

# **Systems Engineering Approach to Technology Integration**

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# Outline

- The Situation
- The Challenge
- Technical Approach
- The Process
- Results
- Road Ahead



# The Situation

- DoD's Annual Investment in S&T Exceeds \$11B



- Perception is that 'The S&T Investment Should Provide Greater and More Responsive Impact to the Warfighter'

# The Situation

## 'Report of the Year'

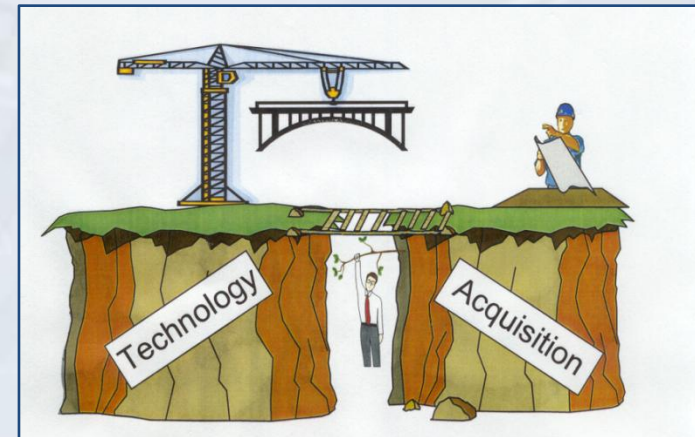
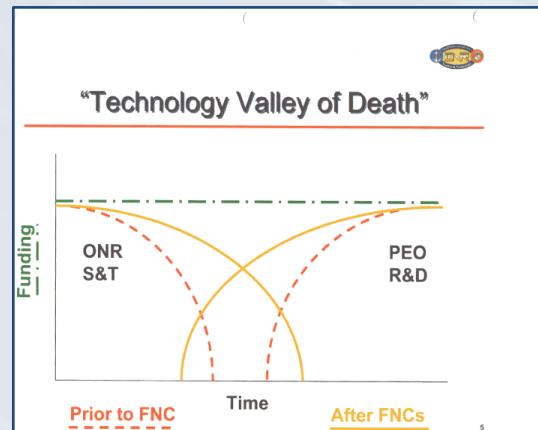
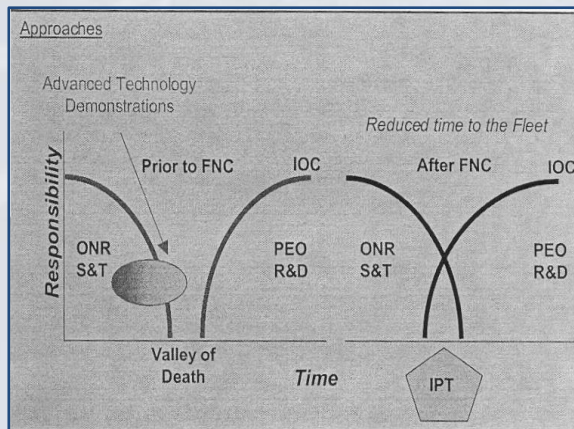
- DoDIG
- GAO



Reports Describe the “Valley of Death”

# The Situation

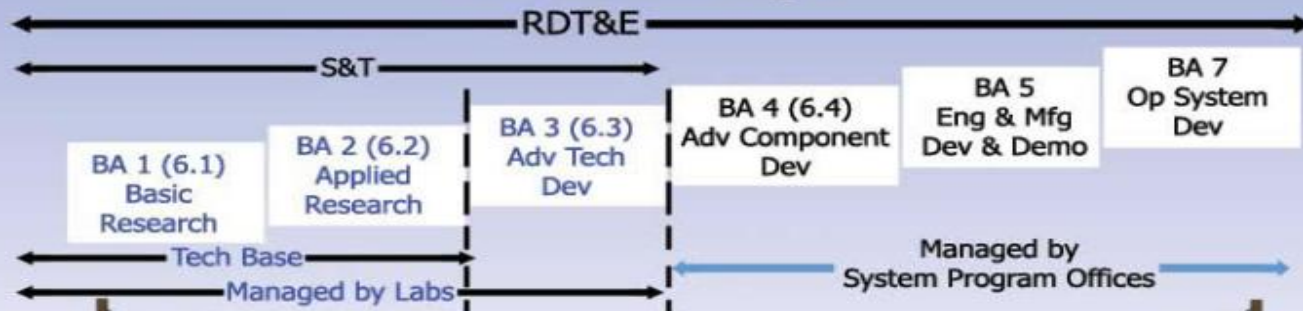
## Long Standing Recognition of the “Valley of Death”





# The Situation

## Speeding Technology Transition "The Challenge"



### Technology Transition "Seam"

#### Perceptions of the S&T Community

- S&T's primary input is provided during the technology development stage.
- S&T hands off technology implementation to the customer.
- S&T's "Technology Push" supports the concept "If it's good technology, they will come."
- S&T's focus is technology-specific versus technology and business oriented.

#### Perceptions of the Acquisition Community

- Budget: Lack of Transition Funds
- Transition Process Lacks Definition & Visibility
- Culture: Difference Goals & Timelines between S&T and Acquisition Managers
- Lack of Incentives to cross or pull across

VALLEY  
OF  
DEATH

# The Challenge

IMSolutions was challenged by the Marine Corps Systems Command to derive a way the S&T Investment could be better focused on the technology needs of Acquisition Programs

