I created the Verification Gap
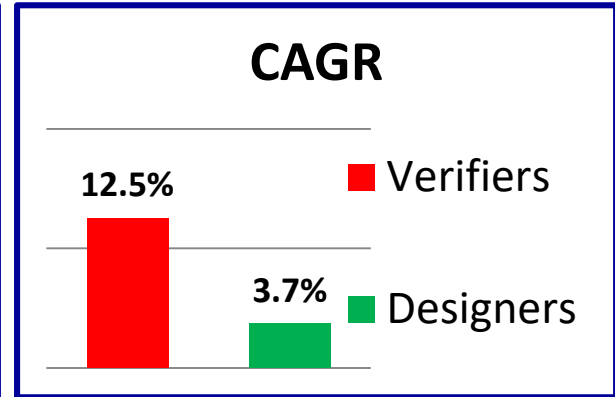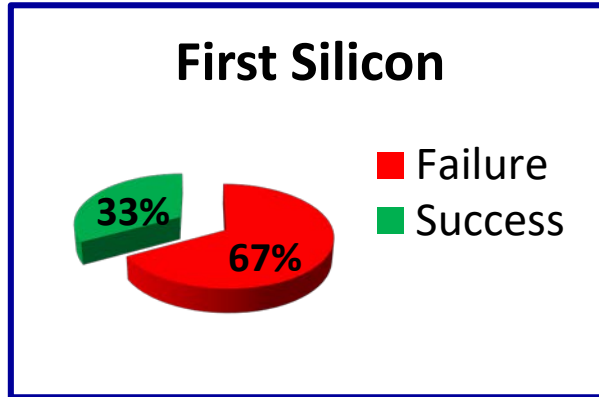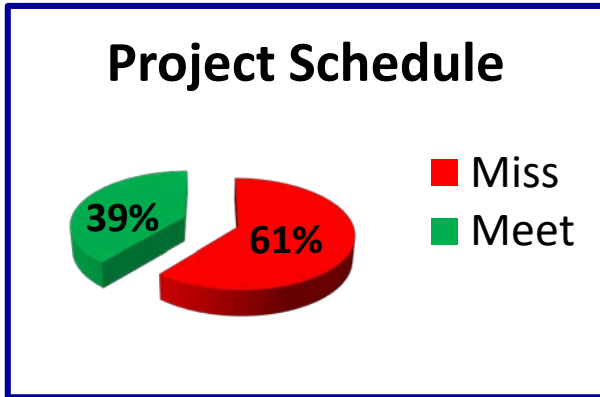
Ram Narayan & Tom Symons

Oracle Labs

Hardware and Software

ORACLE®

Engineered to Work Together

Verification Gap Impact

Project Schedule

39% 61%

- Miss
- Meet

First Silicon

33% 67%

- Failure
- Success

CAGR

12.5% 3.7%

- Verifiers
- Designers

Source: Wilson Research Group and Mentor Graphics, 2014 Functional Verification Study
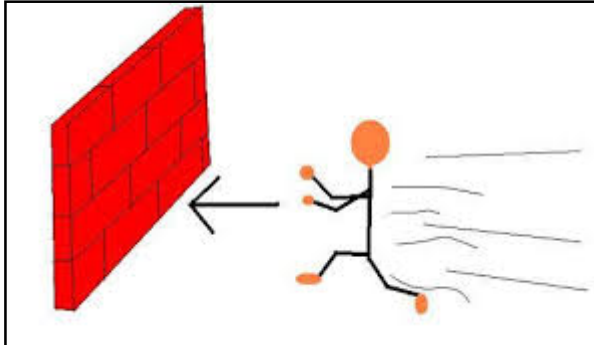
Modus Operandi

- Surveyed industry participants
  - Is the Verification Gap growing?
  - What causes the Verification Gap?
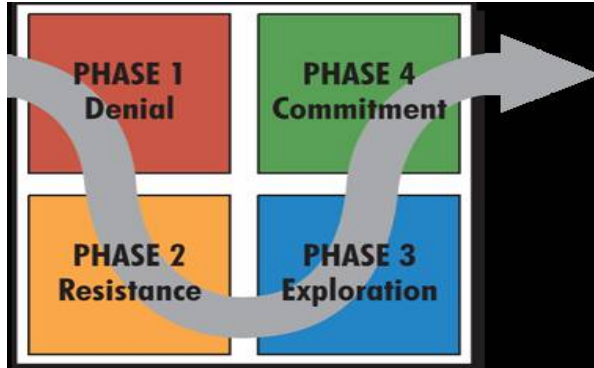 - What have you done to cause or reduce the Verification Gap?

