IN-PERSON 2022 INCOSE San Diego Mini-Conference
Saturday, December 3rd, 2022

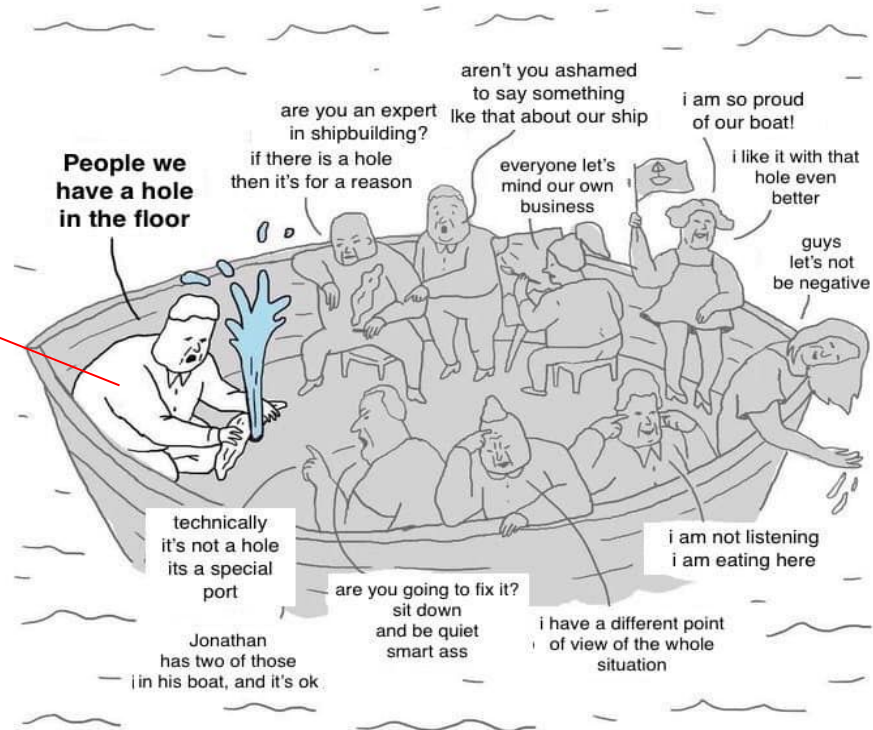# Demonstrating Resilience as Systems Engineers

Sri Harsha Maramraju

Conway's Law - 1967

"Organizations which design systems…..are constrained to produce designs which are copies of the communication structures of those organizations."

- Melwin E. Conway

Our beloved Systems Engineer...

This, right here, is your Systems Engineer

Systems Engineer is expected to:
- Catch errors early.
- Effectively communicate.
- Help minimize rework.
- Be comfortable with change.
- Take chaos and bring structure to it.

General role of a typical Systems Engineer

- Come up with Architectures that meet corporate goals.
- Perform feasibility analyses to assess Technology readiness level (TRL). Identify technical risks.
- Elicit and clarify requirements before jumping into a conclusion.
- Create operational model of the system and support activities.
- Determine solutions to technical issues which will define system architecture, requirements, and capabilities.
- System Integration, Test, and Analysis.
- Post-launch field issues.

In general, a **Systems Engineer** is responsible for everything about the System
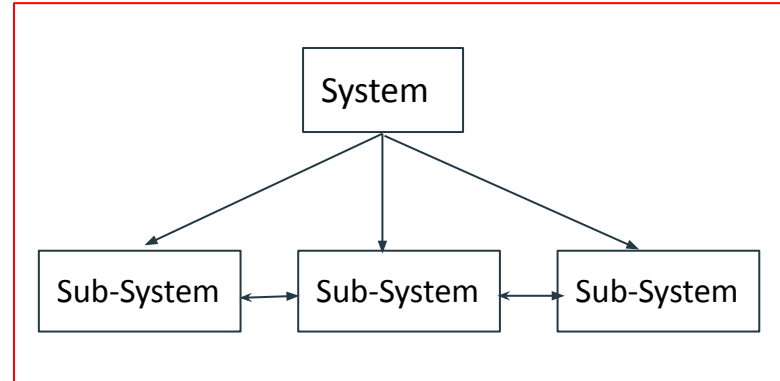
Different Types of Systems Engineer (per any job profile)

