

# Leading Complex Technology Projects to Success

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# About Me



- Ms. Ronning is Owner and Principal Consultant for EBE Consulting, LLC, a woman, minority, and veteran owned small business based in the Portland, Oregon area.
  - She is a PMI® certified Project Management Professional and registered Professional Engineer in 4 states with over 20 years' experience in the wireless telecommunications industry.
- Ms. Ronning is co-chair of the Telecommunications Working group for the International Council on Systems Engineering AND has stepped up to chair the Cascade Chapter – which covers Southwestern and Eastern Washington and all of Oregon.
  - Her goal is to share the vision of systems thinking and to develop best practices for delivering complex technology projects worldwide through her association with INCOSE® and PMI®.



# Agenda

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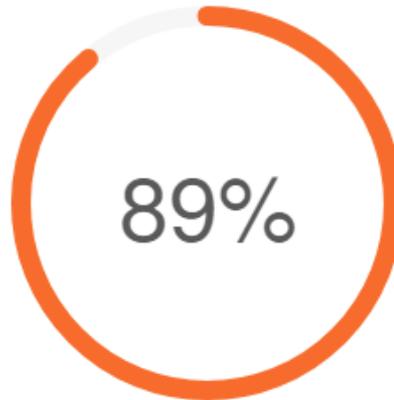
1. What is a complex technology project
2. Systems and systems thinking
3. Leading leaders
4. Using a complex systems delivery model

# PMI® Pulse of the Profession 2016, 2017



80%

**of major projects fail**



89%

**of major projects are more successful  
when organisations break from  
traditional PM methods**



78%

**of major projects are deemed to have  
medium-high levels of complexity**

Reference: About ICCPM, <https://iccpm.com/about-iccpm/>



Defining

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# COMPLEX TECHNOLOGY PROJECTS

# Definition: Complex Project



- According to Queensland University of Technology (QUT) in Brisbane Australia, complex projects are those that:
  - Are characterized by uncertainty, ambiguity, dynamic interfaces and significant political or external influences; and/or
  - Usually run over a period which exceeds the technology cycle time of the technologies involved; and/or
  - Can be defined by effect, but not by solution

Reference: <https://www.projectmanager.com/blog/manage-a-complex-project>

# Definition: Complexity



- INCOSE's Complex Systems Working Group defines complexity and describes how to identify it in an environment, a problem space, or a solution space
  - “In ordinary language, we often call something complex when we can't fully understand its structure or behavior: it is uncertain, unpredictable, complicated, or just plain difficult.”
  - “Complexity is an attribute of the technical system being developed but also of the problem space (including people and organizations), and the environment. Complexity is associated with size, diversity, dynamism and with emergence.”

Reference: INCOSE Complex Systems Working Group 2015, A Complexity Primer for Systems Engineers

# Definition: Complexity (cont.)



- QUT “Model of Project Complexity: Distinguishing dimensions of complexity from severity” states...
  - “...complex systems are made up of large numbers of multiple-interacting components in which it is difficult to or understand the behaviour of the individual components or predict the overall behaviour of the system, based on knowledge of the starting conditions”

Reference: Remington, Zolin, Turner 2009, A Model of Project Complexity: Distinguishing dimensions of complexity from severity

