# Intentional Innovation through Fail Fast Formulating

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# What is Innovative?

**What products are innovative?**
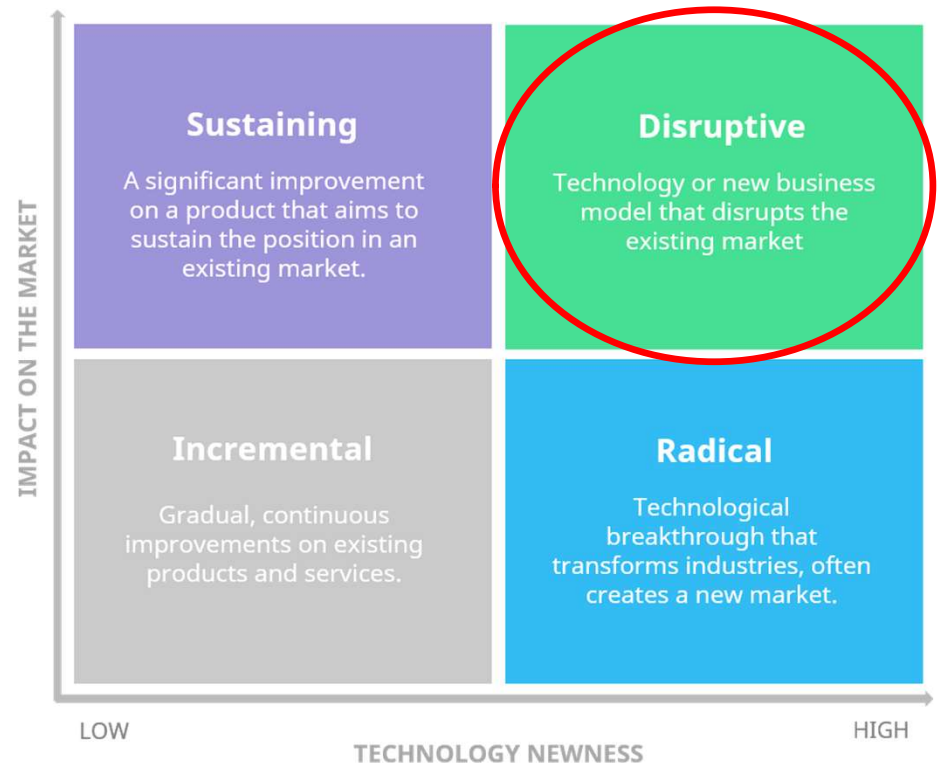**Why?**
**Which companies are innovative?**
**Why?**

# Degree of Innovation

▶**Types of Innovation** –

▶ Typically **Sustaining**

- ▶ Significantly better
- ▶ Market asking for it

▶ **Disruptive** starts out slow

- ▶ Changes the way things are done
- ▶ Examples;
- ▶ Intumescent versus cementitious
- ▶ Films versus liquid paint
- ▶ Passivation versus barrier coat

IMPACT ON THE MARKET

**Sustaining**

A significant improvement on a product that aims to sustain the position in an existing market.

**Disruptive**

Technology or new business model that disrupts the existing market

**Incremental**

Gradual, continuous improvements on existing products and services.

**Radical**

Technological breakthrough that transforms industries, often creates a new market.

LOW

HIGH

TECHNOLOGY NEWNESS

# Intentional Innovation

How do we know it's innovative? **New Ideas with High Market Impact $$$$**

**Ideal - Sustainable difference, Significantly better, Easily adopted**

Why do we want innovation?

- **Profitability** - Gross profit margins are higher than that of average

- **Sustainability** – Development profits that last and are protected through IP

- **Market share** – Market revenue increases as identity develops "**supplier of solutions**"

- **Your competition is!**

Innovation by design?