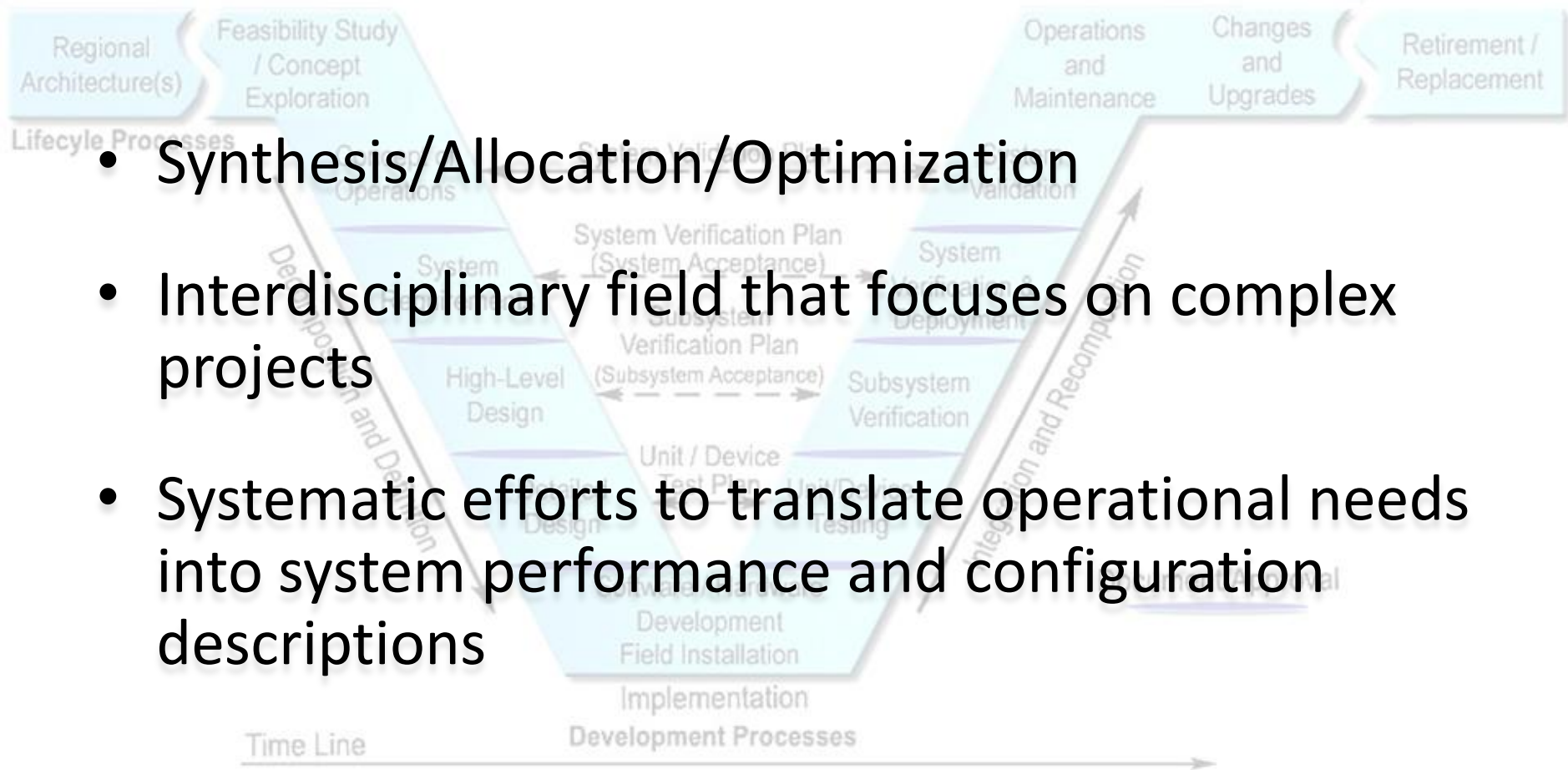


What follows is the result of our efforts- - -

# Technical Approach

## Systems Engineering Approach

- Synthesis/Allocation/Optimization
- Interdisciplinary field that focuses on complex projects
- Systematic efforts to translate operational needs into system performance and configuration descriptions





# Technical Approach



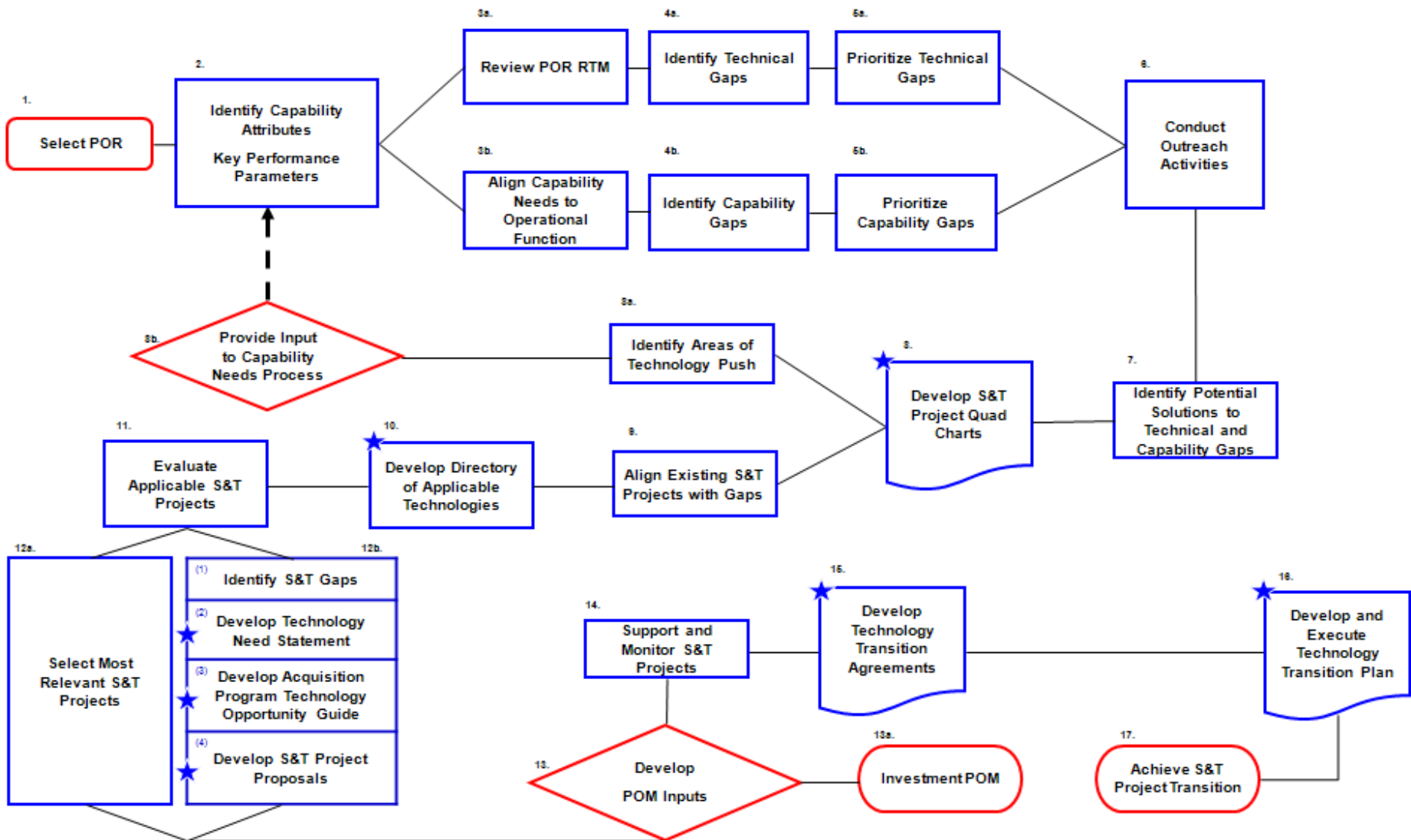
It Takes All 4 to  
Enable Technology  
Transition