# Complexity Stated Simply...



- The sum of the parts are greater than the whole

$$2 + 2 = 5$$



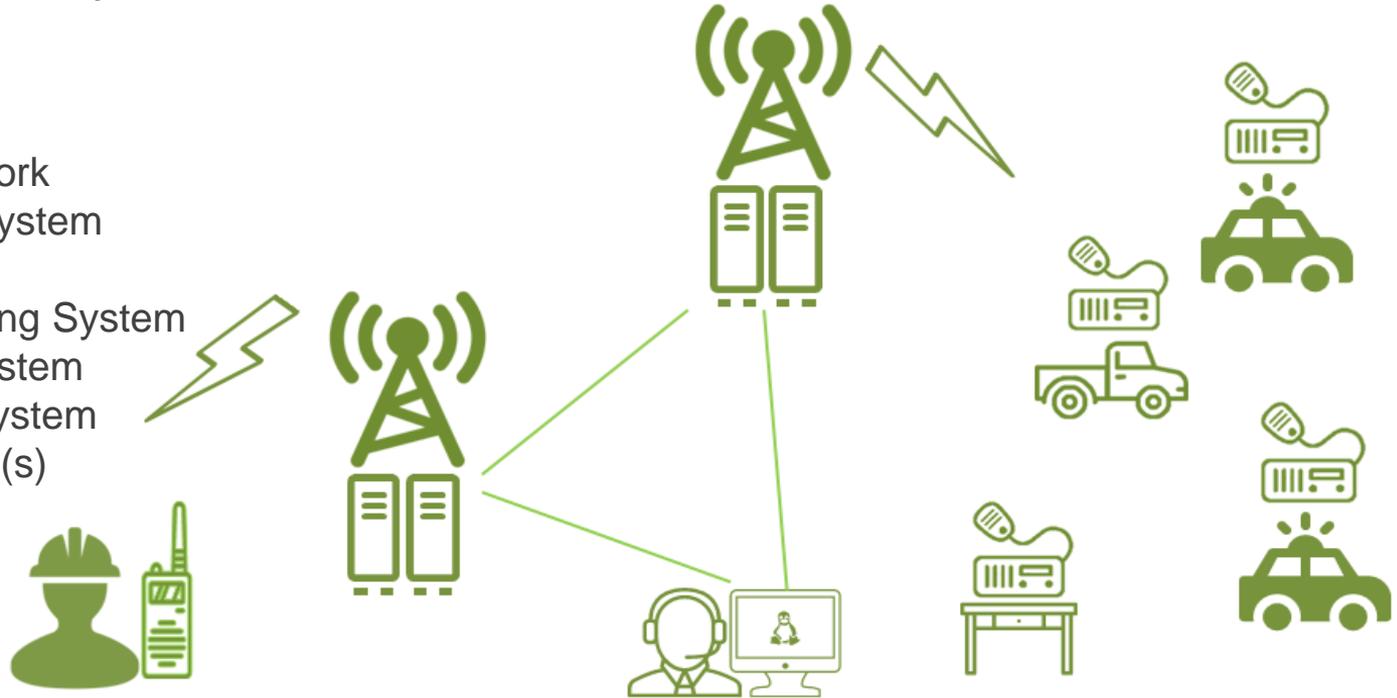
Understanding

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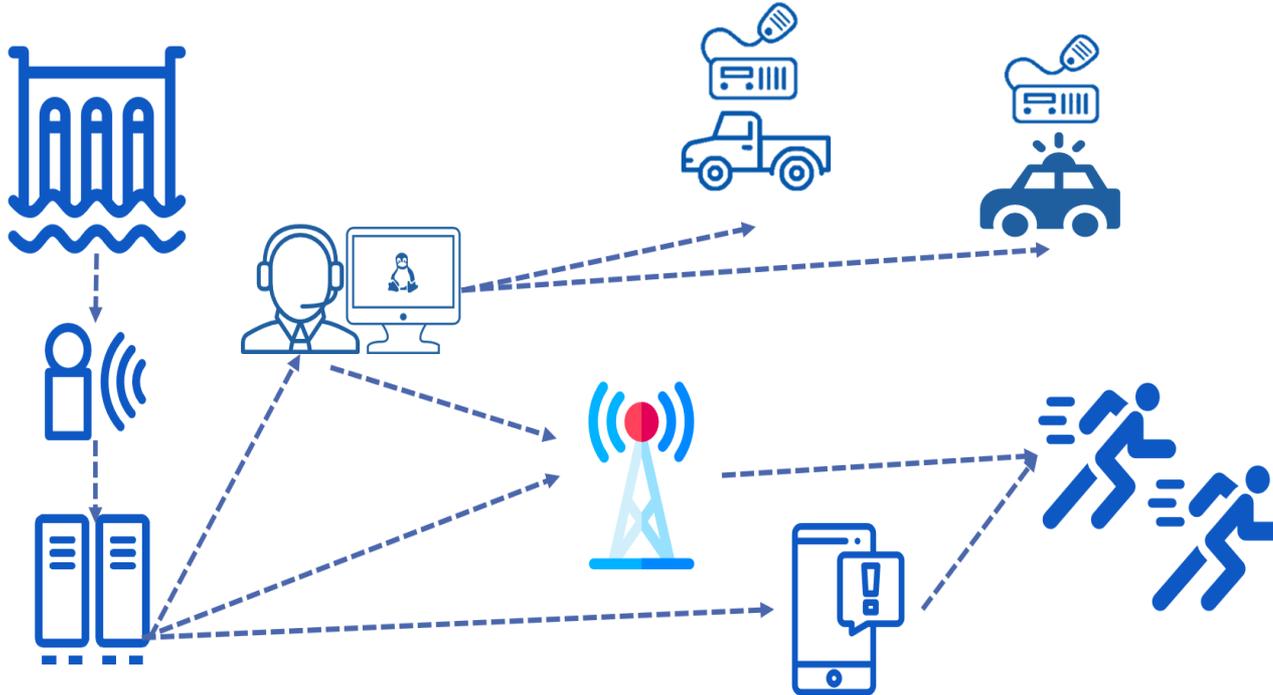
# **SYSTEMS AND SYSTEMS THINKING**

