Technology Evaluation Cycles and Maturity Assessment

Multi-Dimensional Assessment of
Technology Maturity Workshop
Organized by AFRL, Wright Patterson AFB, OH

May 9-11, 2006

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Agenda

I. Role of Technology Cycles (Hype Cycle and Adoption Cycles) in identifying technologies for a System or Project

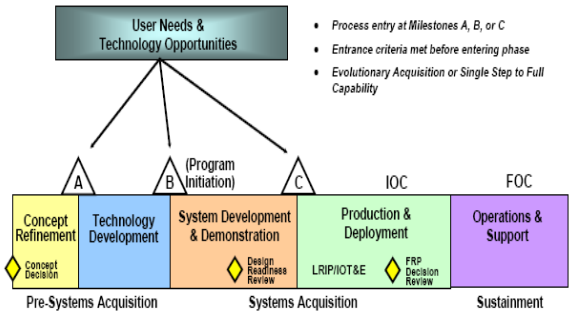
II. Introduce a methodology, called TechIP (Technology Insertion Plan) which can be used through the complete life cycle of a System or Project to identify, select, insert, integrate and manage technologies.

- tManager (Technology Manager)
- iManager (Insertion and Integration Manager)
- pManager (Plan Manager)

Strategic Issues: Policy Guidelines

Technology Identification, Due Diligence, Risk Management, Insertion, Integration, Collaboration and Planning processes are **on-going,** and **cover complete life cycle** of a System-of-Systems (SoS) or System.

Figure 1. The Defense Acquisition Management Framework.



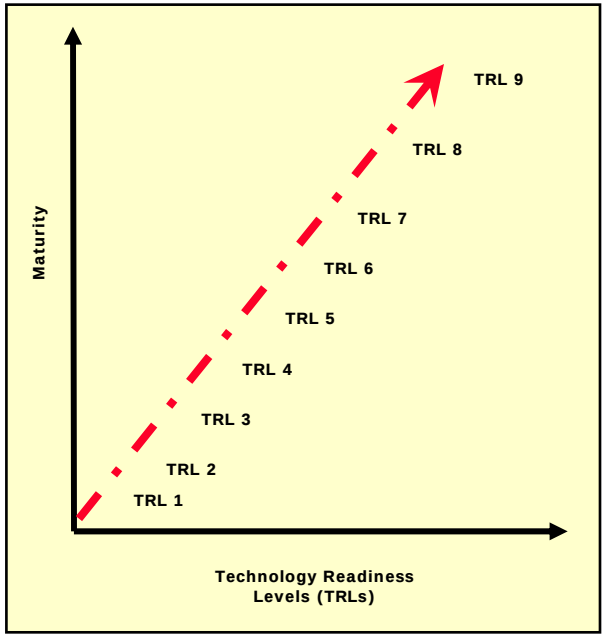
DoDI 5000.2 states that ….

" …. The purpose is …. to reduce technology risk and to determine appropriate set of technologies to be integrated into a full system. Technology Development is a continuous technology discovery and development process reflecting close collaboration between the S&T community, the user, and the system developer. It is an iterative process designed to assess the viability of technologies while simultaneously refining user requirements". In addition, it states that ….

"…. Technologists and industry shall identify and protect promising technologies in laboratories and research centers, academia, and foreign and domestic sources; reduce the risks of introducing these technologies into the acquisition process; and promote coordination, cooperation and mutual understanding of technology issues…."

Strategic Issues: The Pitfalls

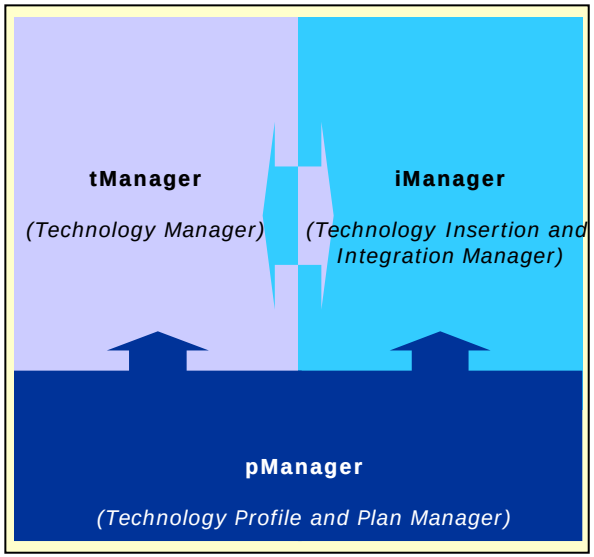
Current practices (e.g.: TRA/TRLs) lack:



