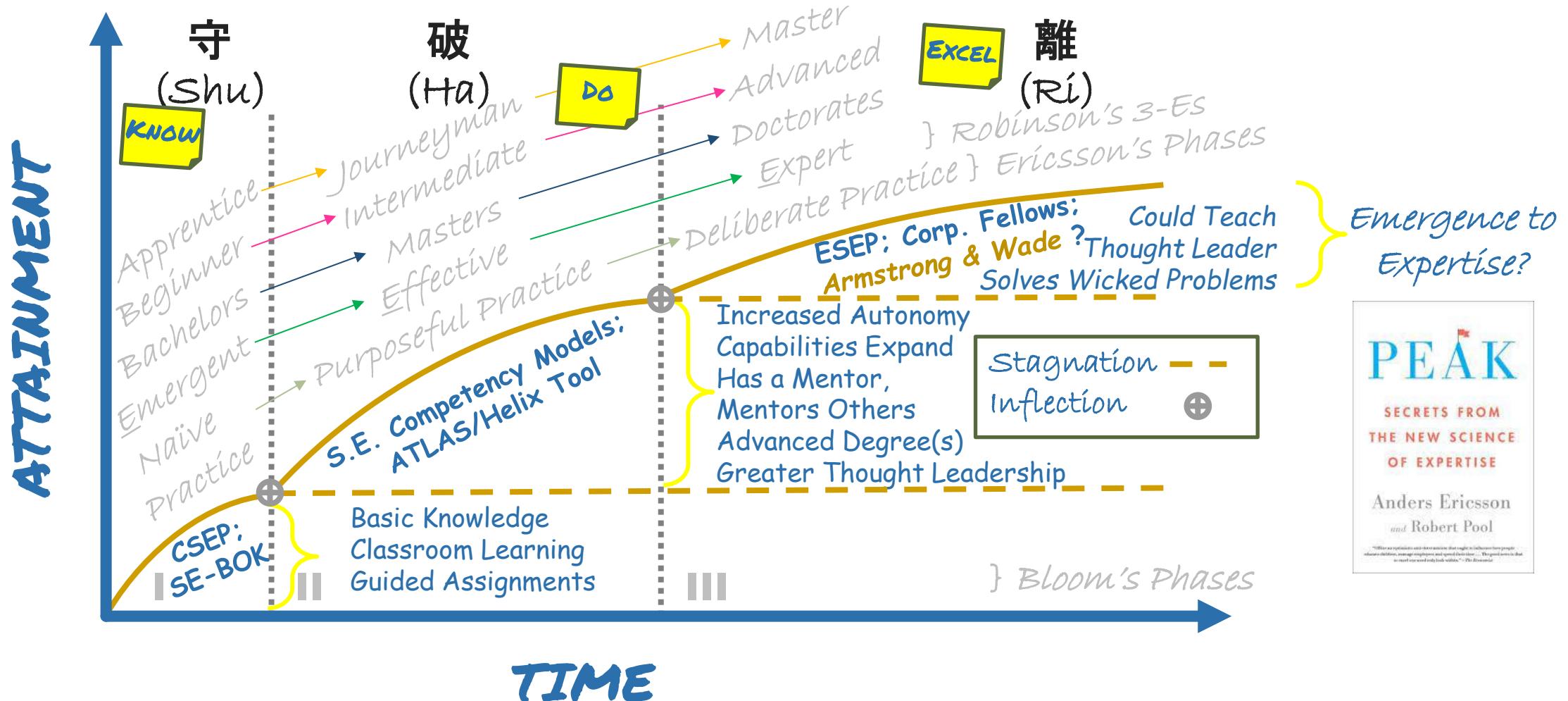
# PEAK (Ericsson) – Specialists, Kind Problems Expertise