- Classify the Verification Gap
  - By contributors
  - By tractability

Verification Gap Tractability
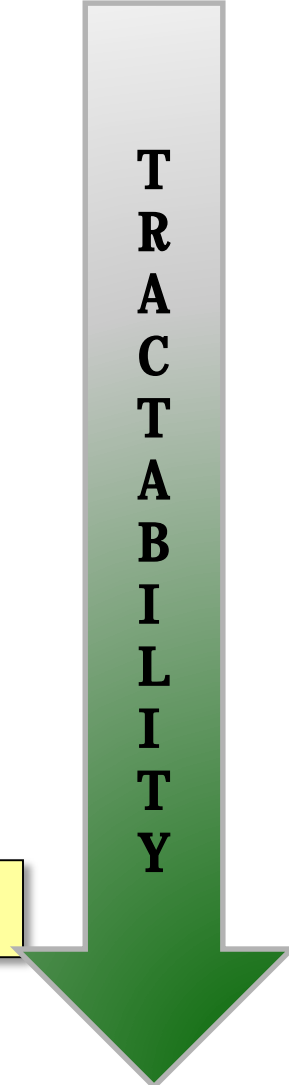

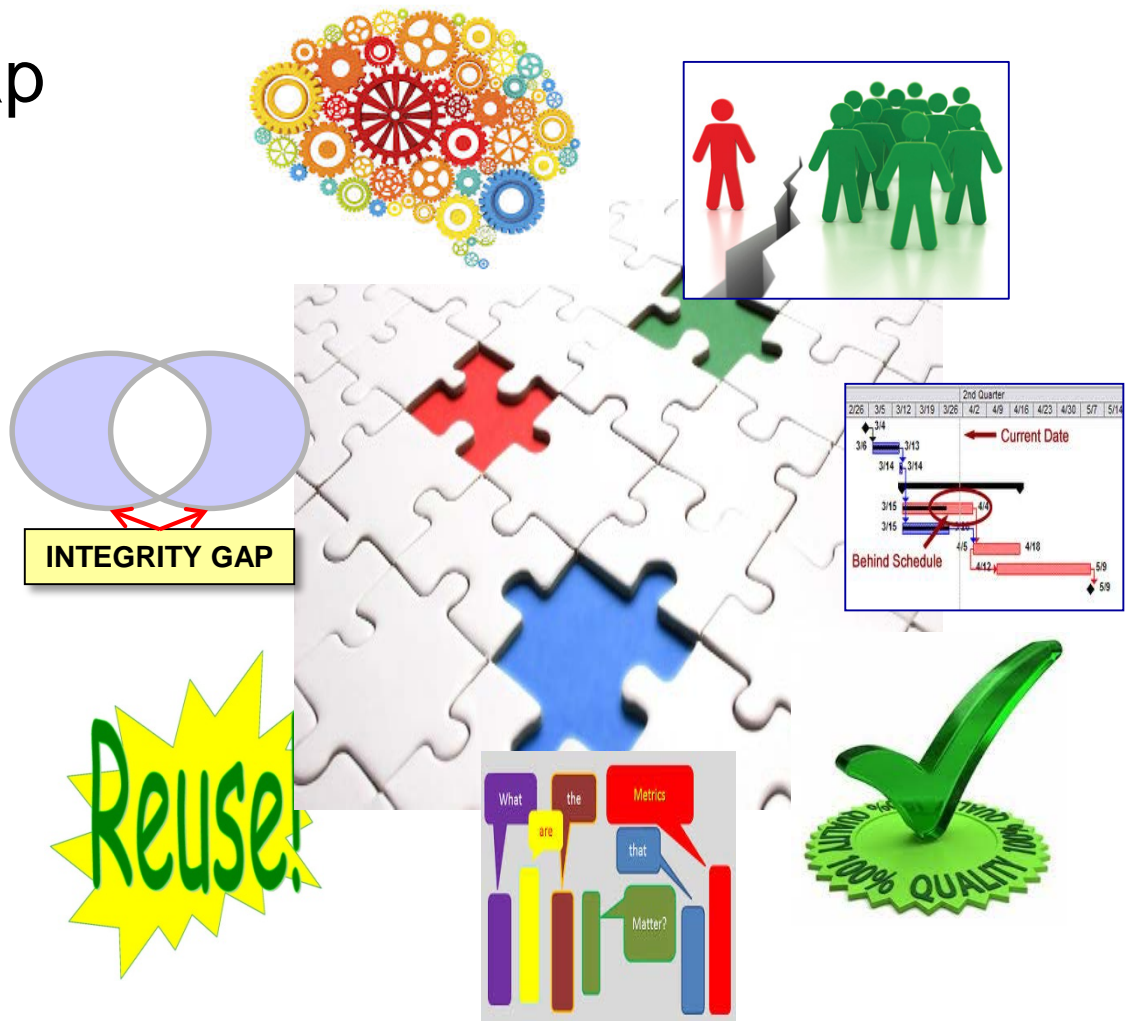**Inherent Verification Gap**

Transient Verification Gap

That hurt.
Maybe this one
won't be so bad!

Self-induced Verification Gap

T R A C T A B I L I T Y

Verification Gap Contributors

- The Complexity Gap
- The Skills Gap
- The Schedule Gap
- The Quality Gap
- The Metrics Gap
- The Reuse Gap
- The Integrity Gap

INTEGRITY GAP

Complexity Gap

- Complexity sources
  - IP's + Features
  - Cores
  - Configurations
  - Protocol complexity
  - SW content

- Verification impact inherent

Skills Gap

- Growing verification skill set