- Culture of **Critical Thinking** and **Creative Problem Solving**

- Creating a **Need** and **Desire** to solve problems and be entrepreneurs

# Market Needs for Innovation

**Mature Markets – Nice to Haves / Incremental Improvements**

- Major problems solved
- Satisfied with current solutions
- High level of competition and cost reduction
- Ex. Bridge and Highway

**Emerging Markets – Must Haves / Step Change Solutions**

- Many problems with full range of difficulty
- Value add options with accelerated change
- Ex. Enhanced Oil
- Ex. Electronic Vehicle

# Accidental Innovation

Microwave oven –

Vulcanized rubber –

Velcro –

Penicillin –

Viagra –

Corn flakes –

Pacemaker –

Radioactivity –

Dynamite –

Coca-Cola -

# Where to Start?

**Starts with a technology?**

**Starts with a molecule?**
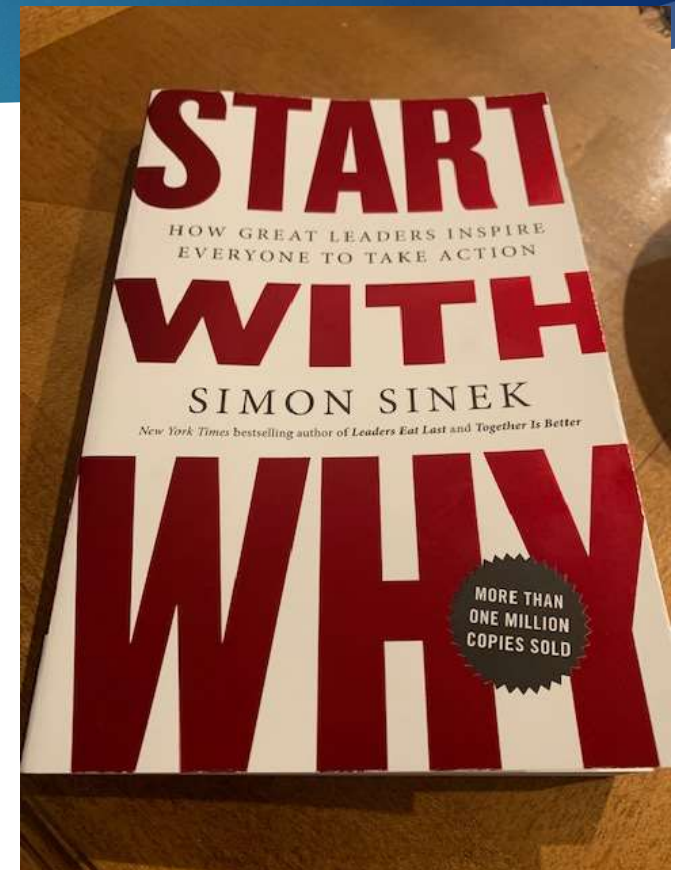
**Starts with a problem?**

**Something else?**

# Purpose and Focus

*"Start with WHY", Simon Sinek*

Start with a **Purpose** and maintain it.

**Common issues –**
- Scope change / creep
- Moving key targets (CTQs)
- Broad approach, "see what happens"
- Technology focus, PUSH
- Internally created, "out of touch"
- Poor listening, interpretation

# Innovation Process

## Innovation Strategy

1. Start with **Real Voice of Customer** and **Problem Statements** from Sales and Marketing

2. Create a **Wealth of Technology** with **Value Propositions (solutions)** to problem statements

**Stage Gate 1 - Opportunity / Financial and Conceptual Design**

- Get it right in the beginning with commitment from commercial
- Quicker to market with value-add process
- Greater sales revenue generation immediately after launch

# What is a Problem Statement?

- "A problem statement is usually one or two sentences to explain the problem your solution / project will address. In general, a problem statement will outline the negative points of the current situation and explain why this matters. It also serves as a great communication tool, helping to get BUYIN and SUPPORT from others."

- Apply the 5 W's – Who, What, Where, When, and Why

# Writing a Problem Statement

**Review your new problem statement against the following criteria:**

● **It should focus on only ONE problem.**

● **It should be one or two sentences long.**

● **It should NOT suggest a solution.**

**We do not develop technologies!**

# Poor Problem Statement Approach

Misuse 1: Problem statement are used as a feature list

Misuse 2: Problem statements are driven by business goals

Top ten –

1. **Assign a cause**
2. **Contain the solution**
3. **Are based on conjecture or belief rather than fact**
4. **Are too long**
5. **Do not describe actual current condition or problem condition**
6. **Do not describe the ideal or desired condition**
7. **Are not measurable**
8. **Are unclear**
9. **Are not specific**
10. **Refer to issues outside of the scope of the actual problem**