# Land Mobile Radio System

1. Land Mobile Radio System
2. RF System
3. IP Network
4. Fiber Network
5. Microwave Network
6. Dispatch (911) System
7. AVL System
8. Alarm & Monitoring System
9. Data Logging System
10. Voice Logging System
11. Site Civil System(s)



# Early Warning System



1. **Early Warning System**
  - a) Outdoor Sirens
  - b) Indoor Alerting Devices
  - c) Highway Message Signs
2. RF System
3. IP Network
4. Fiber Network
5. Microwave Network
6. Dispatch System
7. Alarm & Monitoring System
8. Data Logging System
9. Site Civil System(s)

# How Many Engineers Does it Take to...



**Project Manager & Systems Engineer**

**Operations & Maintenance**

| System   | Description  | Subject Matter Expert                   |
|--|--|---|
| <b>System of Interest</b>  |  |   |
| <b>Early Warning System</b>  | End User interface includes siren controllers and siren alerting devices                                   | Siren Architect; Acoustics Engineer     |
| <b>Supporting Systems</b>  |  |   |
| <b>Baseband (IP-TDM) Network System</b>                              | Baseband IT network routing protocols and physical network connections between devices                     | Network                                 |
| <b>“Hardwired” or Point-to-Point Networks</b>                        | Fiber or Microwave or Copper Wire  | Fiber<br>Microwave                      |
| <b>“Wireless” or Point-to-Multipoint Networks</b>                    | Radio Frequency (RF)   | RF/ Radio                               |
| <b>Data logging, alarm notifications, &amp; equipment monitoring</b> | Remote Terminal Units (RTUs)<br>SNMP Management Servers  | Alarm & Monitoring                      |
| <b>Site Civils</b>   | Shelters, Towers, Generators, Fence, Grounding   | Civil Engineer(s); Construction Manager |
| <b>Physical Site Systems Equipment</b>                               | General: End user devices, equipment racks, antennas, primary & backup power, network connectivity systems | Site Architect; Facilities Maintenance  |

# Roles

## Project Delivery

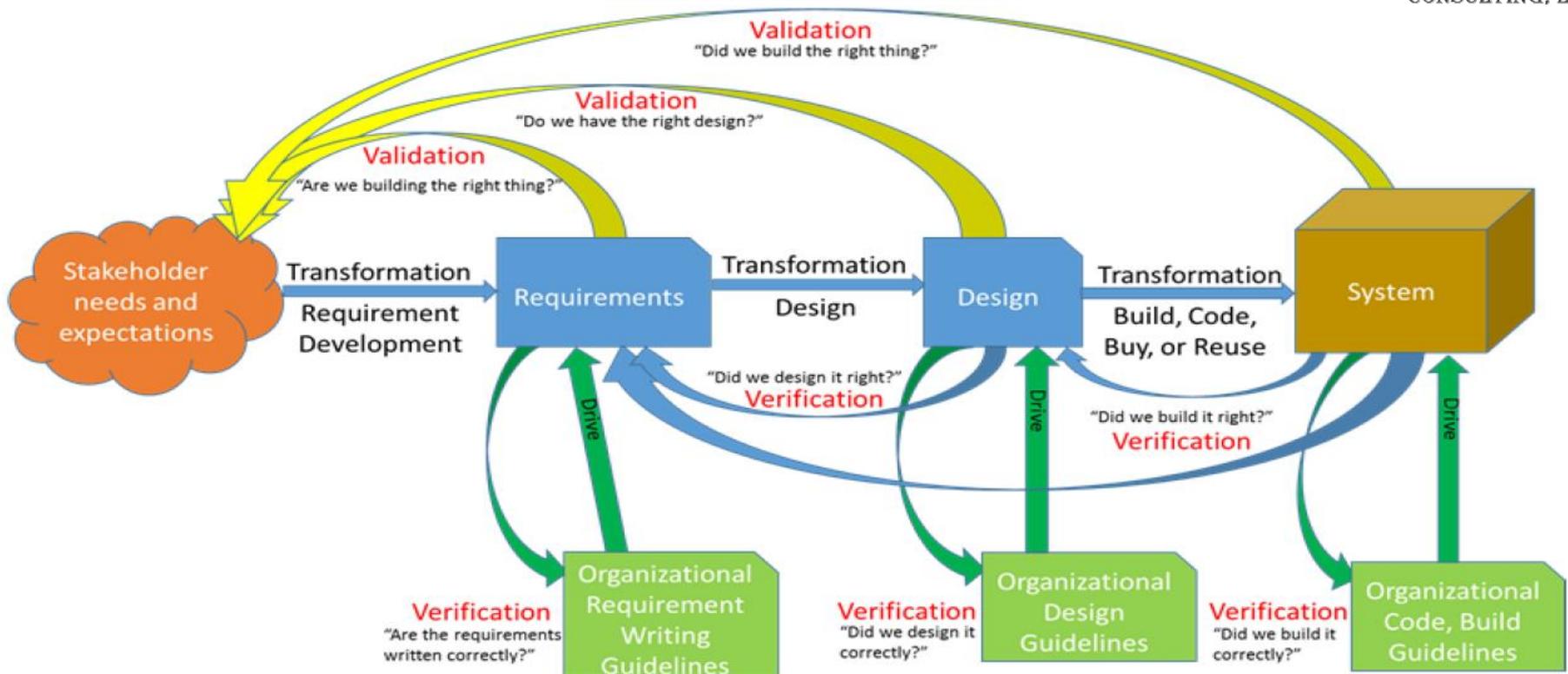
- Project Manager
- Systems Engineer
- System Architect
- Design Engineer
- Field Engineer
- Installation & Test