# Shu Ha Ri may go by many different names



# So... what about for systems engineering?



# Version 1.0 of the New INCOSE Competency Framework

New Framework Competency Areas	CORE SE PRINCIPLES					PROFESSIONAL COMPETENCIES					TECHNICAL COMPETENCIES					SE MANAGEMENT COMPETENCIES				INTEGRATING COMPETENCIES																	
	Systems Thinking	Lifecycles	Capability Engineering	General Engineering	Critical Thinking	Systems Modelling and Analysis	Communications	Ethics and Professionalism	Technical Leadership	Negotiation	Team Dynamics	Facilitation	Emotional Intelligence	Coaching and Mentoring	Requirements Definition	System Architecting	Design for...	Integration	Interfaces	Verification	Validation	Transition	Operation and Support	Planning	Monitoring and Control	Decision Management	Concurrent Engineering	Business & Enterprise Integration	Acquisition and Supply	Information Management	Configuration Management	Risk and Opportunity Management	Project Management	Finance	Logistics	Quality	
SEP Program Technical Areas																																					
Requirements Engineering	✓✓✓	✓	✓✓✓	✓	✓	✓✓✓	✓	✓	✓	✓✓✓					✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
Systems and Decision Analysis	✓✓✓		✓	✓	✓	✓✓✓	✓	✓	✓	✓✓✓					✓✓✓	✓	✓								✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Architecture/Design Development	✓✓✓		✓✓✓	✓	✓	✓✓✓	✓	✓	✓	✓					✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
Systems Integration	✓		✓✓✓	✓	✓	✓✓✓	✓	✓	✓	✓					✓	✓✓✓	✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Verification and Validation	✓		✓	✓	✓	✓✓✓	✓	✓	✓	✓✓✓					✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓				
System Operation and Maintenance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Technical Planning	✓✓✓		✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Technical Monitoring and Control	✓✓✓		✓	✓	✓	✓	✓	✓	✓	✓									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acquisition and Supply	✓	✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓✓✓					✓✓✓	✓✓✓	✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Information and Configuration Management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Risk and Opportunity Management	✓✓✓		✓✓✓	✓	✓	✓✓✓	✓	✓	✓	✓					✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Lifecycle Process Definition and Management	✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓									✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Specialty Engineering	✓✓✓		✓	✓	✓	✓	✓✓✓	✓	✓	✓								✓	✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Organizational Project Enabling Activities	✓✓✓		✓	✓	✓	✓	✓	✓	✓	✓									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other																																					

**Figure 4 Comparison of SEP Technical Areas to New Framework Competencies**

In this figure, the following key applies:

- ✓✓✓ The SEP technical area has an extensive or significant overlap with the framework competency area.
- ✓ The SEP technical area has a more limited, or implicit relationship to the framework competency area or is encompassed by multiple areas.

Greyed-out cells indicate professional competencies covered formally only as part of Expert-level INCOSE designation. These competencies are not expected to be demonstrated at "Practitioner" (i.e. Certified Systems Engineering Professional or CSEP) level.

Figure 4 is a primarily intended a subjective mapping provided for those seeking guidance in this area. However, it suggests all SEP Technical Areas are covered by at least one of the competencies within the Competency Framework.

# Where's the emergence for holistic expertise in SE?

Does the **whole** of being an expert merely occur as the **sum of the parts** from being assessed to the individual expert levels across a competency framework?

**OR**

Do the behaviors and characteristics of those we call “**experts**” in systems engineering **emerge** through other behaviors?