- Systems Engineer
- Lead/Senior/Staff/Technical/Principal/Chief Systems Engineer
- Systems Software Engineer
- Systems Safety Engineer
- Requirements/V&V Systems Engineer
- Systems Architect
- Systems Integration Engineer
- Systems Service Engineer
- Systems Scientist
- Systems Specialist
- Systems Product Owner
- …

VS

- Program Manager
- Lead Design Engineers
- Speciality Engineers
- Support Personnel
- Team Leaders
- …

"Systems Engineers CANNOT be expected to have blinders on and work in their comfort zones…"

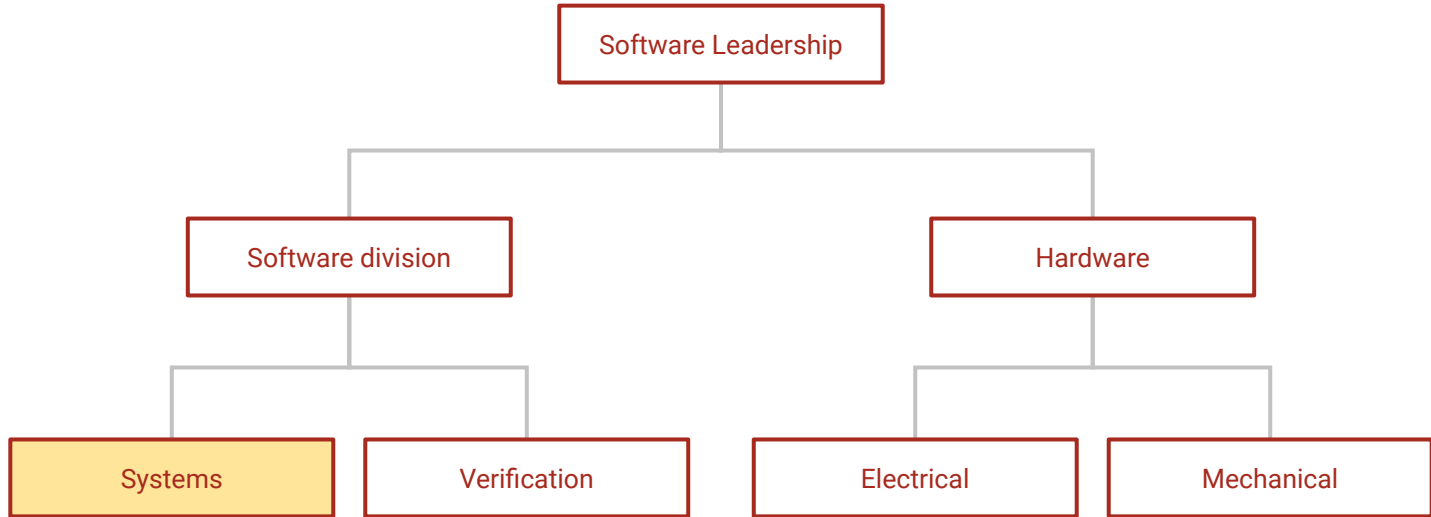"System Engineers are NOT who you are, it is what you do…"

Your values, your R-A-C-I

Question: Is Systems Engineering a 'Supporting Role' or is it a dedicated role in your organization?

- RACI - Responsible, Accountable, Consulted, Informed.
- Responsibility, Accountability and Authority (RAA) - definitions
- Who has the RAA of a project?
- How often do System Engineers have the authority to make decisions? And what kind of decisions?