- Do not address complete life cycle.
- Single Dimension (**subject of this workshop**)
- Lack of a collaboration platform that can be used by the executive management through technology developers, systems designers and the end users to evaluate, select and implement technologies.
- Does not provide links to related methodologies, such as the SEI Capability Maturity Model (CMM), and the DoDI 5000.2 references to the Evolutionary Acquisition (EA), and Spiral Development (SD) requirements.
- Addresses only “system” technologies (hardware, software, etc.), and does not address “process” technologies (algorithms, formulas, models, methodologies, work flow, etc.)
- TRA/TRLs are based on the government experiences and do not consider industry “best practices”, such as the Gartner Group’s “Technology Hype Cycle”, and the Forrester Group’s “Innovation Network”.

Strategic Issues: A Solution

TechIP Methodology consists of two models, tManager & iManager, and associated tools, called pManager



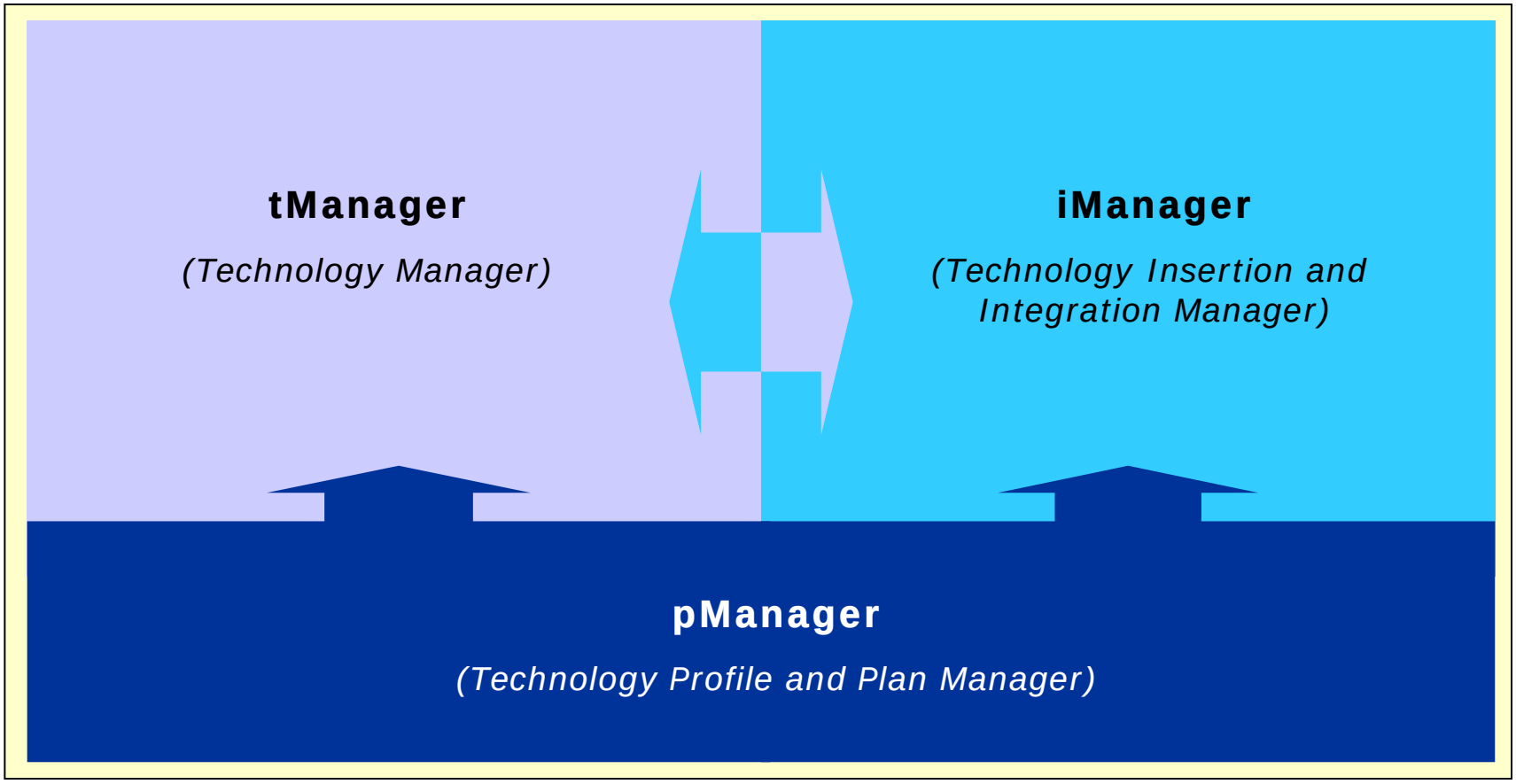
- To implement a comprehensive technology insertion and risk management solution which addresses the DoDI 5000.2 requirements and the TRA/TRL shortcomings, what is needed is ……