## Operations & Maintenance

- Business Unit
- System Manager
- Maintainer
- Operator
- Regulators

Key  
Stakeholders

# Stakeholder: Needs >> Validation



Reference: Ryan, M., Wheatcraft, L., "On the Use of the Terms Verification and Validation", INCOSE International Symposium IS2017, July 2017.



Lead by

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# LEADING LEADERS

# Shared Project Leadership Model



- In an attempt to deliver projects successfully, we have traditionally focused on management and control, and virtually excluded the vital role of leadership.
  - Traditionally, the project manager focuses on planning, budgeting, organizing, staffing, monitoring, and controlling.
  - All project team members report to the project or program manager regarding project work assigned to them.

Reference: Hass, Kathleen 2000, Managing Complex Projects. Part 1 ([link](#))

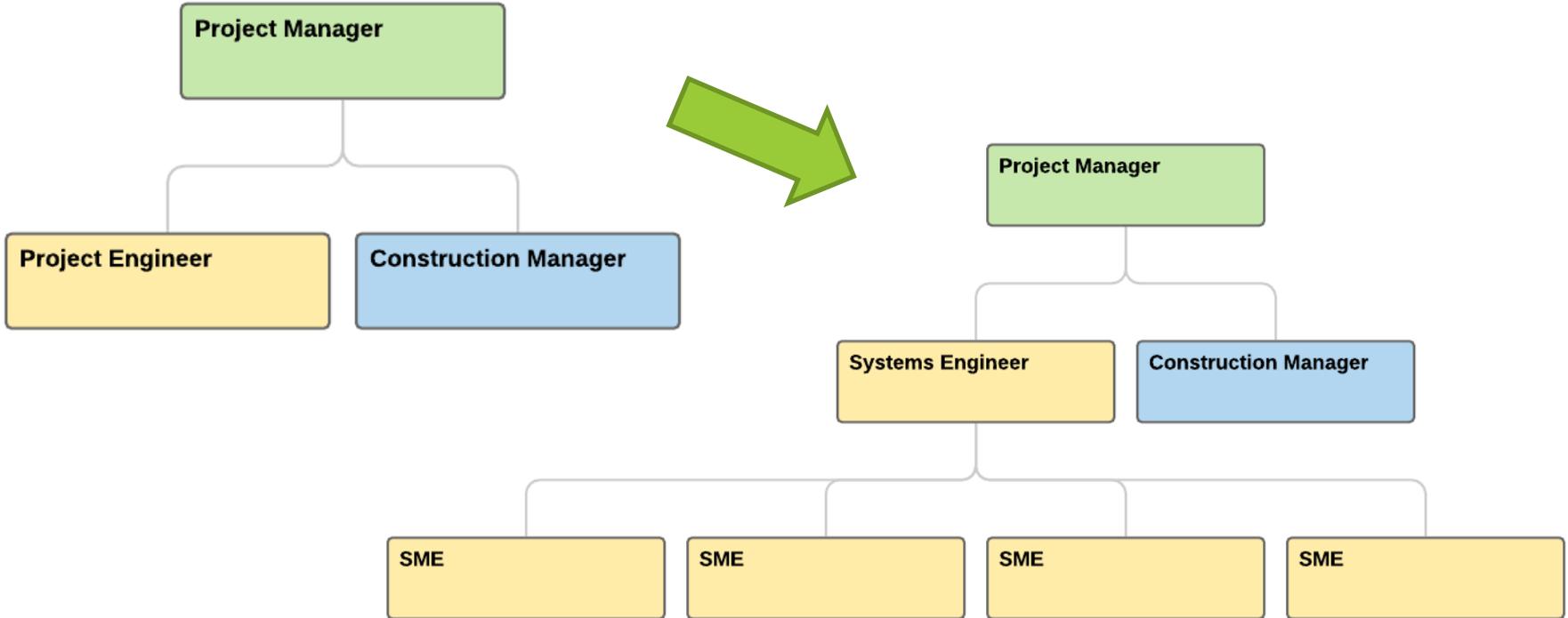
# Shared Project Leadership Model



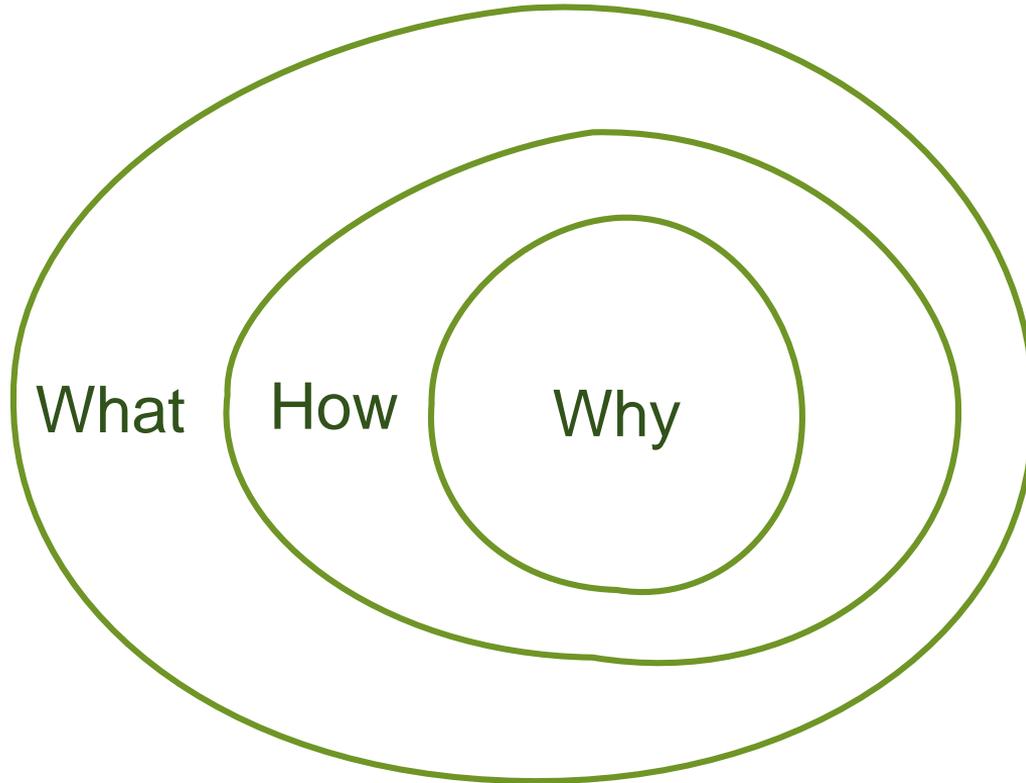
- It is now becoming clear that complex projects thrive on collaboration, teams, and leadership rather than management, command and control.
  - *In the 21st century, managing complex projects is transitioning **from a focus on project management to a focus on shared team leadership.***
- This core leadership team shares responsibility for guiding the project, each taking the lead when their expertise is needed most.
- Clearly, complex projects are just that: too complex for the traditional project manager and
  - ***requiring expertise leadership from several key experts.***

Reference: Hass, Kathleen 2000, Managing Complex Projects. Part 1 ([link](#))

# Project Team



# Simon Sinek: The 'Golden Circle'



## Simon Sinek: Start with “why”

- There are leaders and there are those who lead.
  - **Leaders** hold a position of power or authority.
  - **Those who lead** inspire us, be they individuals or organizations.
- We follow **those who lead**,
  - not because we have to, but because we want to.
  - not for them, but for ourselves.