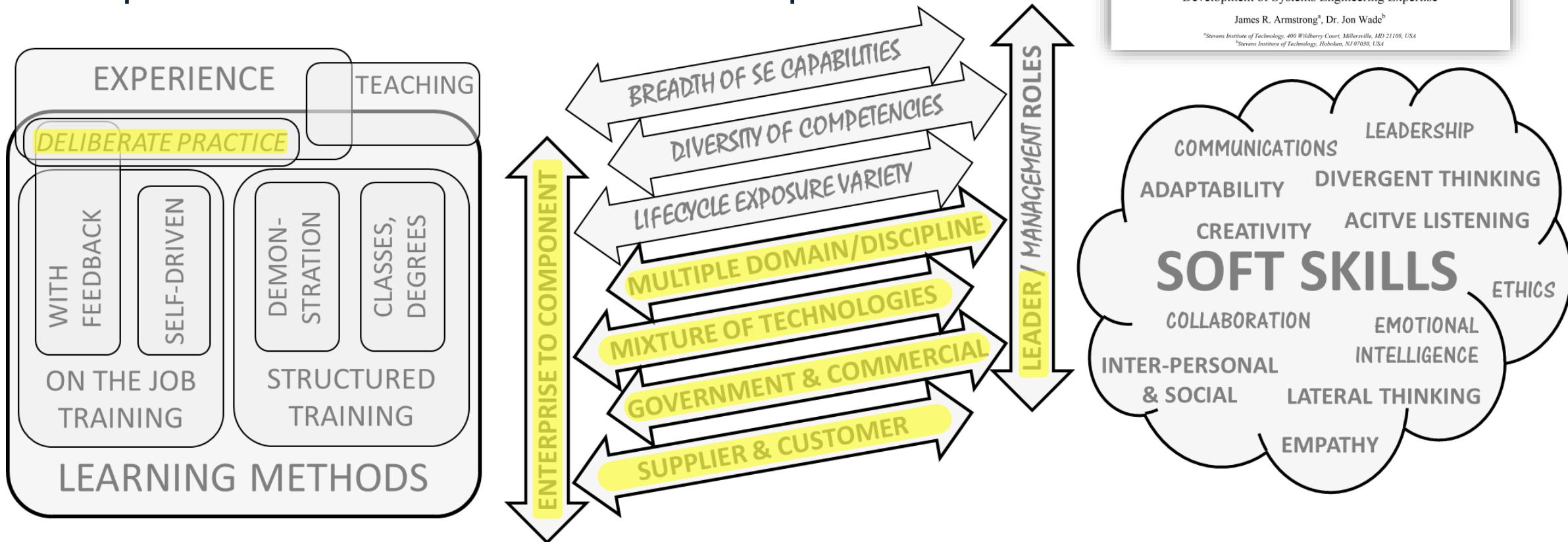
Synthesis  
Systemic thinking  
Critical thinking  
Divergent thinking

Paradoxical / Adaptive thinking  
Allegorical / Lateral thinking  
Other dimensions that can cut across a competency model's threads?

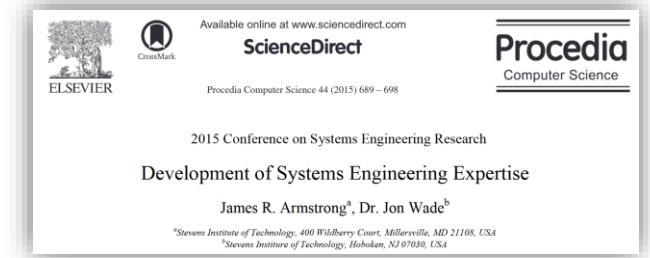
*How can we find inflection points...  
to go beyond merely amassing capability effectiveness scores?*

# Systems engineering's source for range

- A grounded theory study of INCOSE ESEPs/Fellows, Corporate Fellows/Leaders in SE on expertise



Themes & Categories characterizing systems engineering expertise (Armstrong & Wade)

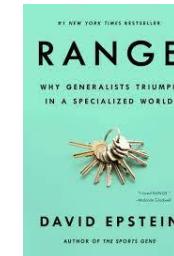


# Kind Problems vs. Wicked Problems... are in RANGE

## Specialists...

*learn more and more about less and less  
until they know everything about nothing*

- Chess Masters
- London Taxi Drivers
- Violinists
- Golf Pro (“Tiger”)
- Plumbers
- Electricians



## Dealing with Kind Problems

*...aren't necessarily easy to solve but the  
routes to solutions are well defined*

- Designing bridges, circuits, other technology
- Medical Diagnosticians, Surgeons

Generalists... ( “T” / “π” / “” ... “—”)

*learn less and less about more and more  
until they know nothing about everything*

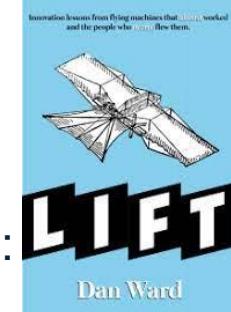
- Tennis pro (“Roger”)
- Bill Nye, (“Science Guy”)
- Dr. Neil DeGrasse Tyson
- Corporate Fellows
- Expert Systems Engineering Professionals

## Dealing with Wicked Problems

*...those lacking a pre-ordained  
approach for solving*

Today's Kind Problems were once **Wicked**:

- Powered Human Flight
- Editing DNA (CRISPR/Cas9)