**Charles Kettering of General Motors Corporation is said to have said** *"A problem clearly stated is a problem half solved."*

https://blog.gembaacademy.com/2007/11/08/top_10_problems_with_problem_statements/

# Who is an Innovator?

▶ "A formulator is a professional responsible for **creating** and **developing** products according to specifications and regulations. They ensure quality by conducting programs of sampling and analysis, and maintain production schedules."…**INNOVATOR**?
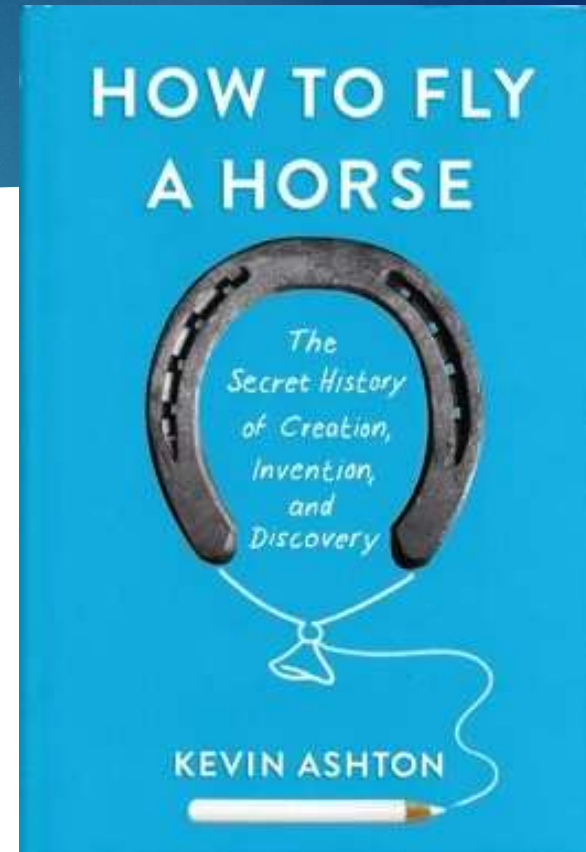
# How Do We Innovate?

**"How to Fly a Horse", Kevin Ashton**

**"Creation is not a moment of inspiration but a lifetime of endurance."**

**Does it take something special to be innovative?**

**Is everybody innovative?**

# Mission Statements

**Drive market value** solutions for high value asset protection through **superior subject matter expertise**.

- We actively pursue adding value to the business
- We are not a "service" to the business
- We are driven to learn at depth every aspect of what we do creating true expertise
- We do not wait for opportunity to come our way to provide the next challenge
- **We create our path, make our way, and drive to the desired outcome**