Using a

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# COMPLEX SYSTEMS DELIVERY MODEL

# Complex Systems Delivery Model (CSDM)



- Definition of a complex systems delivery model
  - The lifecycle phases of each supporting system are considered independently until such time they are necessary to be integrated and tested together with the system of interest (SOI)
- A complex system delivery model is necessary to be used on projects where there are few, if any,
  - integrators capable of undertaking ownership of the system of interest and all supporting systems, or
  - if there are one or more supporting systems that must be designed, managed, and/or integrated by the owner

| Task Name                           | Duration | Start    | Finish   | Predecessor | 2020 |    |    |    |    | 2021 |    |    |    |  |  |
|-------------------------------------|----------|----------|----------|-------------|------|----|----|----|----|------|----|----|----|--|--|
|                                     |          |          |          |             | Q3   | Q4 | Q1 | Q2 | Q3 | Q4   | Q1 | Q2 | Q3 |  |  |
| <b>Project Scoping</b>              | 30d      | 07/01/19 | 08/09/19 |             |      |    |    |    |    |      |    |    |    |  |  |
| Options Analysis & Scope Definition | 30d      | 07/01/19 | 08/09/19 |             |      |    |    |    |    |      |    |    |    |  |  |
| Approval and Funding                | 0        | 08/09/19 | 08/09/19 | 2           |      |    |    |    |    |      |    |    |    |  |  |
| <b>Project Design</b>               | 160d     | 08/12/19 | 03/20/20 |             |      |    |    |    |    |      |    |    |    |  |  |
| 30% Design Package                  | 20d      | 08/12/19 | 09/06/19 | 3           |      |    |    |    |    |      |    |    |    |  |  |
| 60% Design Package                  | 20d      | 09/09/19 | 10/04/19 | 5           |      |    |    |    |    |      |    |    |    |  |  |
| 90% Design Package                  | 20d      | 10/07/19 | 11/01/19 | 6           |      |    |    |    |    |      |    |    |    |  |  |
| Final Design Package                | 20d      | 11/04/19 | 11/29/19 | 7           |      |    |    |    |    |      |    |    |    |  |  |
| Permitting                          | 100d     | 11/04/19 | 03/20/20 | 7           |      |    |    |    |    |      |    |    |    |  |  |
| <b>Procurement</b>                  | 60d      | 03/23/20 | 06/12/20 |             |      |    |    |    |    |      |    |    |    |  |  |
| Bid Process                         | 60d      | 03/23/20 | 06/12/20 | 9           |      |    |    |    |    |      |    |    |    |  |  |
| Award                               | 0        | 06/12/20 | 06/12/20 | 11          |      |    |    |    |    |      |    |    |    |  |  |
| <b>Construction</b>                 | 98d      | 06/15/20 | 10/28/20 |             |      |    |    |    |    |      |    |    |    |  |  |
| Procure Materials                   | 60d      | 06/15/20 | 09/04/20 | 12          |      |    |    |    |    |      |    |    |    |  |  |
| Site Grading                        | 30d      | 06/15/20 | 07/24/20 | 12          |      |    |    |    |    |      |    |    |    |  |  |
| Foundation                          | 15d      | 07/27/20 | 08/14/20 | 15          |      |    |    |    |    |      |    |    |    |  |  |
| Framing                             | 20d      | 08/17/20 | 09/11/20 | 16          |      |    |    |    |    |      |    |    |    |  |  |
| Sheathing                           | 25d      | 09/14/20 | 10/16/20 | 17          |      |    |    |    |    |      |    |    |    |  |  |
| MPE                                 | 60d      | 07/27/20 | 10/16/20 | 15          |      |    |    |    |    |      |    |    |    |  |  |
| Drywall                             | 12d      | 09/28/20 | 10/13/20 | 19FS        |      |    |    |    |    |      |    |    |    |  |  |
| Roofing                             | 15d      | 09/14/20 | 10/02/20 | 17          |      |    |    |    |    |      |    |    |    |  |  |
| Windows & Doors                     | 5d       | 10/05/20 | 10/09/20 | 21          |      |    |    |    |    |      |    |    |    |  |  |
| Paint                               | 10d      | 10/14/20 | 10/27/20 | 20          |      |    |    |    |    |      |    |    |    |  |  |
| Final Inspection                    | 1d       | 10/28/20 | 10/28/20 | 23          |      |    |    |    |    |      |    |    |    |  |  |
| Certificate of Occupancy            | 0        | 10/28/20 | 10/28/20 | 24          |      |    |    |    |    |      |    |    |    |  |  |