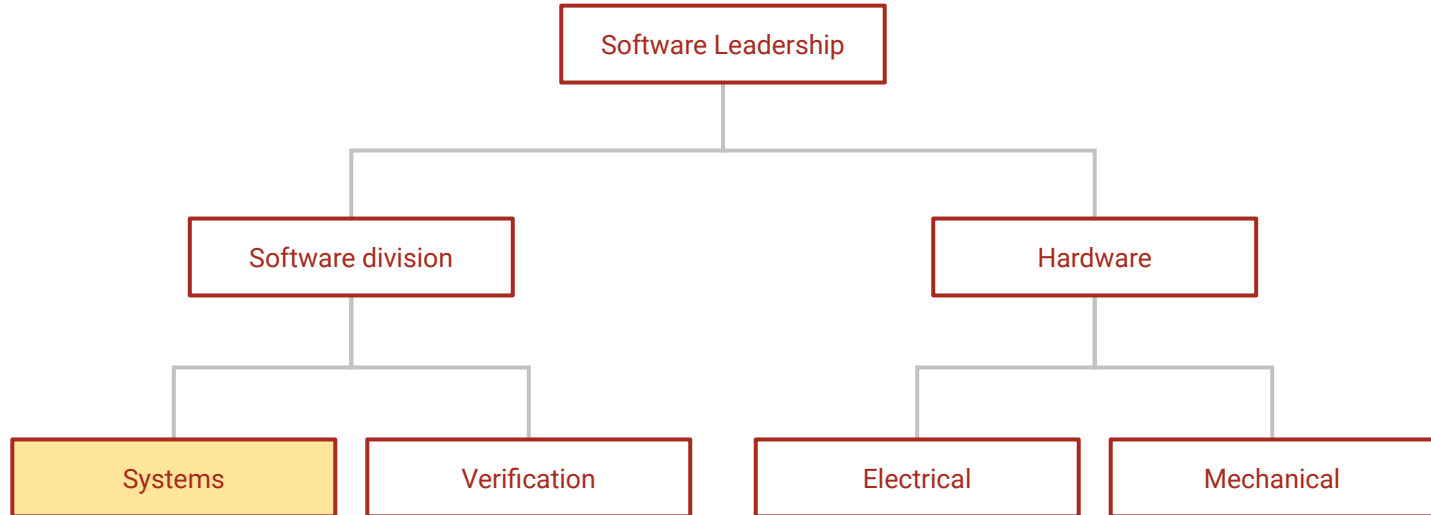# Scenario 1: Journey of a SE in a Software Company

- Software developers acting as Systems Engineers.
- Often see creating Software workstream with Systems activities baked into it.
- Driven by Agile tools

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                    ┌─────────────────────┐
                    │ Software Leadership │
                    └─────────────────────┘
              ┌──────────────┴──────────────┐
       ┌──────────────────┐          ┌──────────────┐
       │ Software division │          │   Hardware   │
       └──────────────────┘          └──────────────┘
         ┌──────┴──────┐            ┌──────┴──────┐
    ┌─────────┐  ┌──────────────┐  ┌───────────┐  ┌────────────┐
    │ Systems │  │ Verification │  │ Electrical│  │ Mechanical │
    └─────────┘  └──────────────┘  └───────────┘  └────────────┘
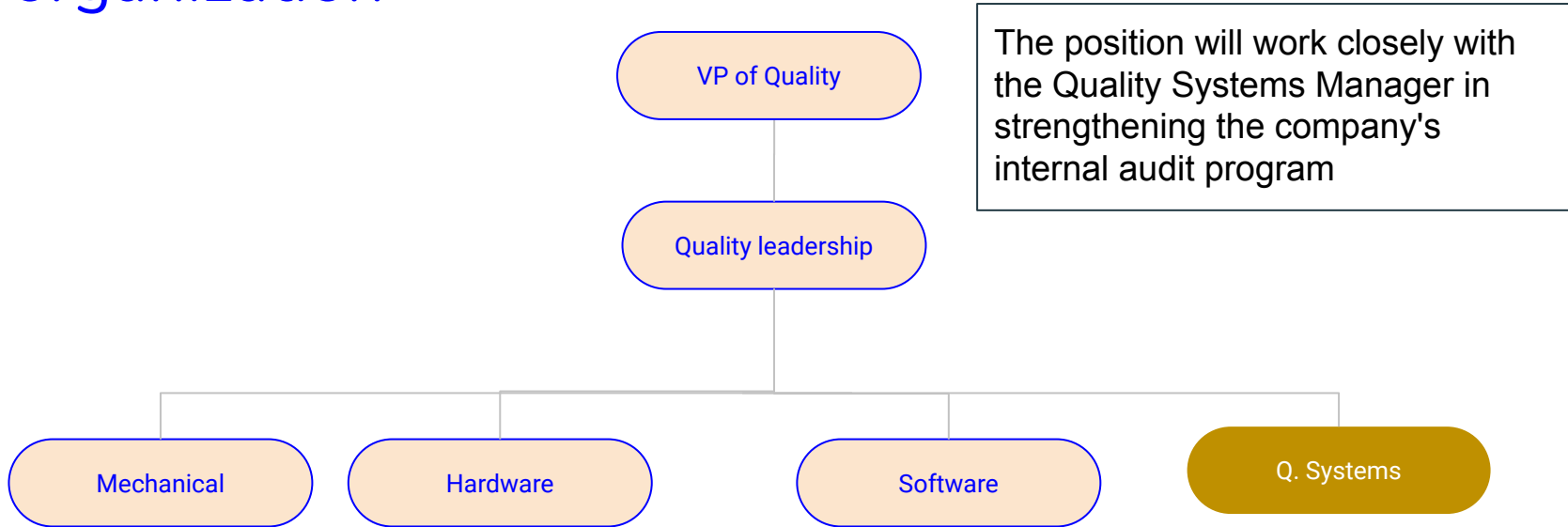```