*A jack of all trades yet a master of none, is oftentimes better than a master of one*

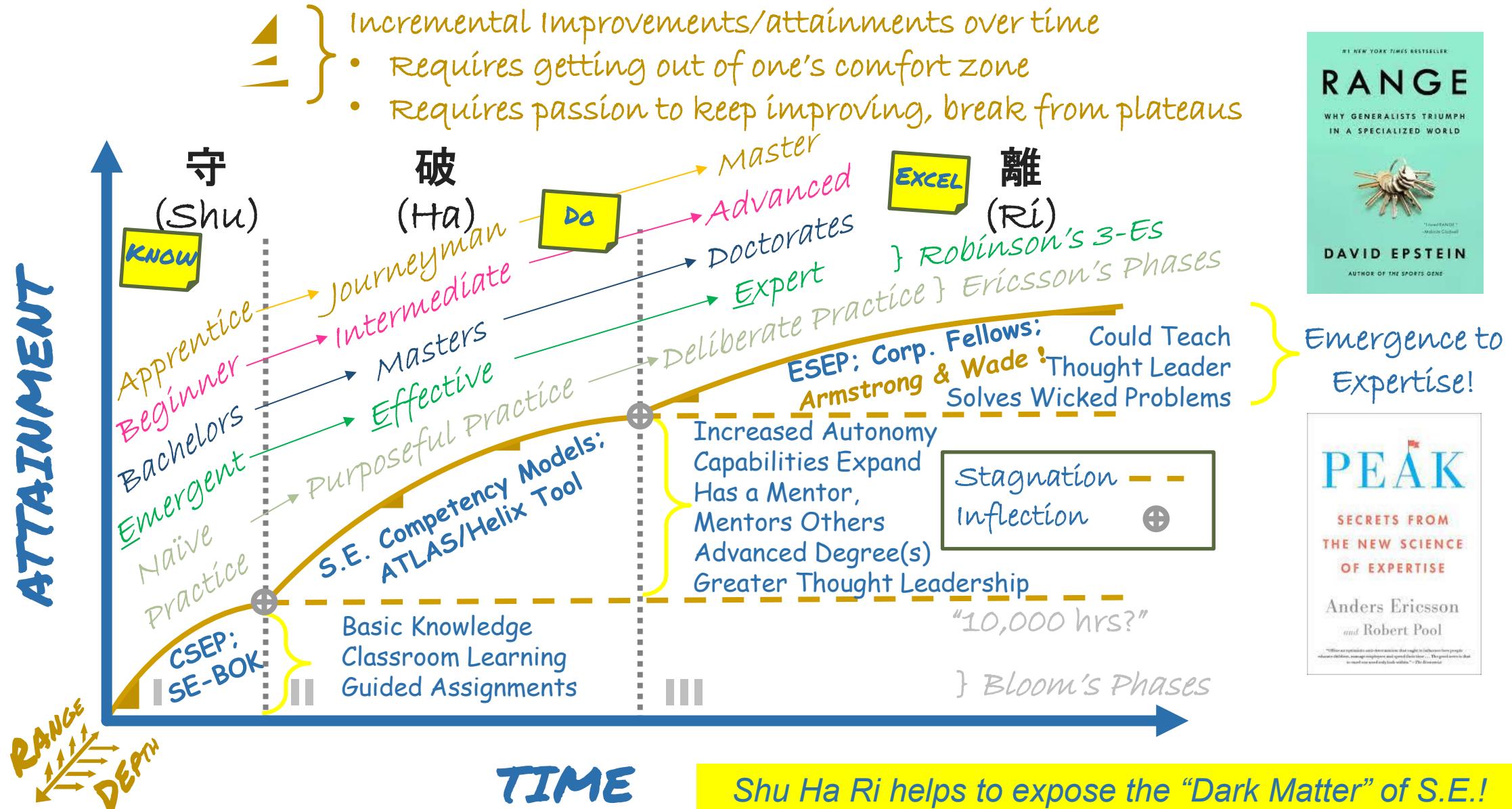
# The Irony in Academia



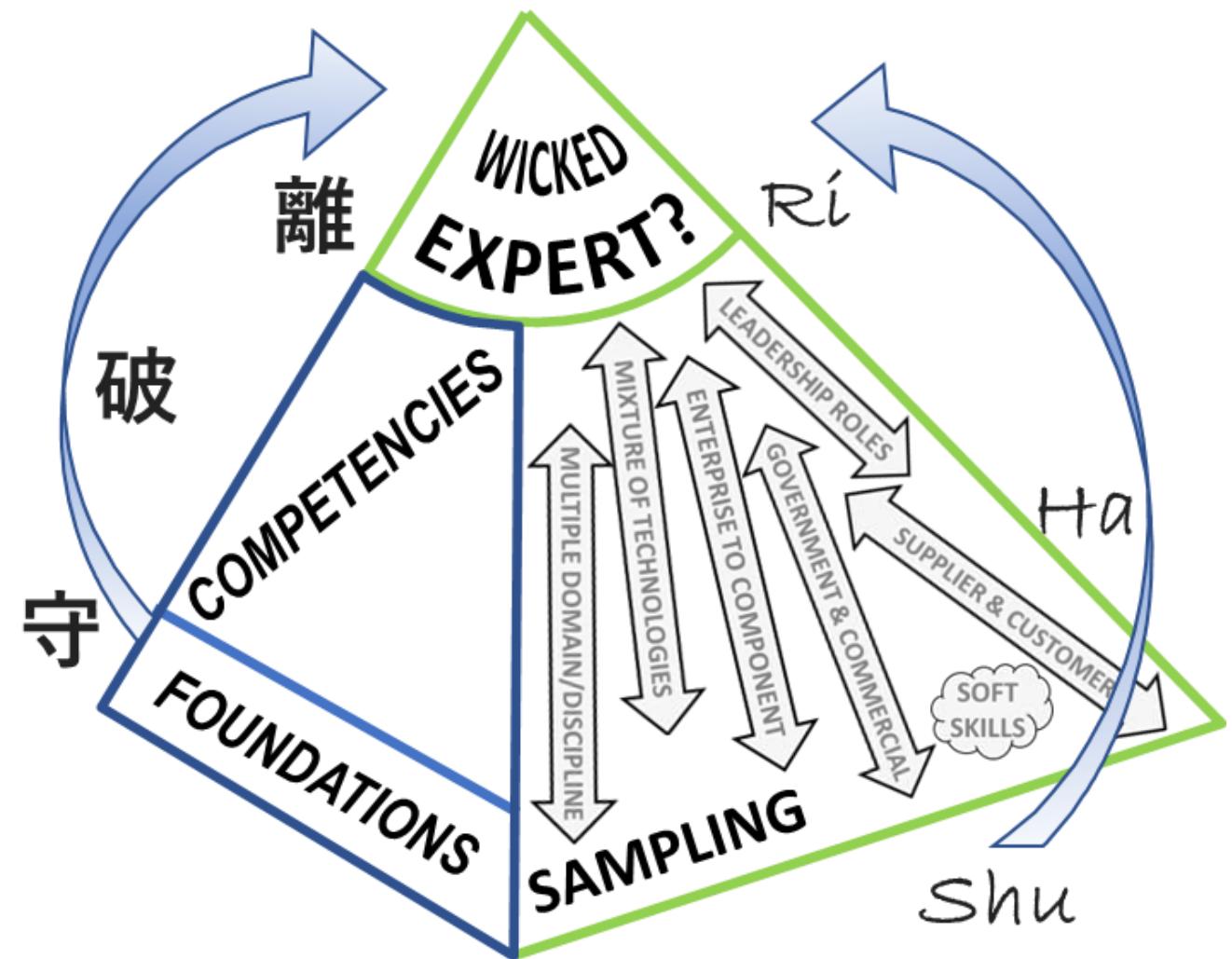
“...attaining a doctorate in systems engineering demonstrates becoming an *extreme specialist* on one’s research topic, ...whereas attaining expertise in the practice of systems engineering seems better aligned to being an *extreme generalist*”