A methodology and associated tools that can be used to identify technologies, perform technology due diligence, risk assessment, technology insertion and integration activities for the full life cycle of a SoS or System.

- **TechIP** (Technology Insertion Plan)

TechIP Methodology

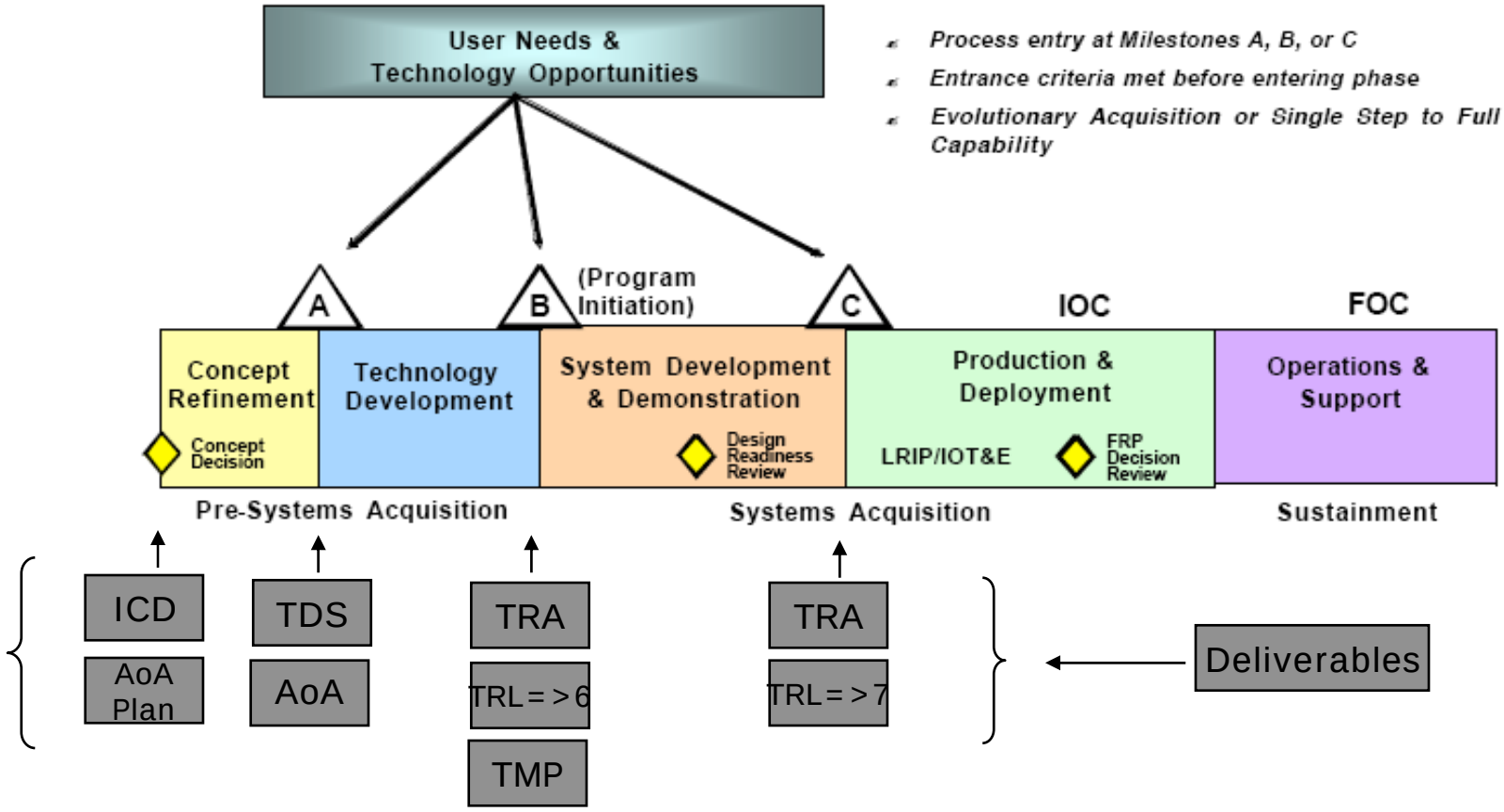
The TechIP methodology provides a framework for the management of technology through SoS Life Cycle.