# Scenario 1: Journey of a SE in a Software Company

**Challenges:**

- May lack the ability to empower.
- Functional teams may not wait for Systems engineers to finalize Needs and System-level requirements.
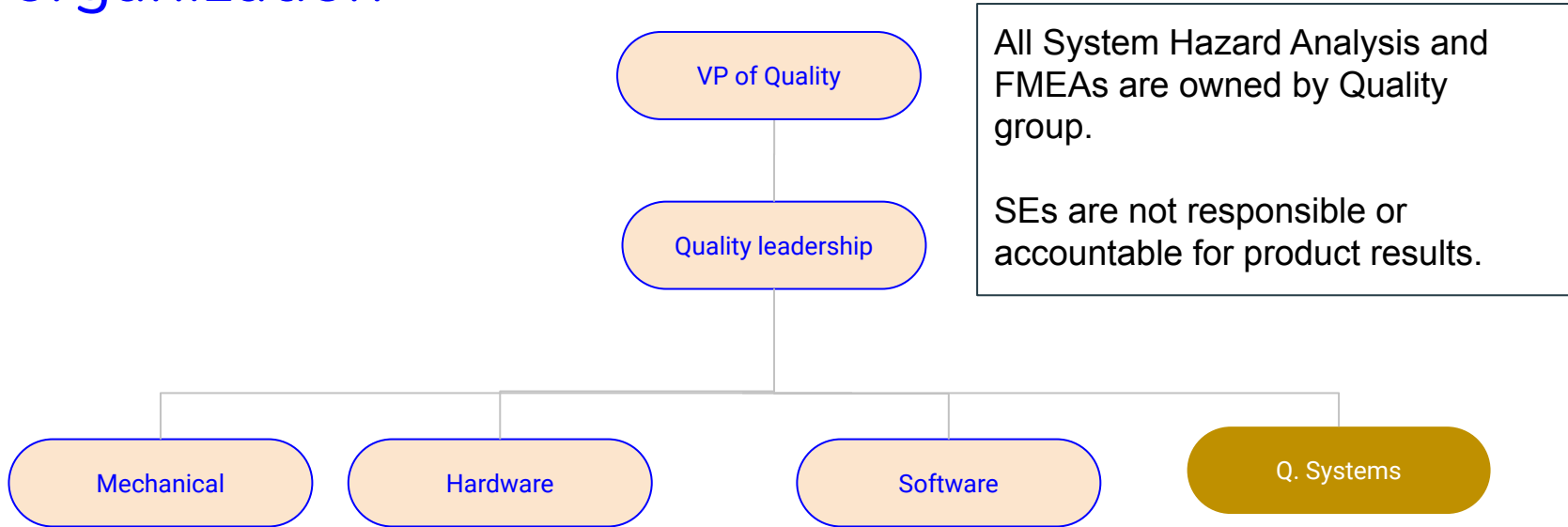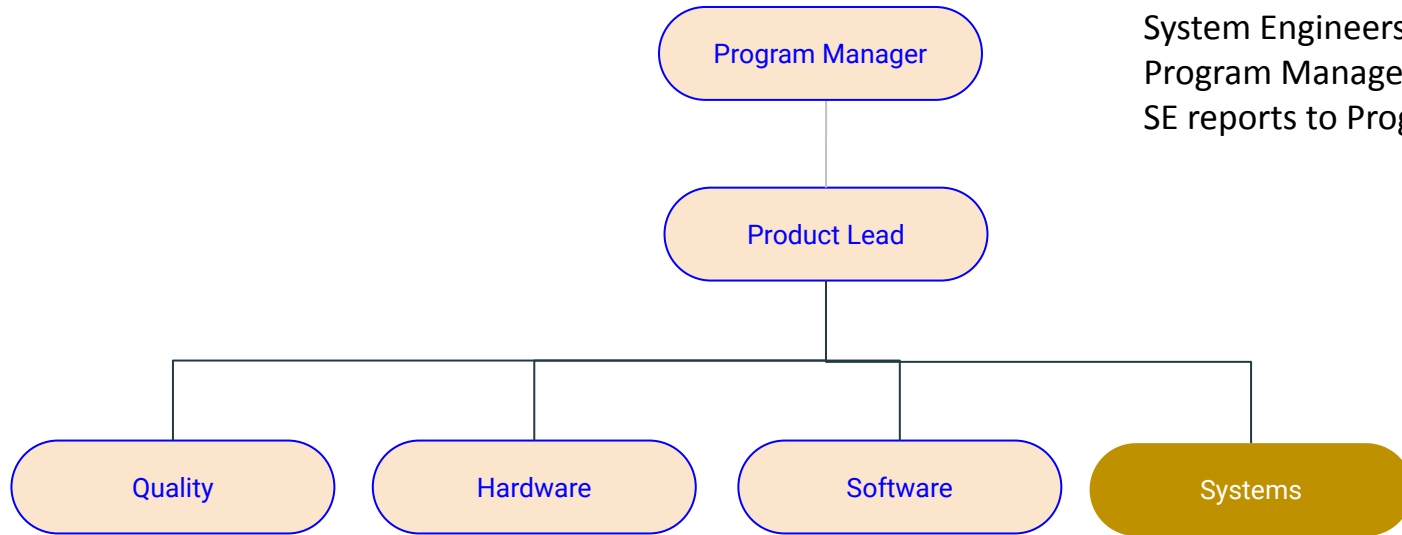- System requirements may read like Software requirements.