**(At The Same Time)!**

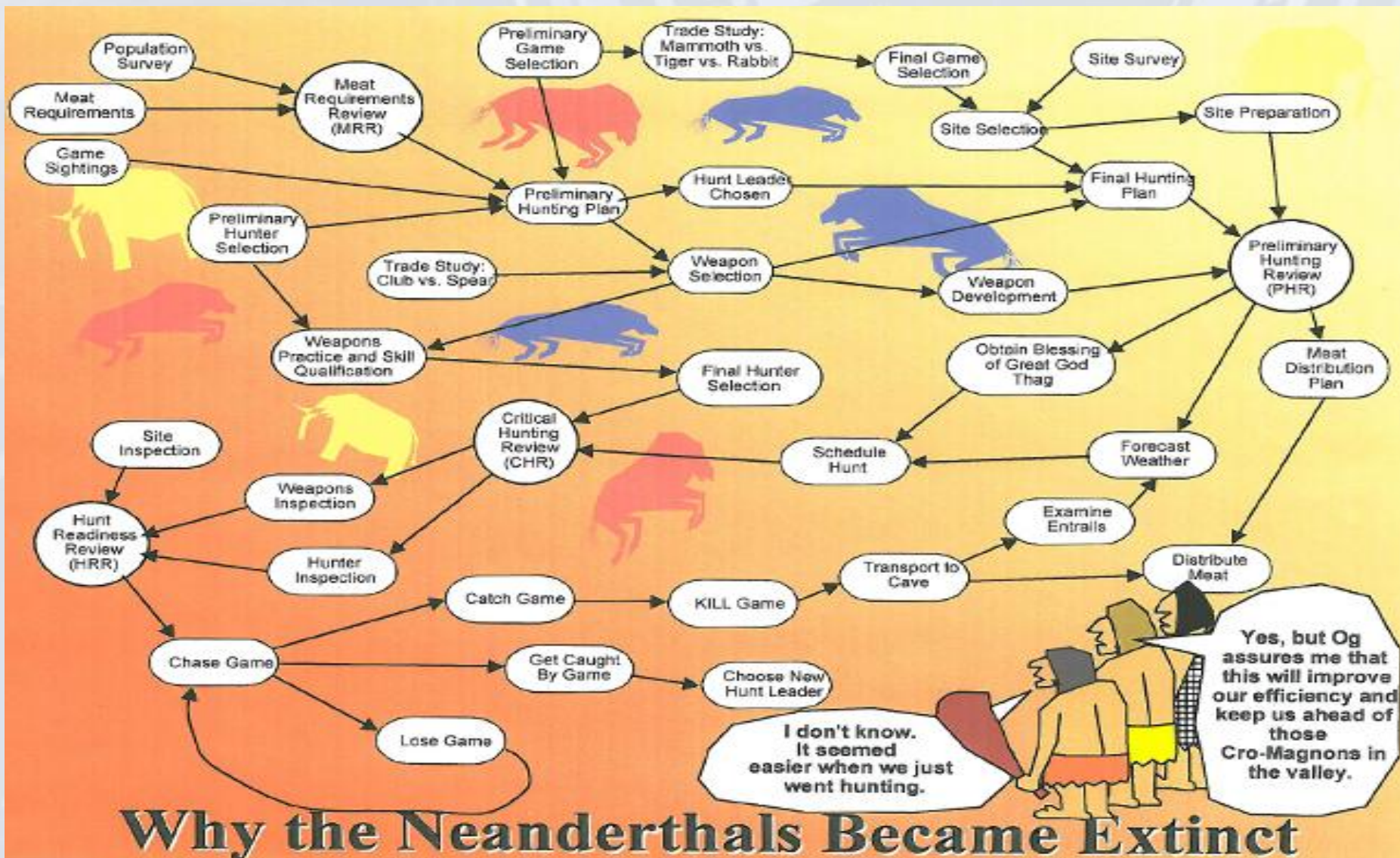
# Technical Approach

## Basic Technology Insertion Process

★ Indicates Document Development Activity



# Technical Approach



**Why the Neanderthals Became Extinct**

# Technical Approach

Retain Awareness that too narrow a focus on the **Process** can lead to lack of attention to the:

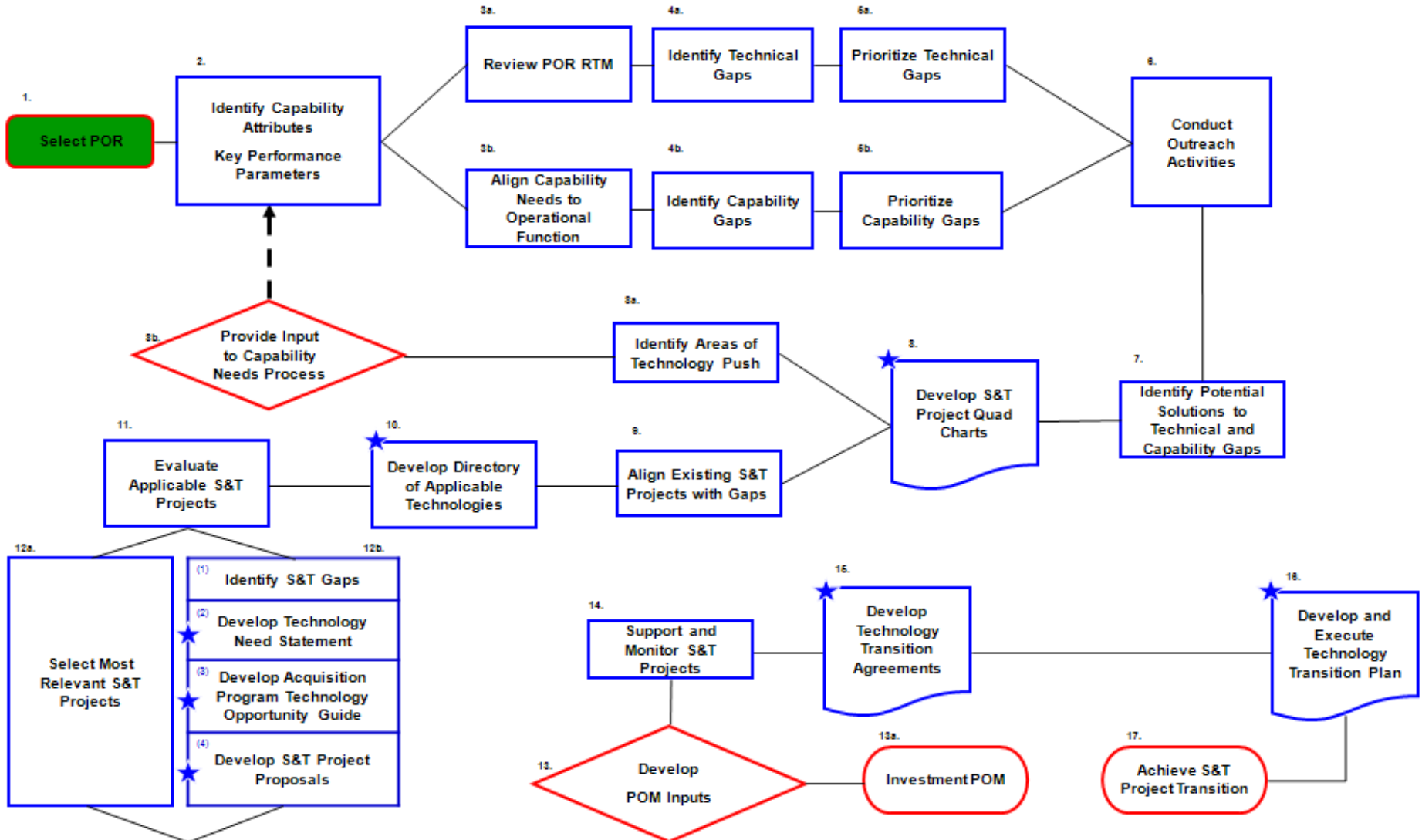
- Interim **Products** that enable the process
- The **Product** that the Warfighter needs