tManager: DoD Framework and Deliverables

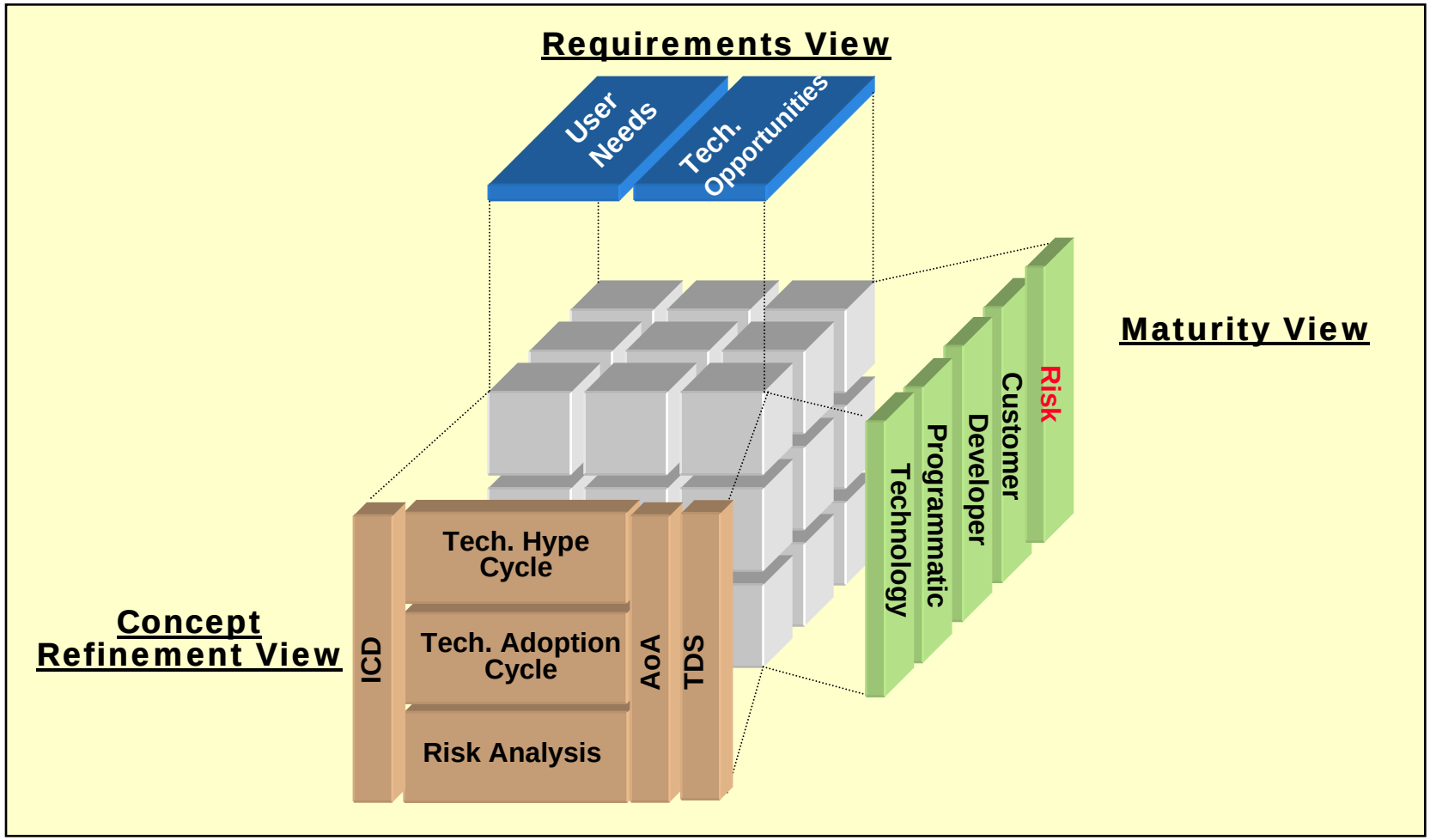
Technology Identification, Due Diligence, Risk Management, Insertion, Integration, Collaboration and Planning processes cover complete System-of-Systems (SoS) Life Cycle.