# Complete Project Planning
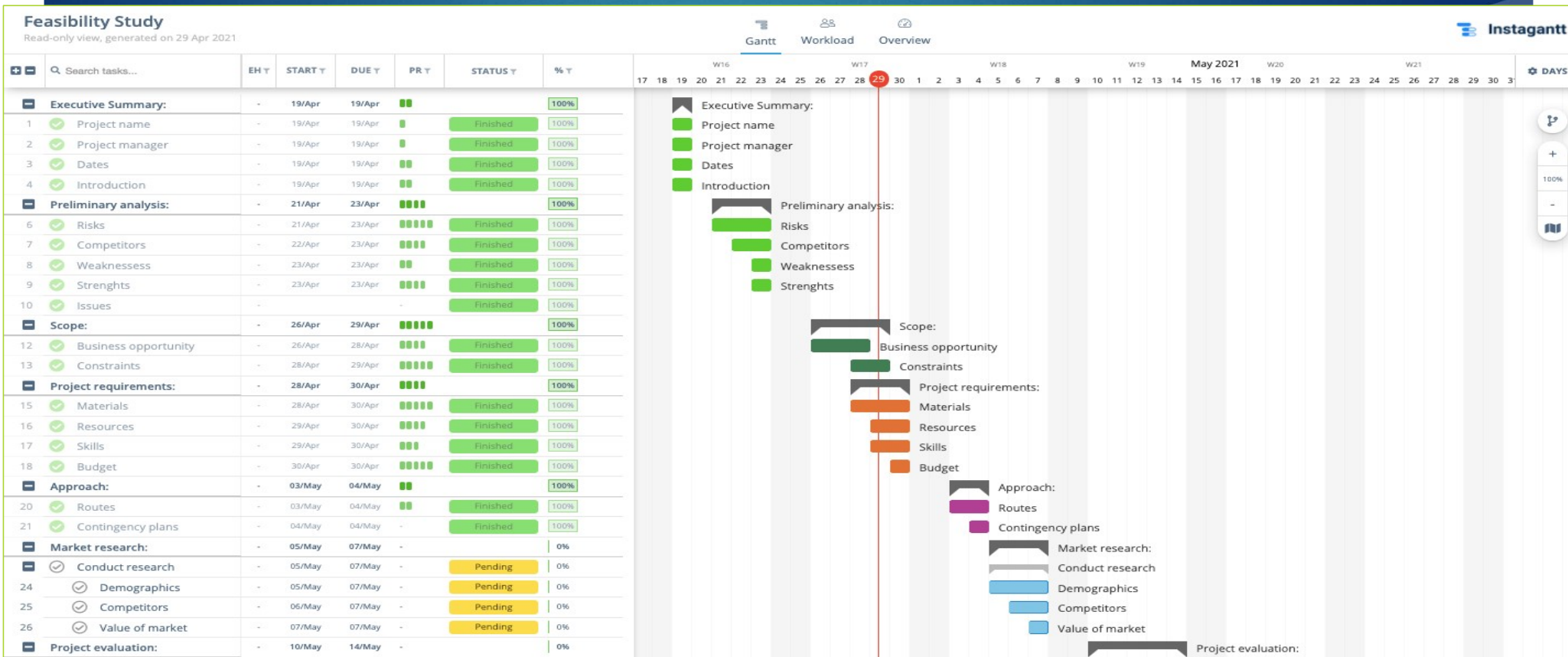
# Plan to Fail - Systematic

- **Fail Fast Testing** –
  - Purpose – **Downselect prototypes** (possible options)
  - Quick screening of all possibilities from all sources
  - Focus on **relative performance**, not absolute
  - No **PASS**
  - Do not assume and eliminate poor performers before screening
  - The range of performance will provide the logic and direction
  - **How is this different from what is typical or standard practice?**

# Plan to Pass – Standard Practice

▶ **Problem statement** – Current atmospheric coating systems don't meet life of asset expectations in an aggressive environment (Ex. offshore platform).

▶ **ALL Design Profile CTQs** – Fitness for Use / Fitness for Purpose

  ▶ **Atmospheric corrosion (ASTM D 5894, NaCl, NH4SO4)**

    ▶ Adhere to the standard and the expectation in the specification

  ▶ **Weathering UV degradation resistance (UVA)**

    ▶ Include test fence significant location(s) exposure (Florida, Arizona)

  ▶ **Application – Well defined criteria related to existing products (Chemistry?)**

    ▶ Pot life, cure speed, sag resistance, film formation, viscosity, VOCs, 1K / 2K

# Plan to Pass vs Plan to Fail

- **Standard Testing** –
  - **5000-10000hrs**
    - **200-400days????**
    - How long would it be before usable comparative test data would be produced?
  - Increase the severity and accelerate the comparative testing
  - Benchmarks are **CRITICAL**



(a) 1000 Hours   (b) 5000 Hours   (c) 10000 Hours

# Plan to Fail – Agile Iterating

▶ **Problem statement** – Current atmospheric coating systems don't meet life of asset expectations in an aggressive environment (Ex. offshore platform).

▶ **Focus CTQs** –

 ▶ **Electrolyte corrosion (TM0174)**

  ▶ **120F, 5% NaCl immersion**

 ▶ **UV degradation resistance (UVB)**

  ▶ **UV-B (280 – 315 nm), energy at 426 – 380 KJ mol$^{-1}$**

  ▶ *UV-A (315 – 400 nm), energy at 389 - 300 KJ mol$^{-1}$*

▶ **Standard CTQs** – Less important, Focus during Stage 3 development / optimization

 ▶ VOCs, DFT, cure time, viscosity, etc.