# The Process

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# The Process

## Select a Program Of Record

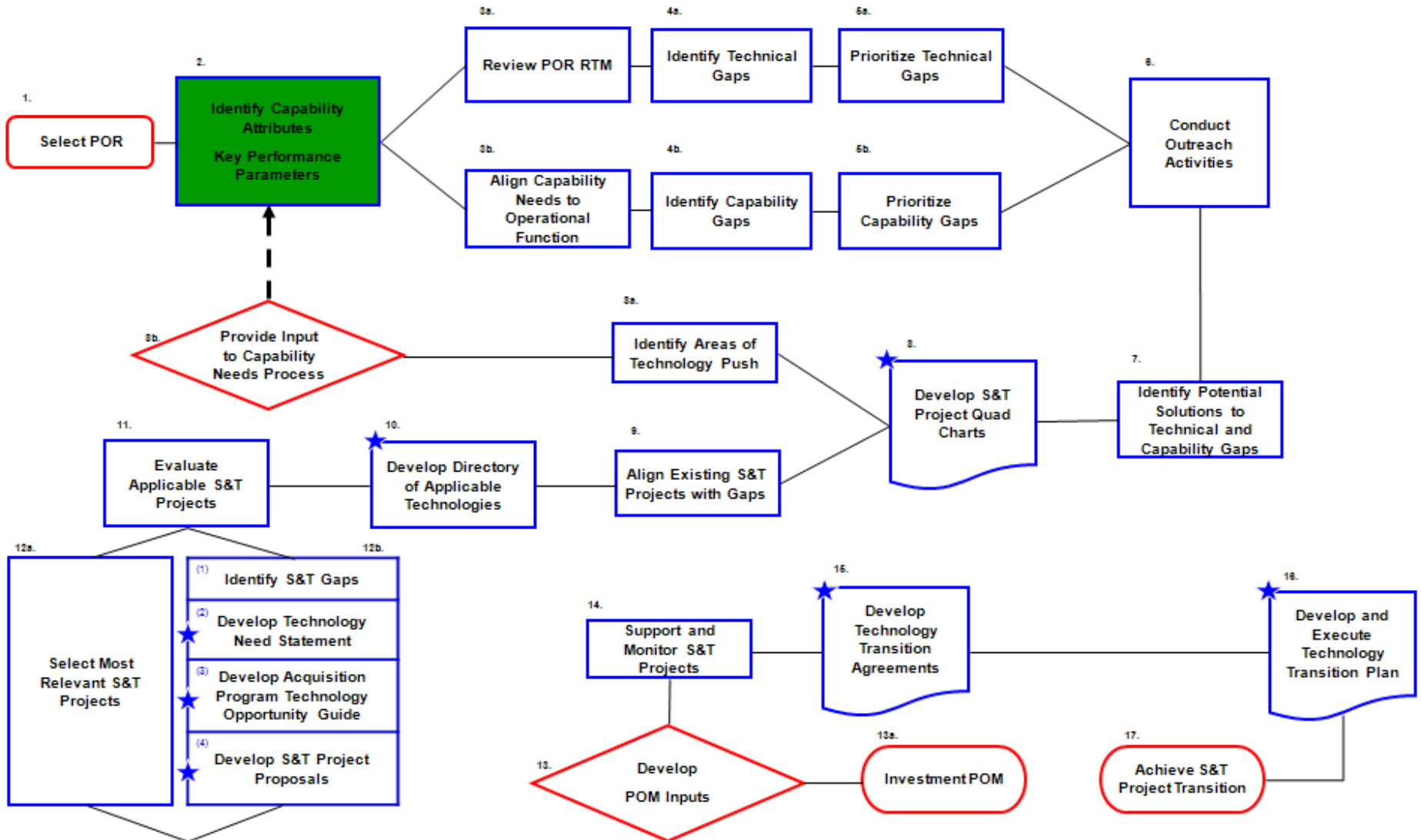
- Viable Technology Transition Target
  - Response to Approved Capability Need
  - Have Unsatisfied Capability Needs
  - Existing or Planned Out-Year Funding Profile
- The other balls have to be in place