- Design as well as verification

- Lack of software skills

- Productivity range up to 10x

- Skills development

- Innovation management

- Management skills

- Both transient and self-induced

Schedule Gap

- Are schedules the problem?

  – Aggressive schedules

  – Aggressive milestones

- Pressure forces shortcuts

- Pay me now or pay me later

- Both transient and self-induced
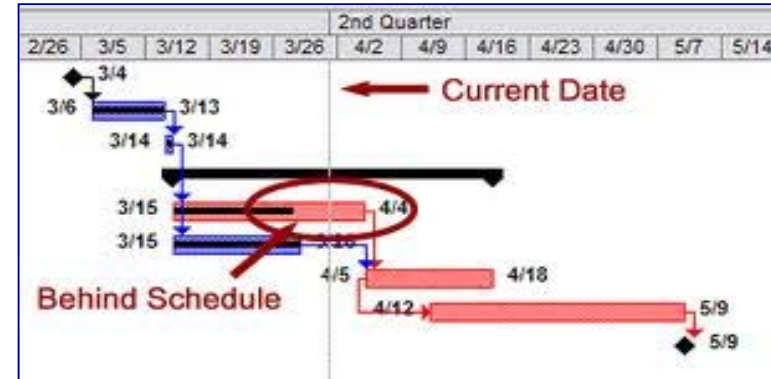
Quality Gap

- Architectural Thrash

- Environment Quality
  - Build methods
  - Edit-compile-run loop
  - Regression Management

- Best-known-methods not in use
  - Often seen as low priority
  - ~20% productivity hit

Metrics Gap

- Metrics explosion
  - Coverage driven verification
  - Assertion driven verification