# Scenario 2: Journey of a SE in Quality-driven organization



VP of Quality

Quality leadership

Mechanical

Hardware

Software

Q. Systems

The position will work closely with the Quality Systems Manager in strengthening the company's internal audit program

# Scenario 2: Journey of a SE in Quality-driven organization



VP of Quality

Quality leadership

Mechanical

Hardware

Software

Q. Systems

All System Hazard Analysis and FMEAs are owned by Quality group.

SEs are not responsible or accountable for product results.

# Scenario 3: Journey of a SE in PM driven organization



Program Manager

Product Lead

Quality

Hardware

Software

Systems

System Engineers represents the Program Manager.
SE reports to Program Manager.

Systems Engineers are not accountable for product results.

# Scenario 3B: Journey of a SE in PM driven organization

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                    ┌──────────────────┐
                    │ Program Manager  │
                    └──────────────────┘
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| Software Engineering | Hardware Engineering | Mechanical Engineering | Electrical Engineering | Systems Engineering | Quality Engineering |
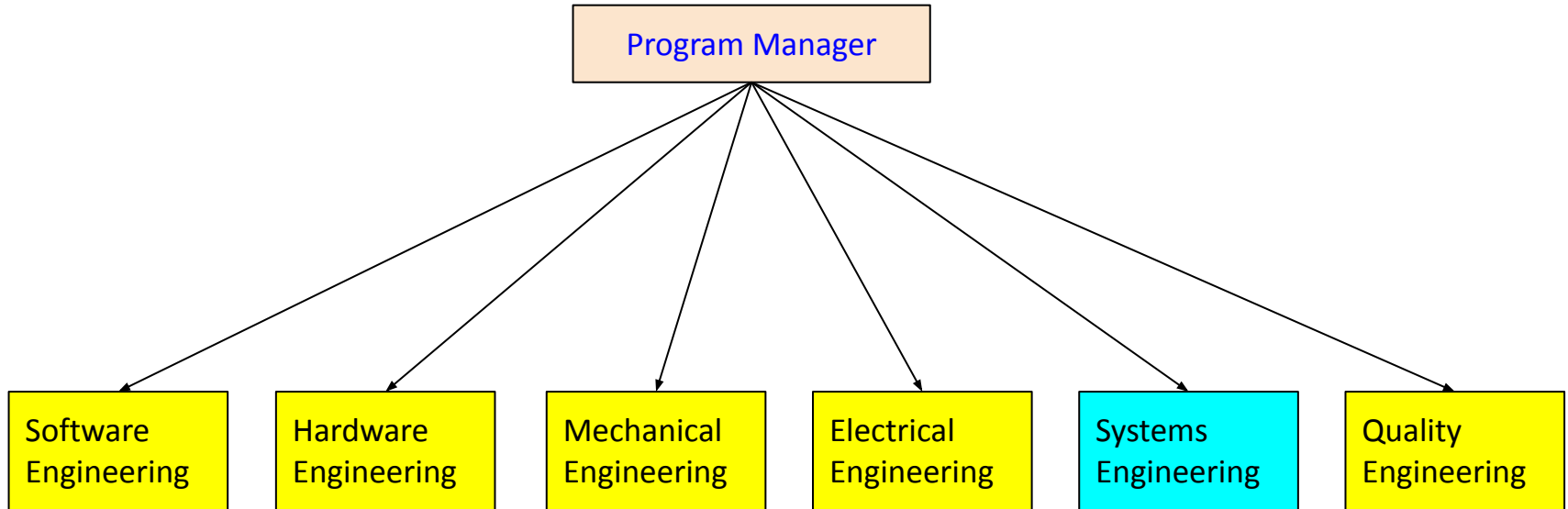
This model encourages siloed environment with no incentive to collaborate naturally…

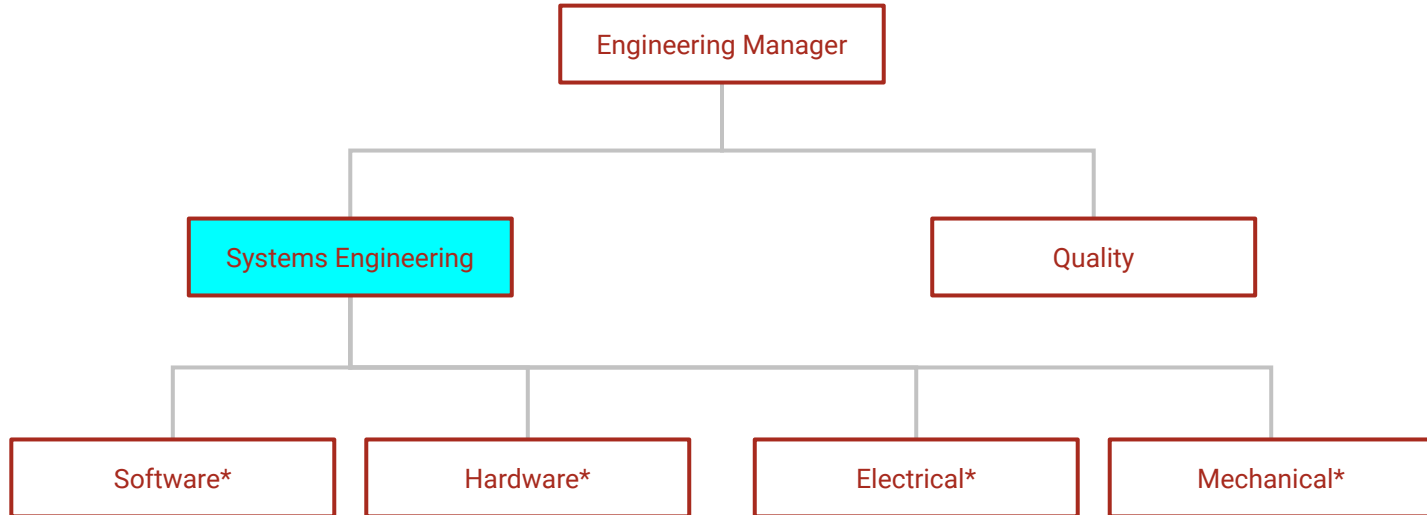# Where's the place of a Systems Engineer in an Organization?

