

117-50-D The Engineer's Dilemma

Dedication

This chapter is dedicated to Professor Clayton Christensen, my honored teacher.

Professor Christensen taught us that intelligence, discipline, and hard work are not always sufficient. Entire industries can be disrupted, not because their leaders are incompetent, but because the systems in which they operate are evolving faster than their assumptions. The recognition of those limits requires not weakness, but humility.

The transition from Complex Engineered Systems (CES) to Complex Adaptive Systems (CAS), and eventually to Hyper Complex Adaptive Systems (HCAS), carries the same lesson. The more adaptive the system becomes, the more the engineer must replace command with observation, control with influence, and certainty with stewardship.

For more than half a century, the information technology profession has been built upon a simple and extraordinarily successful idea:

If we understand the system well enough, we can control it.

That assumption was not unreasonable. After all, IT was built upon deterministic foundations.

- We wrote the code.
- We designed the databases.
- We defined the interfaces.
- We controlled the infrastructure.
- We established the rules.

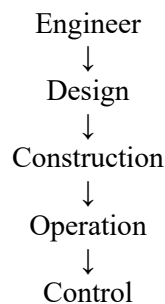
The system existed because we created it. Naturally, we assumed that we controlled it.

The inheritance of the industrial age

Modern information technology inherited its worldview from earlier engineering disciplines.

- A bridge does not change its objectives.
- An electrical grid does not decide to reorganize itself.
- A turbine does not suddenly decide to become a locomotive.

The engineer stands outside the system and exerts control over it.



This worldview proved spectacularly successful.

Then the world changed

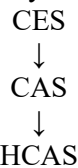
- Human beings entered the loop.
- Organizations entered the loop.
- Markets entered the loop.
- Algorithms entered the loop.
- Agents entered the loop.
- Agents began interacting with other agents.
- The environment itself became part of the computation.
- The result was the transition from CES to CAS.

The second transition

The first transition was difficult enough.

The second transition may prove even more unsettling.

- CAS gradually became HCAS.
- Not merely adaptive systems, but adaptive systems operating at machine speed.



Suddenly, the assumptions of the past began to break down.

The uncomfortable truth

IT professionals are accustomed to hearing phrases such as:

- "Fix it."
- "Patch it."
- "Scale it."
- "Optimize it."
- "Control it."

HCAS responds differently.

HCAS says:

- "Observe me."
- "Learn from me."
- "Adapt to me."
- "Influence me."
- "Stabilize me."

The word nobody wants to hear

Helplessness.

- Not incompetence.
- Not defeat.
- Not surrender.

But Helplessness.

- This is a difficult word for engineers because engineers are, by their nature, problem solvers.
- To admit helplessness feels like an admission of failure.

- But the reality is much more subtle.
- The acknowledgment of helplessness is often the first step toward wisdom.

Biology learned this lesson long ago

- Physicians do not command the immune system.
- Ecologists do not command the forest.
- Meteorologists do not command the atmosphere.
- Economists do not command the market.
- They observe.
- They model.
- They predict.
- They influence.
- They stabilize.

The paradox of the cognitive age

The more powerful our systems become, the less absolute our control becomes.

The more intelligent our creations become, the more humble we must become.

The greater the scale of adaptation becomes, the more important stabilization becomes.

The new engineer

- The engineer of the industrial age was a builder.
- The engineer of the cognitive age may become something else entirely.
 - A steward.
 - A shepherd.
 - A gardener.
 - A stabilizer.

Perhaps this is the most difficult lesson of all.

The engineer is no longer standing outside the machine.

The engineer is standing inside the field.

A DEDICATION TO

PROFESSOR CLAYTON CHRISTENSEN

My Honored Teacher

“The most difficult thing in the world is not to innovate, but to escape from yesterday’s success.”

– Clayton M. Christensen

CES
Complex Engineered Systems

CAS
Complex Adaptive Systems

HCAS
Hyper Complex Adaptive Systems (Machine Speed)

THE ENGINEER’S DILEMMA

*When Control Meets Complexity,
Humility Becomes Wisdom.*

FROM CONTROL	TO STEWARDSHIP
Design	Observe
Predict	Adapt
Optimize	Influence
Command	Stabilize

*Command is easy.
Control is tempting.
Stewardship is wisdom.*

In a world of HCAS,
the engineer is no longer outside the system.
The engineer is inside the field.

GRATITUDE. HUMILITY. STEWARDSHIP.
THAT IS THE ENGINEER’S NEW EQUATION.

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