# Fail Fast - Summary

**Stage 2 Critical Few Failure Cycle Development**

- **Key MUST HAVES from voice of customer create screening cycle DOE**
  - **The essential "gap" in the product solutions**
- **Determine approaches from mind map brainstorm**
  - **Nodes and Participants**
  - **Internal / External…Suppliers / Institutions**
- **Construct useful DOE with proper stimulus and response**
  - **Target outcome – FAIL LAST**
- **Define number of cycles upfront to narrow feasibility to select few**
  - **Then what? How many prototypes do we need to proceed into Stage 3 formulation development and optimization?**

# Finding the MVP(s)

▶ **Standard Development - Minimum Viable Product**

  ▶ Focus on select CTQ criteria to establish an MVP to build off

  ▶ More absolute than relative data

  ▶ Goal is to pass some minimum threshold(s)


▶ **Fail Fast, Fail Last Screening – Most Viable Prototype**

  ▶ **Focus on select CTQ criteria to DOWNSELECT from many options**

  ▶ **Completely relative, comparative data**

  ▶ **Known benchmarks are CRITICAL**

  ▶ **Negative data is just as important**

# Agile Project Management

Iterative fail fast cycles – Similar to Agile vs Waterfall
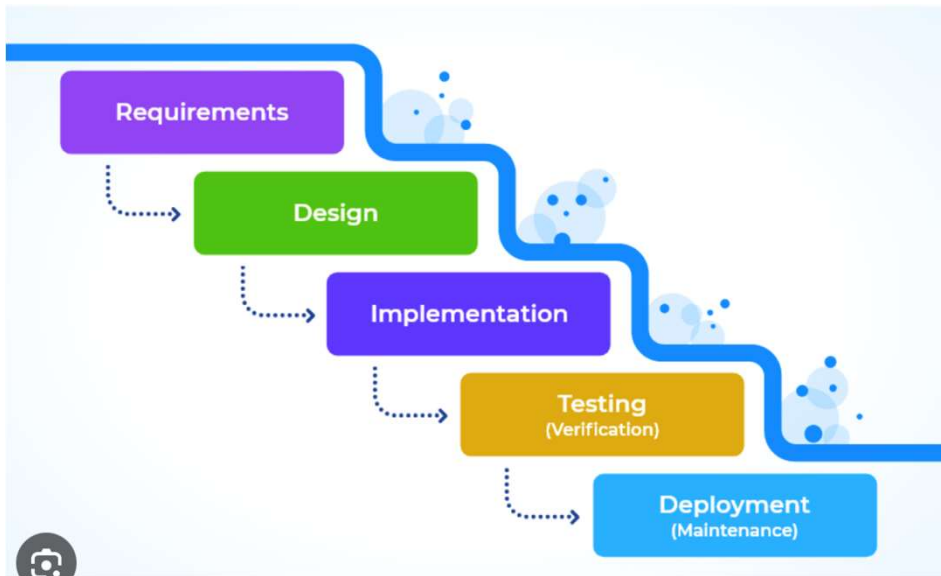
# Robust Design

**Test to Failure to Understand the Range of Performance**
- What features and benefits are we pushing the limits with?
- Temperature, exposure duration, rheology
- **Don't sell the extent of performance!**
    - On the edge of failure…claims
- Understand full set of variables in all variations
    - Surface energy differences,

- Taguchi Methods – DFSS
- Minimize the response from variation through controls
- **What is "Six Sigma"?**



Parameter Diagram of a Product / Process / System

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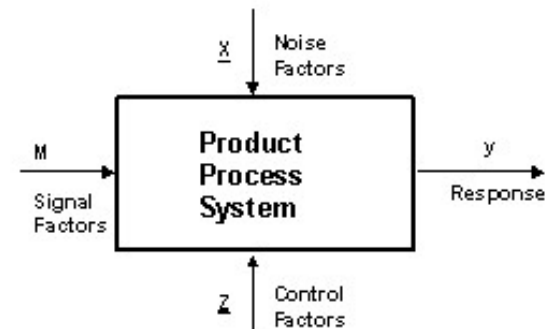
# Key to Innovating Success

## Try something different!

- Does it need to be epoxy / polyurethane
- Using adhesion to overcome barrier shortcomings
- Crystallinity in a thermoset
- Hybrid cure mechanisms, epoxy / NCO / silanol
- Coating responds to the environment / service conditions

# THANK YOU!

QUESTIONS?