- Metrics for metrics sake
  - What matters?
  - What does not?
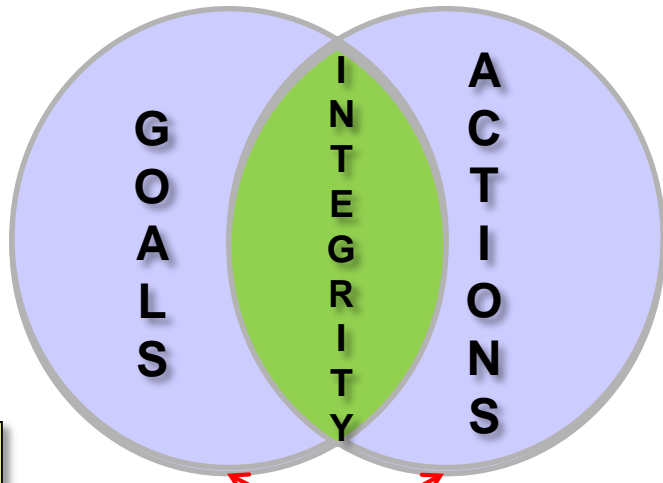
- Scheduling coverage closure
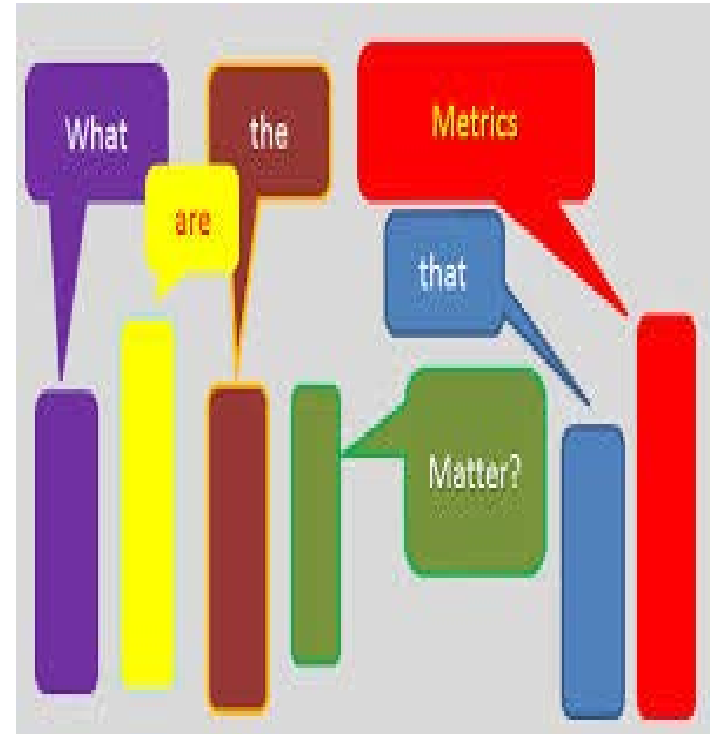
Reuse Gap

- Design IP usage growing
  - Easy for design to insert
  - Hard for verification and software

- IP domain knowledge gap

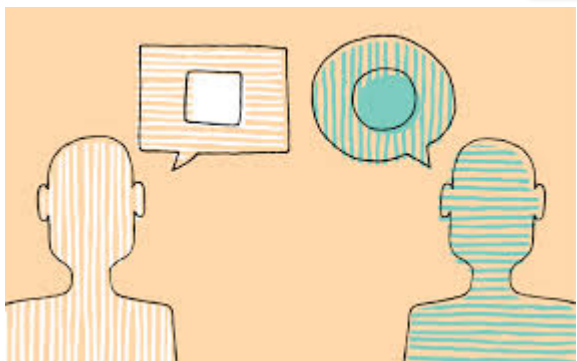- IP knowledge developed at one level not leveraged well at next level
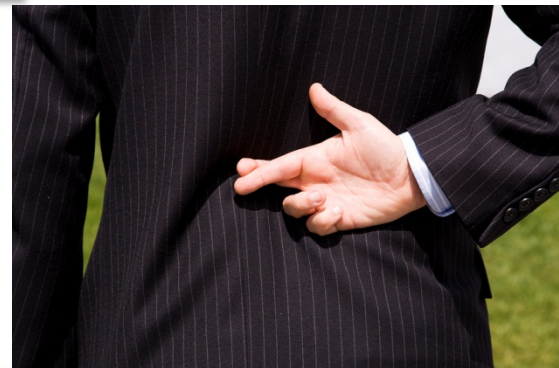
Integrity Gap