# RANGE (Epstein) – the power of generalists... + PEAK

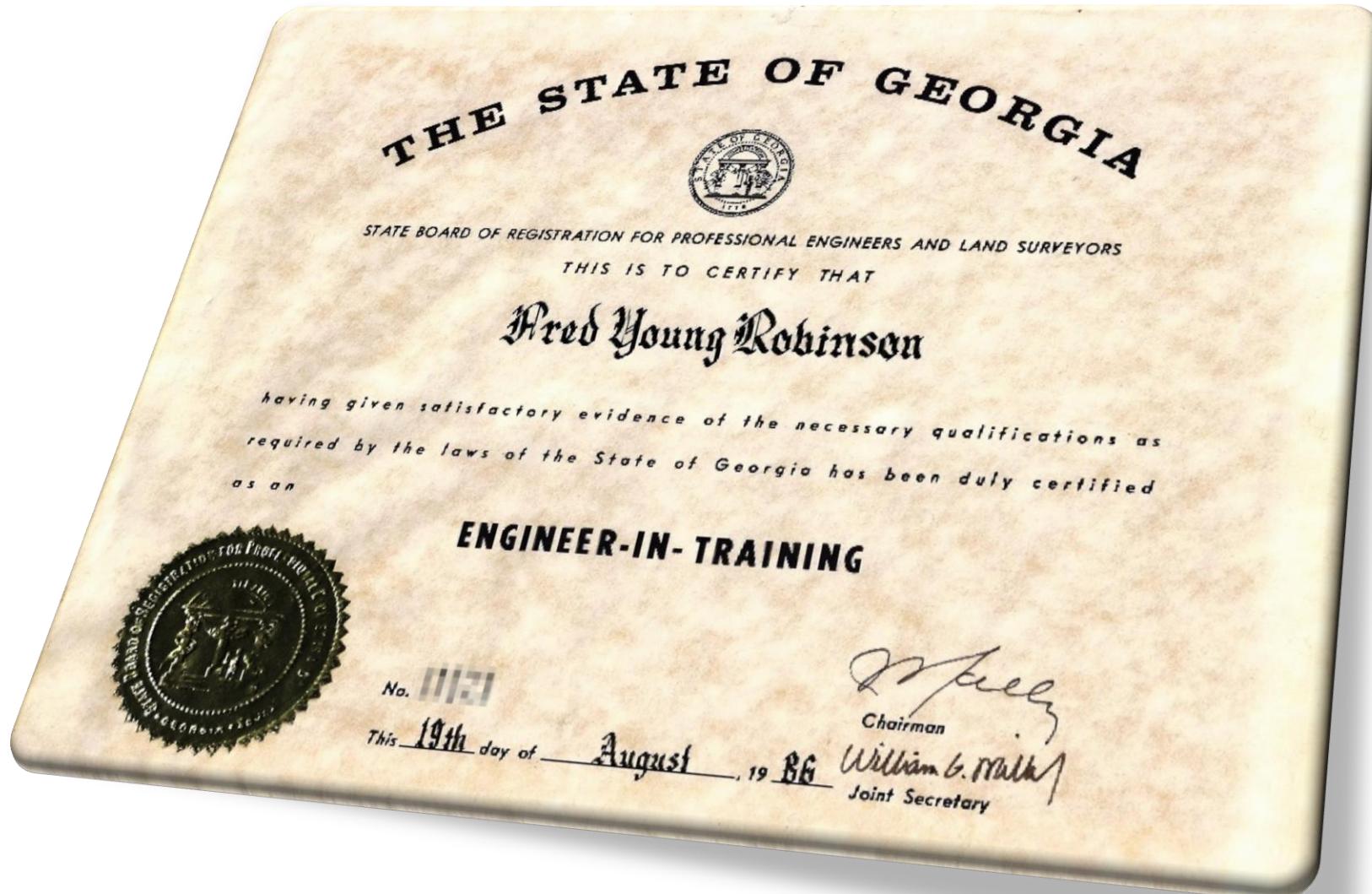


# Specialists (Kind Experts) & Generalists (Wicked Experts)



SEs aren't the only experts who solve wicked problems; others aren't as disciplinarily broad, or as studied...

# Perennially, I am “duly certified as an...”



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Fred Y. Robinson, ScD, ESEP  
[frobinson@mitre.org](mailto:frobinson@mitre.org)  
[www.linkedin.com/in/fyrftd/](https://www.linkedin.com/in/fyrftd/)

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