# The Process

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# The Process

## Understand Key Performance Parameters and Capability Attributes

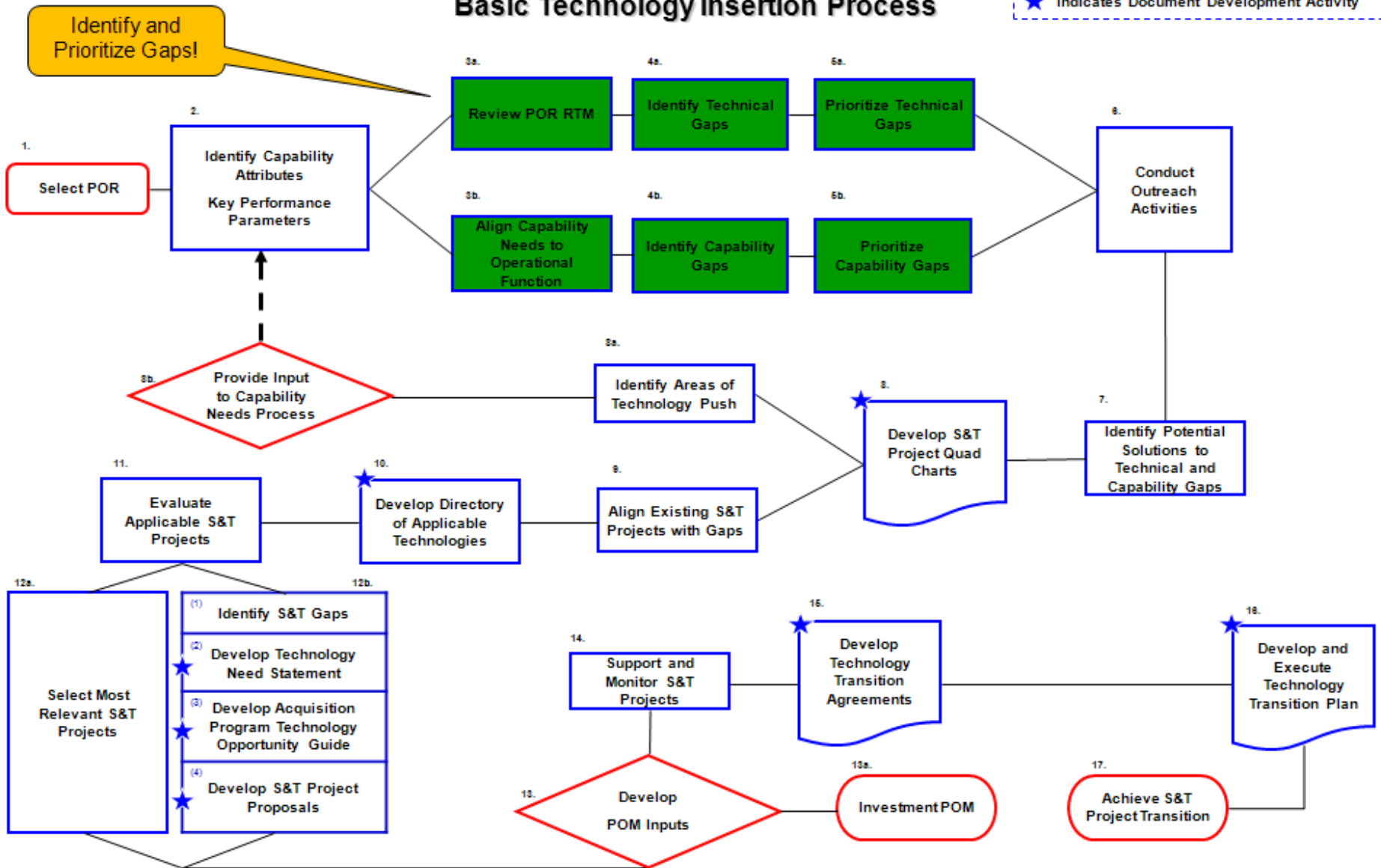
- Identify Critical Gaps  
(The areas where Threshold Capabilities are not being attained)
- Identify Areas for Enhancement  
(The Trade Space between Threshold and Objective Capabilities)



# The Process

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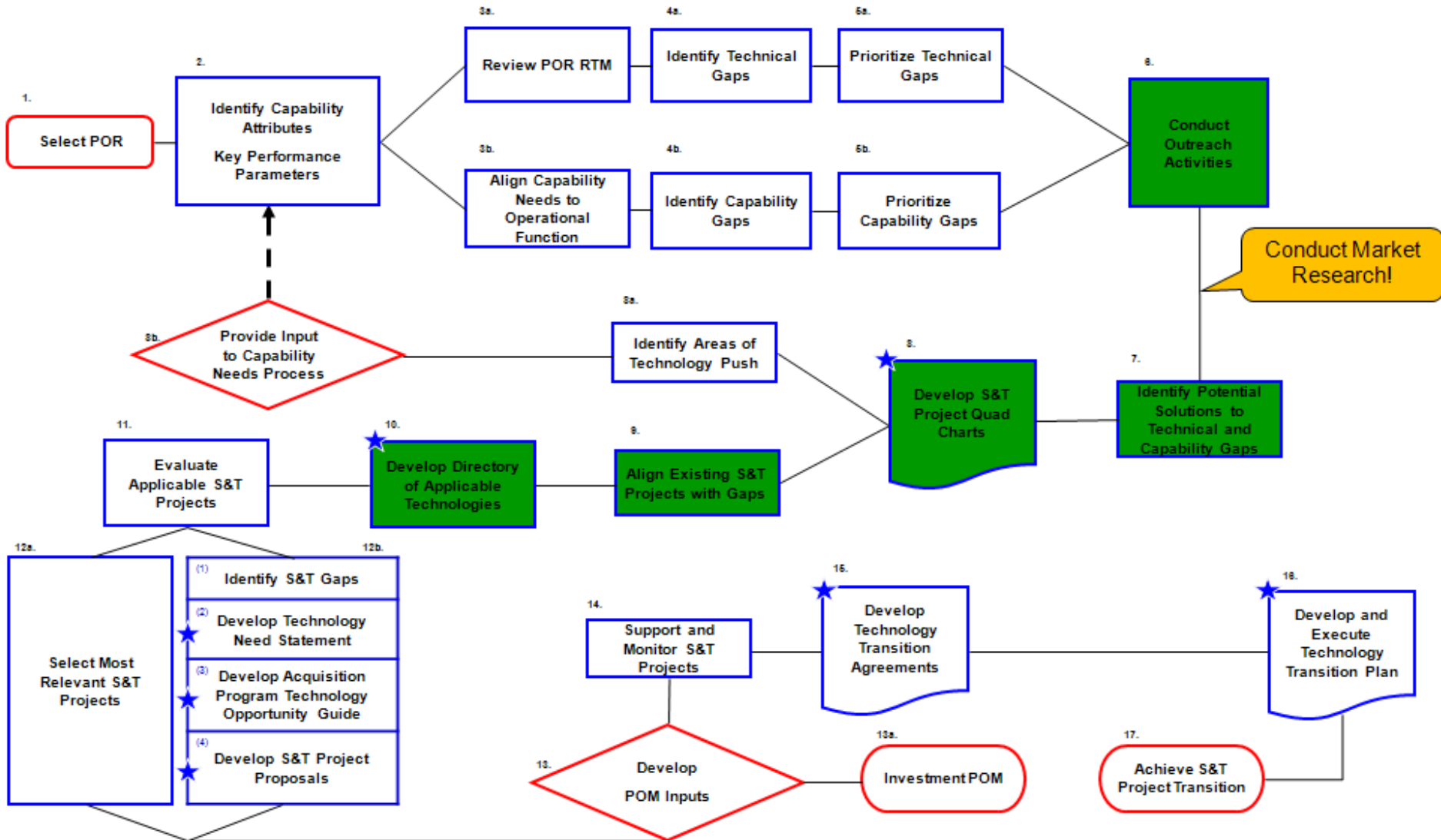
## Identify and Prioritized Gaps