Fear Driven Verification

GOALS

INTEGRITY

ACTIONS

INTEGRITY GAP

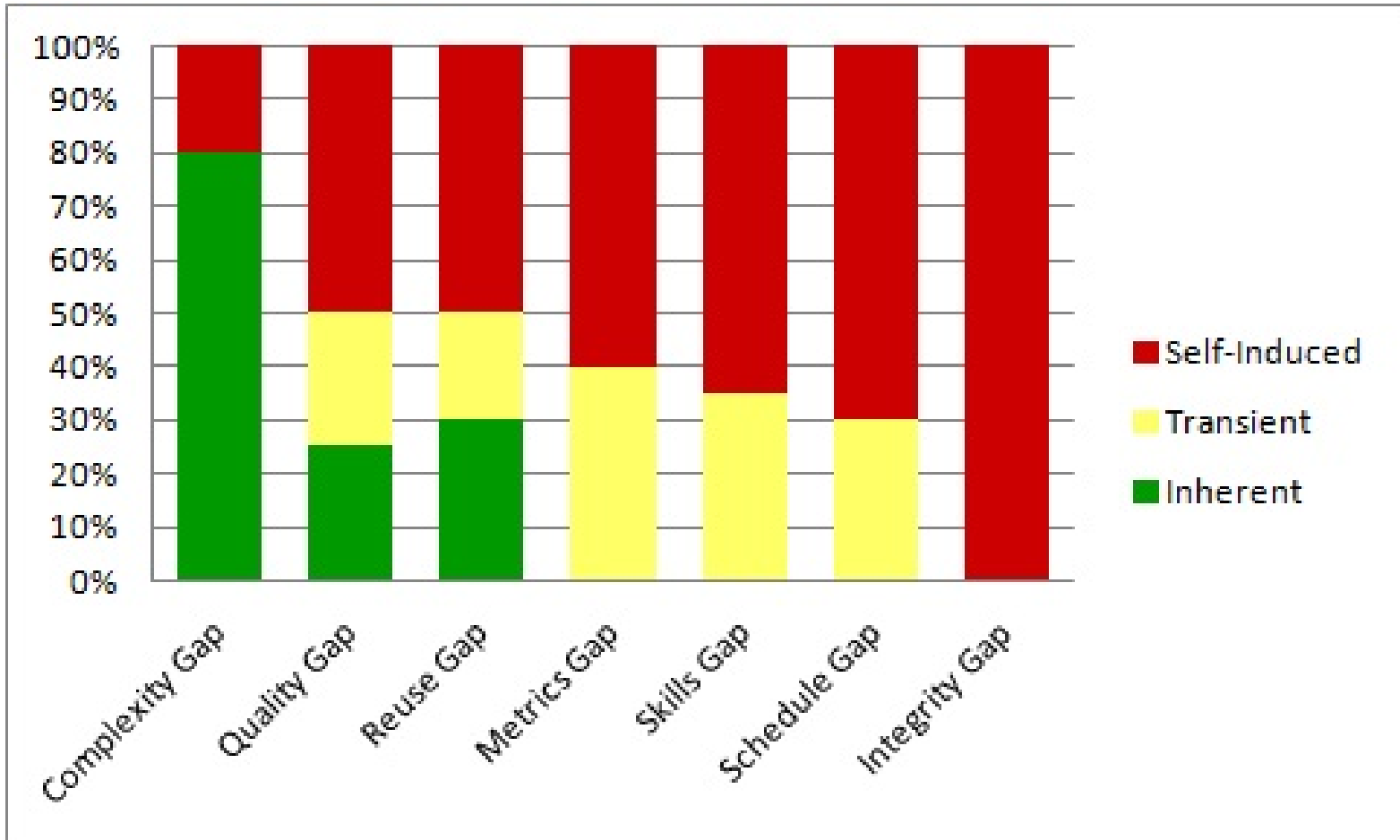**Lack of Introspection**

HIS FAULT
HER FAULT
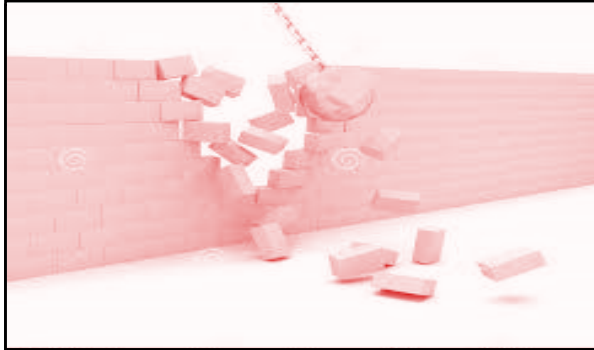THEIR FAULT
NOT ME

Miscommunication Driven Verification

Ulterior Motives Driven Verification

Verification Gap Summary

Verification Gap Tractability

Inherent Verification Gap

INNOVATION

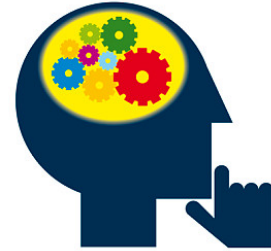**Transient Verification Gap**

INVESTMENT

Self-induced Verification Gap

INTROSPECTION

TRACTABILITY

Conclusion

- Perception of Verification Gap

- Verification is NOT for the paranoid

- Choice & Responsibility

Next Step

- **Understand YOUR Verification Gap**

- **Address the Self-Induced Gap……..NOW!**
  - Am I creating the Verification Gap?
  - What problem am I trying to solve?