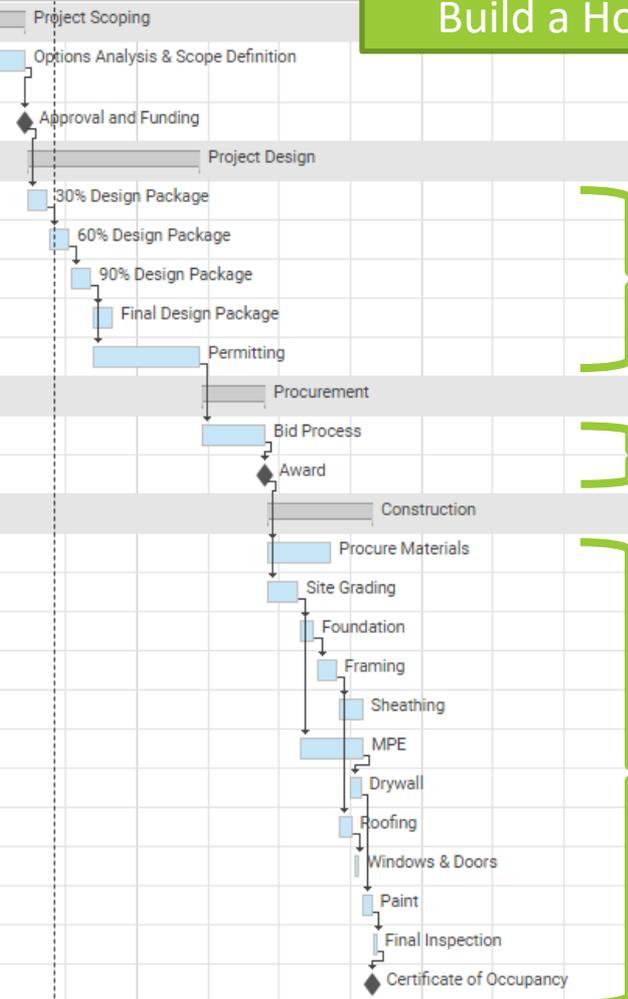
# Build a House (EPC)