Depends on corporate sponsorship, i.e. who champions the project(s)? Are the project(s) sponsored by:

- Is it Quality Leadership?
- Is it Program Management Leadership?
- Is it Software division?

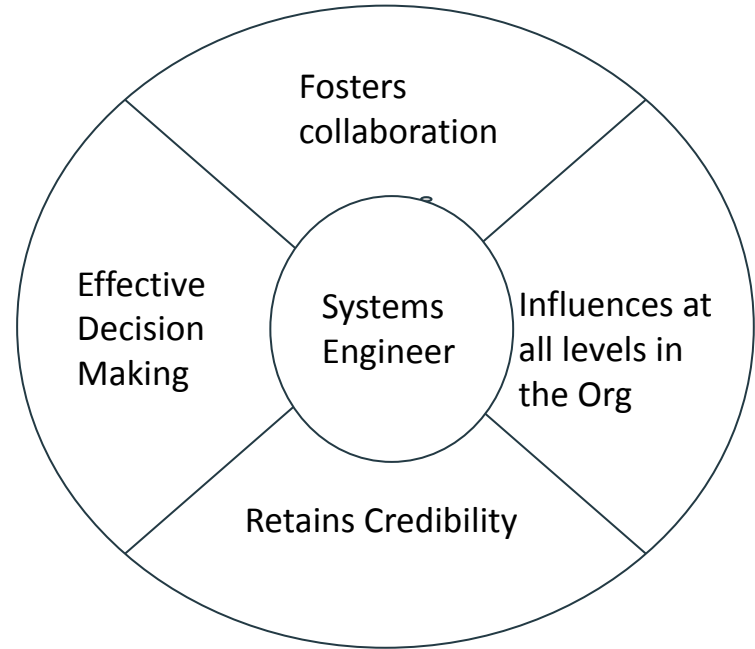Is it the cart before the horse or the horse before the cart?
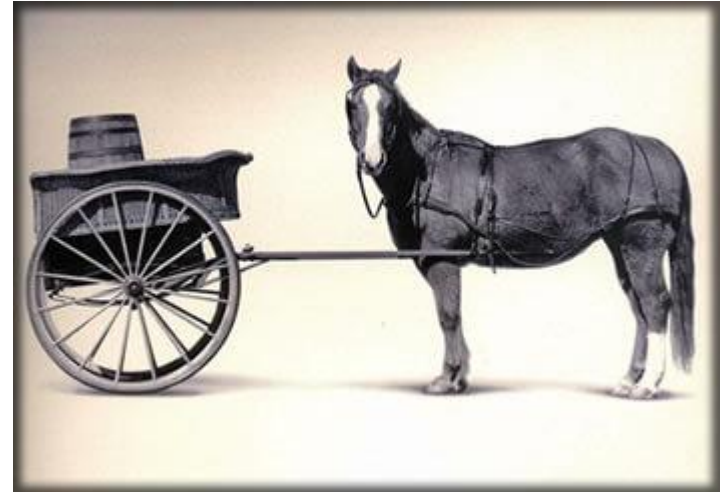
Foundations of a Resilient Systems Engineer

Successful SE behaviors =

Your personal traits i.e who you are

+

Your professional skills i.e. what you can do

Fosters collaboration

Effective Decision Making

Systems Engineer

Influences at all levels in the Org

Retains Credibility

Summary

- Depending on where Systems Engineering is placed in the hierarchy in an organization, a Systems Engineer's role and influence can be determined.
- Corporate leadership should decide how much of Systems Engineering rigor is necessary in their projects.
- Sphere of influence of a Systems Engineer may be dependent on addressing the key systems complexity in the project.