- Traditionally Through
  - Requirements Traceability Matrix
  - Performance Specification
  - Test Results
- Alternatively Through
  - Use of SMEs and User Juries
  - Prioritization of Operational Capability Needs

# The Process

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# The Process

## Conduct Market Research

- Identify existing products/technology capable of closing gaps
- Collect and codify relevant information
- Align information with Gaps or Areas of Enhancement
- Provide a Technology Portfolio

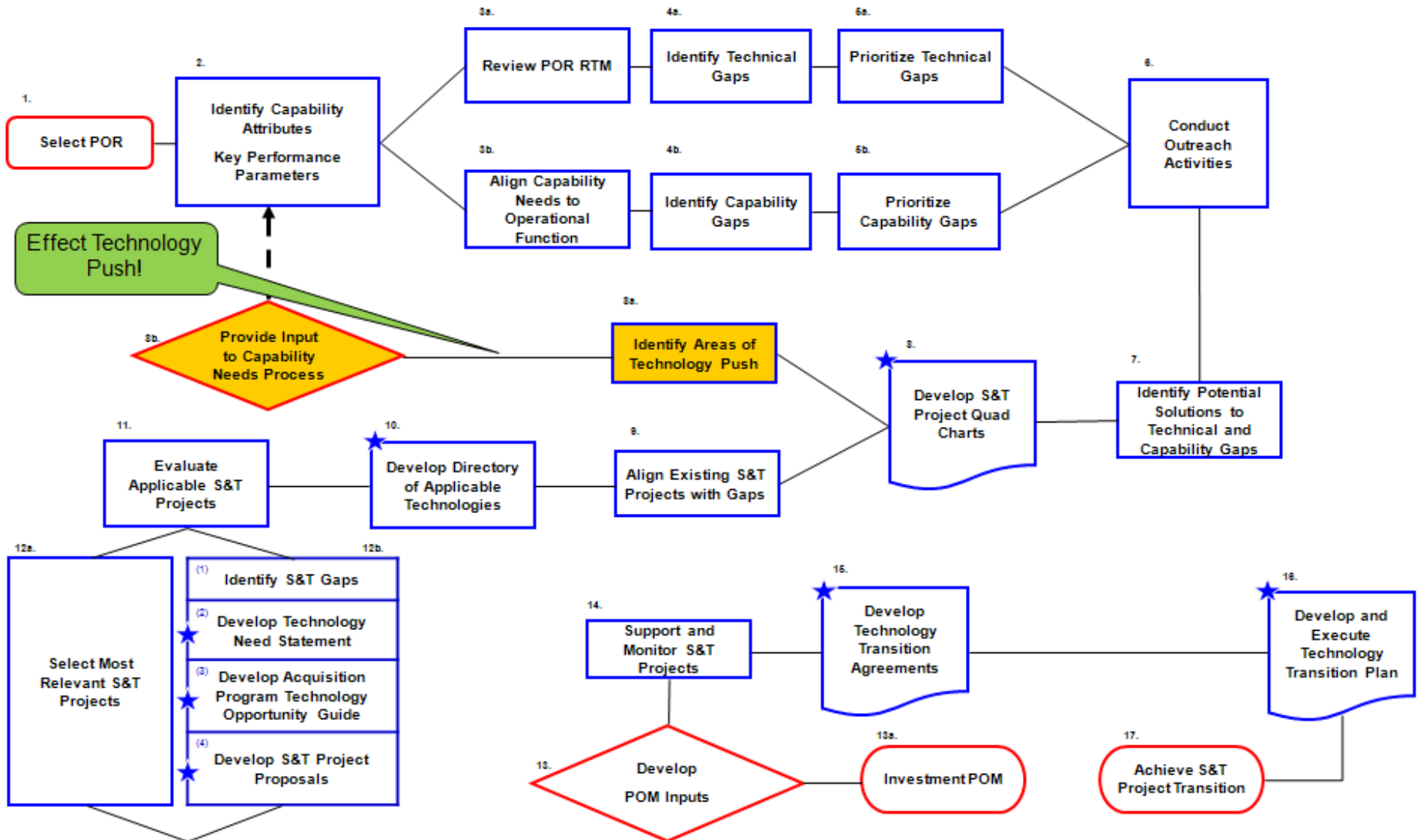




# The Process

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# The Process

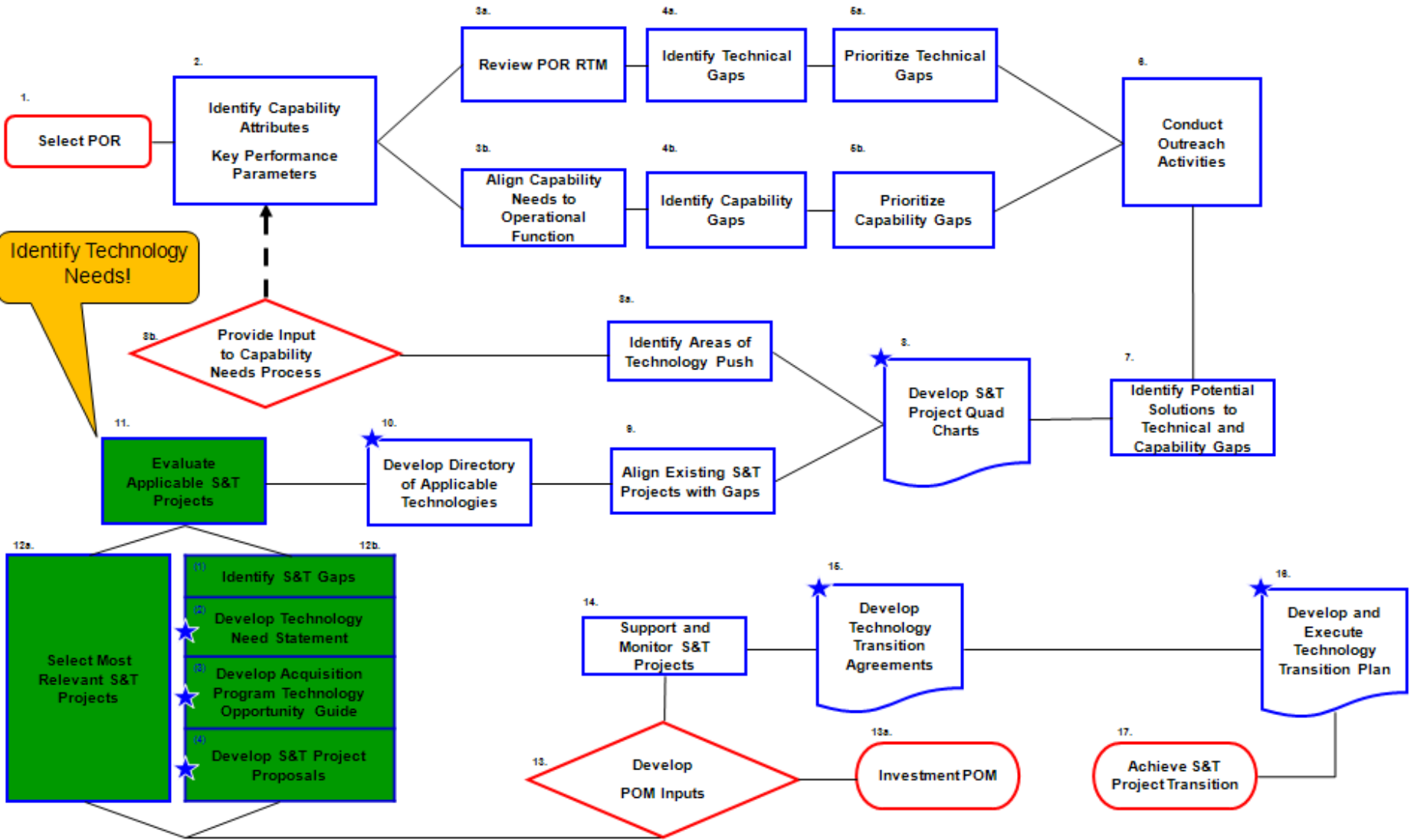
## Effect Technology Push

- Use Technology Portfolio to Advise the Combat Developer on “The Art of the Possible”
- Assist in defining Capability Needs in “functional terms”

# The Process

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# The Process

## Identify Technology Needs

- Align Gaps with existing technology capable of satisfying technical needs
- Actively monitor existing efforts that can fill the Gaps
- Initiate new S&T efforts in areas where Gaps are not filled by existing technology development efforts



## Identify Technology Needs

- Develop “Technology Needs Statements”
- Compile Technology Need Statements into “Program Technology Opportunity Guide”
- Socialize Technology Opportunity Guide with S&T resource sponsors

### Technology Needed Statement Content

- Background
- Current Capability
- Desired Capability
- Key Performance Parameters
- Potential Applications
- Maturation Schedule
- References
- Originator’s POC Information