Engineer

Procure

Construct

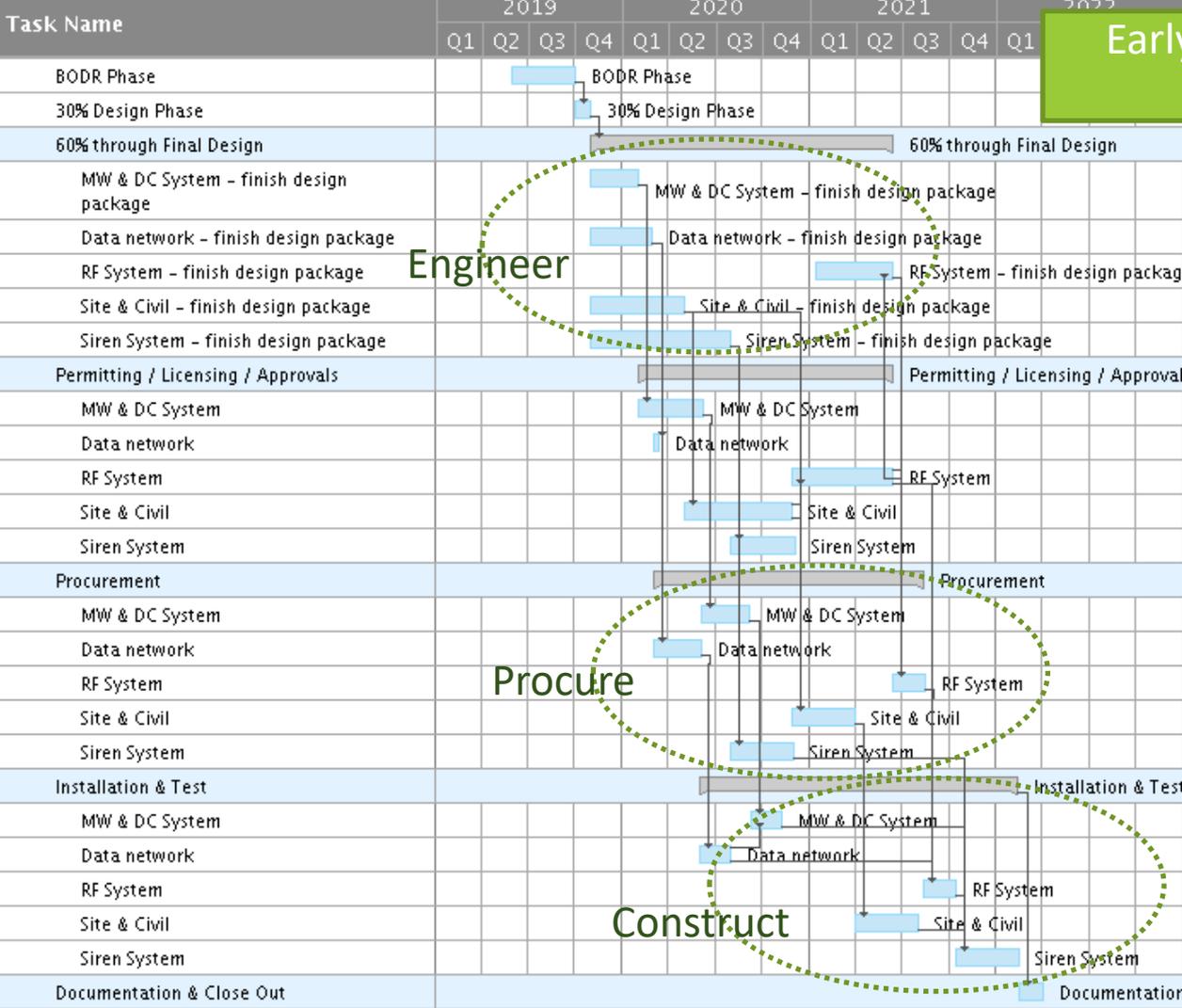


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# Early Warning System (CSDM)

EBC CONSULTING, LLC



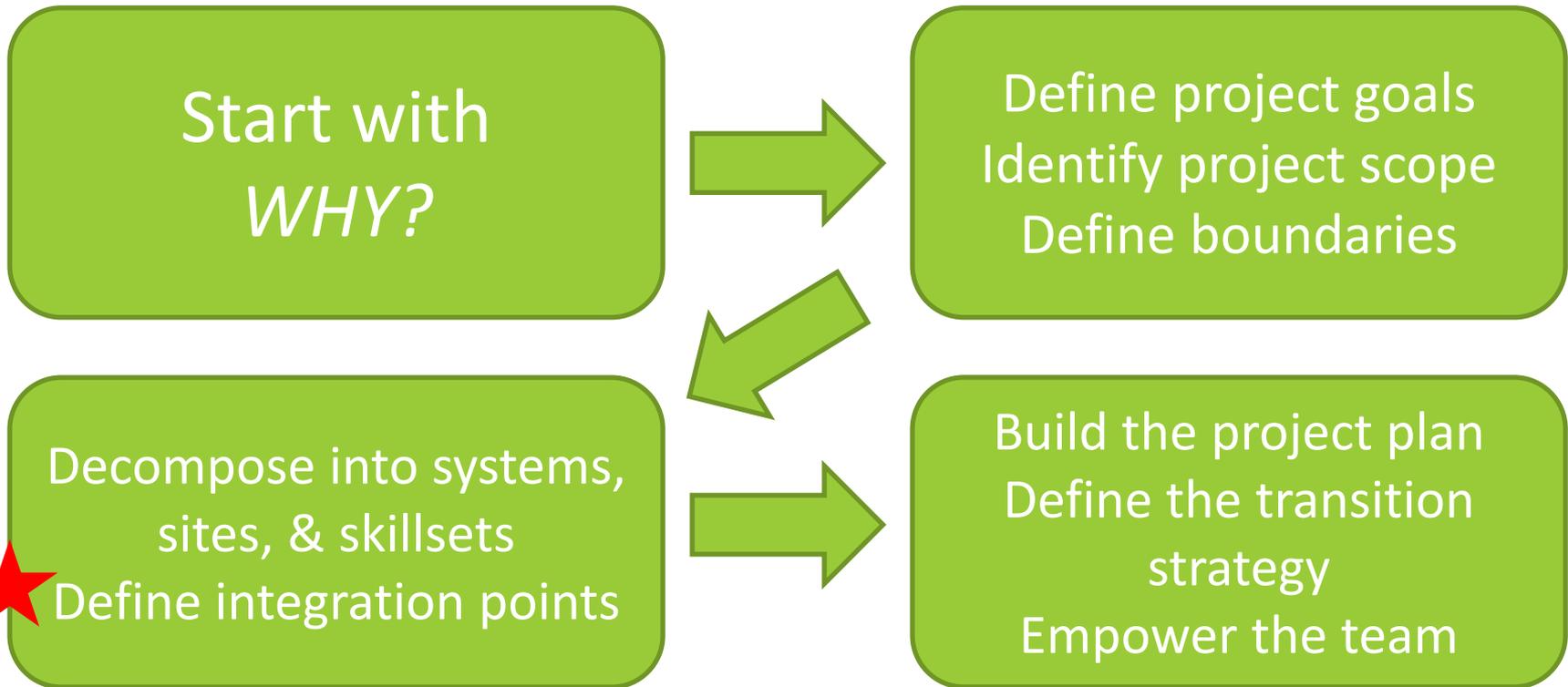
Engineer

Procure

Construct

- Decompose Project into
  - System of Interest
  - Supporting Systems
- Define Integration Points

# Complex Systems Delivery Model (CSDM)



# Questions? Thank you!

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