# The Process

## Identify Technology Needs

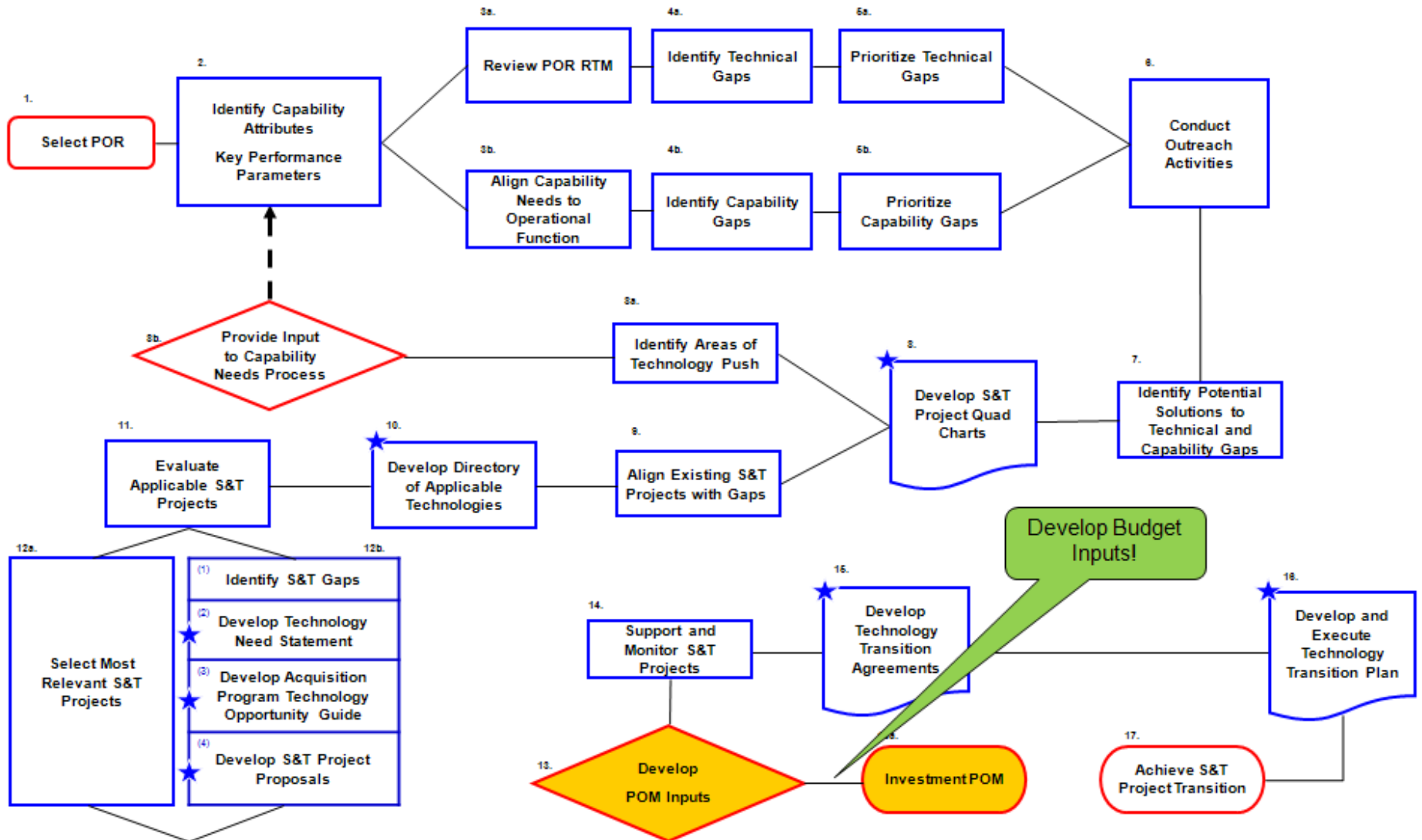
### Some Sources of S&T Funds

- **Advanced Development Program (6.3)**
- **Applied Research Program (6.2)**
- **Basic Research Program (6.1)**
- **Congressional Adds**
- **Defense Exchange Agreement (DEA)**
- **Defense Transformation Program (DTP)**
- **Disruptive Technology Opportunity Fund (DTO)**
- **Foreign Comparative Testing (FCT)**
- **Foreign Weapons Evaluation (FEW)**
- **Future Naval Capabilities (FNC)**
- **Independent Research and Development (IR&D)**
- **Innovative Naval Prototype (INP)**
- **Joint Improvised Explosive Device Defeat Organization (JIEDDO) Initiatives**
- **Joint Capability Technology Demonstration (JCTD)**
- **Joint Test & Evaluation (JT&E)**
- **Manufacturing Technology (MANTECH)**
- **Multi-disciplinary Research Initiative (MURI)**
- **NATO Comparative Test (NCT)**
- **Quick Reaction Fund (QRF)**
- **Small Business Innovative Research (SBIR)**
- **Small Business Technology Transfer (STTR)**
- **Technology Transition Initiative (TTI)**

# The Process

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# The Process

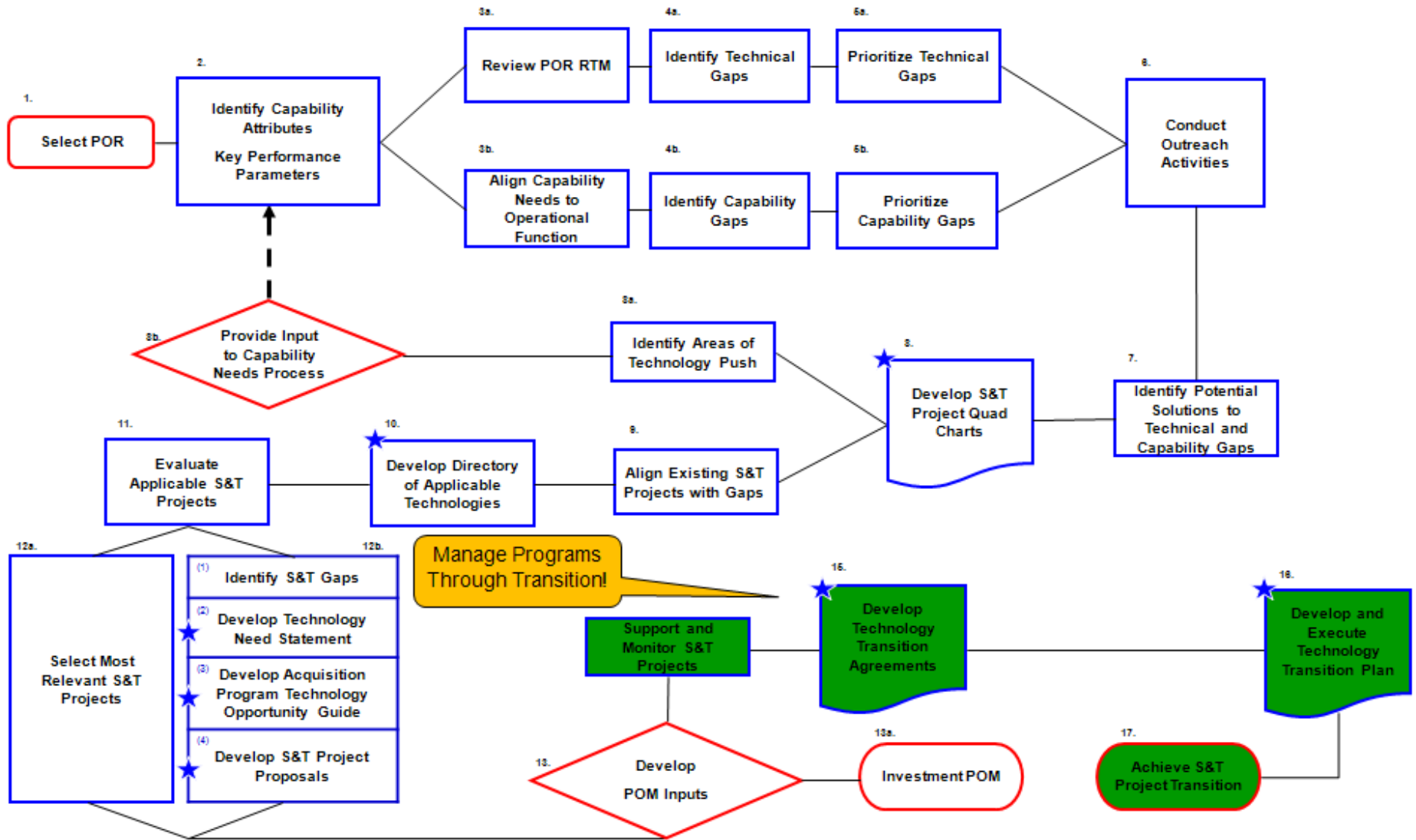
## Develop Budget Inputs

- Develop budget quality cost estimated for technology maturation and integration
- Use cost estimates to leverage program out-year funding through the Planning Programming Budgeting and Execution Process

# The Process

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# The Process

## Manage Programs Through Transition

- Continuous Collaboration
- Support Demonstrations with Acquisition Program systems and equipment
- Develop Transition Documents
  - Technology Transition Agreements
  - Technology Transition Plans

# Results

- Pilot Program conducted on USMC Route Reconnaissance and Clearance Family of Systems
- Technology Portfolio of Immediate value to the Capability Needs Officer
  - Analysis of Alternatives
  - Art of the Possible



# Results

- Technology Opportunities Guide used by Technology Developer in formulating FY-12 Program
- Cost Estimates used by Acquisition Program to substantiate out-year Program Objectives Memorandum submission for POM-14

# Road Ahead

- Refine The Process by providing “Value Added” assessments to integrate cost and risk into prioritization efforts
- Achieve stronger focus of Budget Activity 2/3 on high priority needs of Acquisition Programs
- Continue to tailor and apply to other acquisition programs, where needed