Defense Acquisition Management Framework
(Source: DoDI 5000.2)



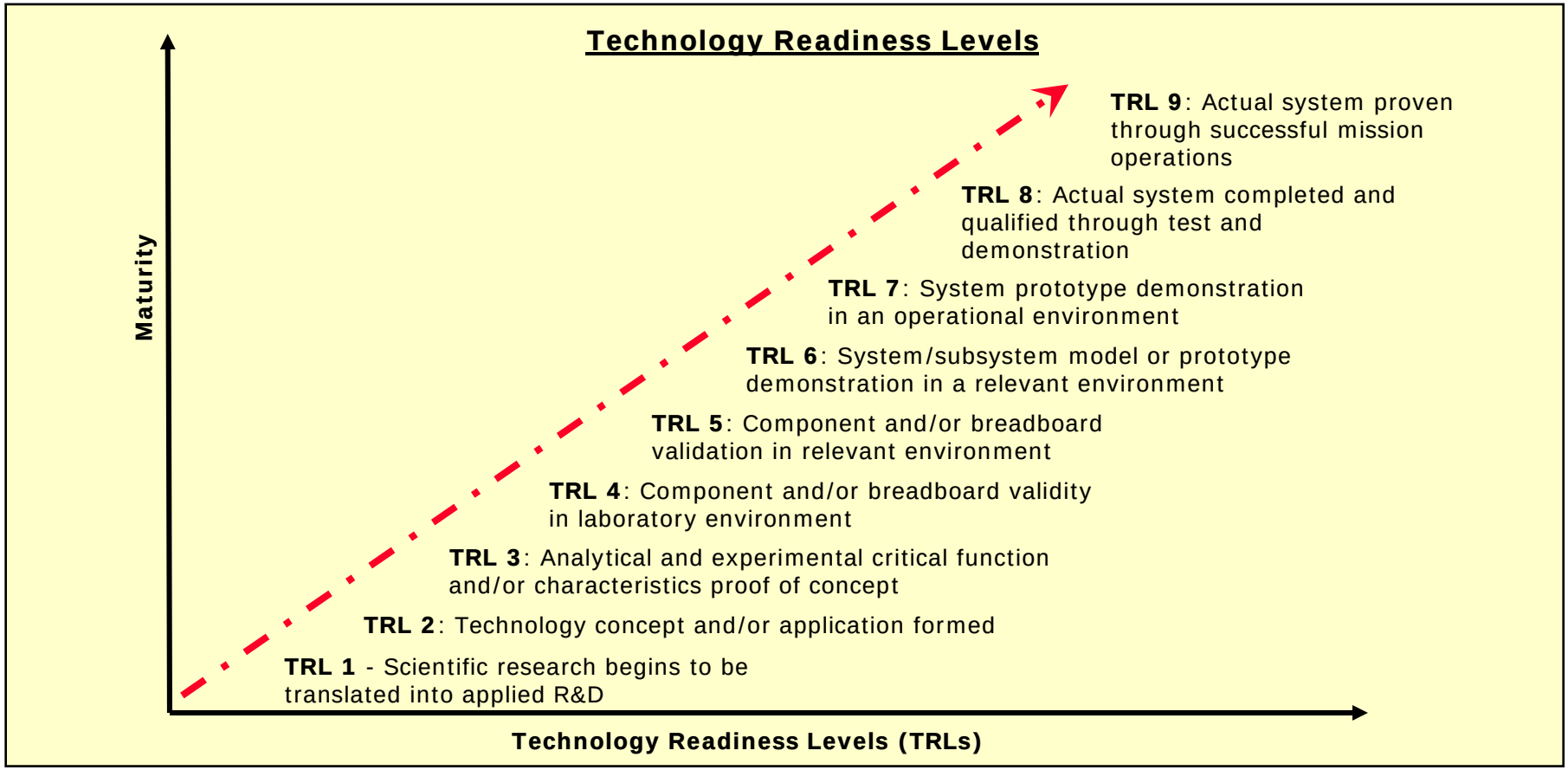
tManager: Technology Selection

Technology selection comprises of reviewing user needs and technology opportunities (**Requirements View**), identifying Critical Technology Elements (**Concept Refinement View**) and conducting maturity analysis (**Maturity View**).



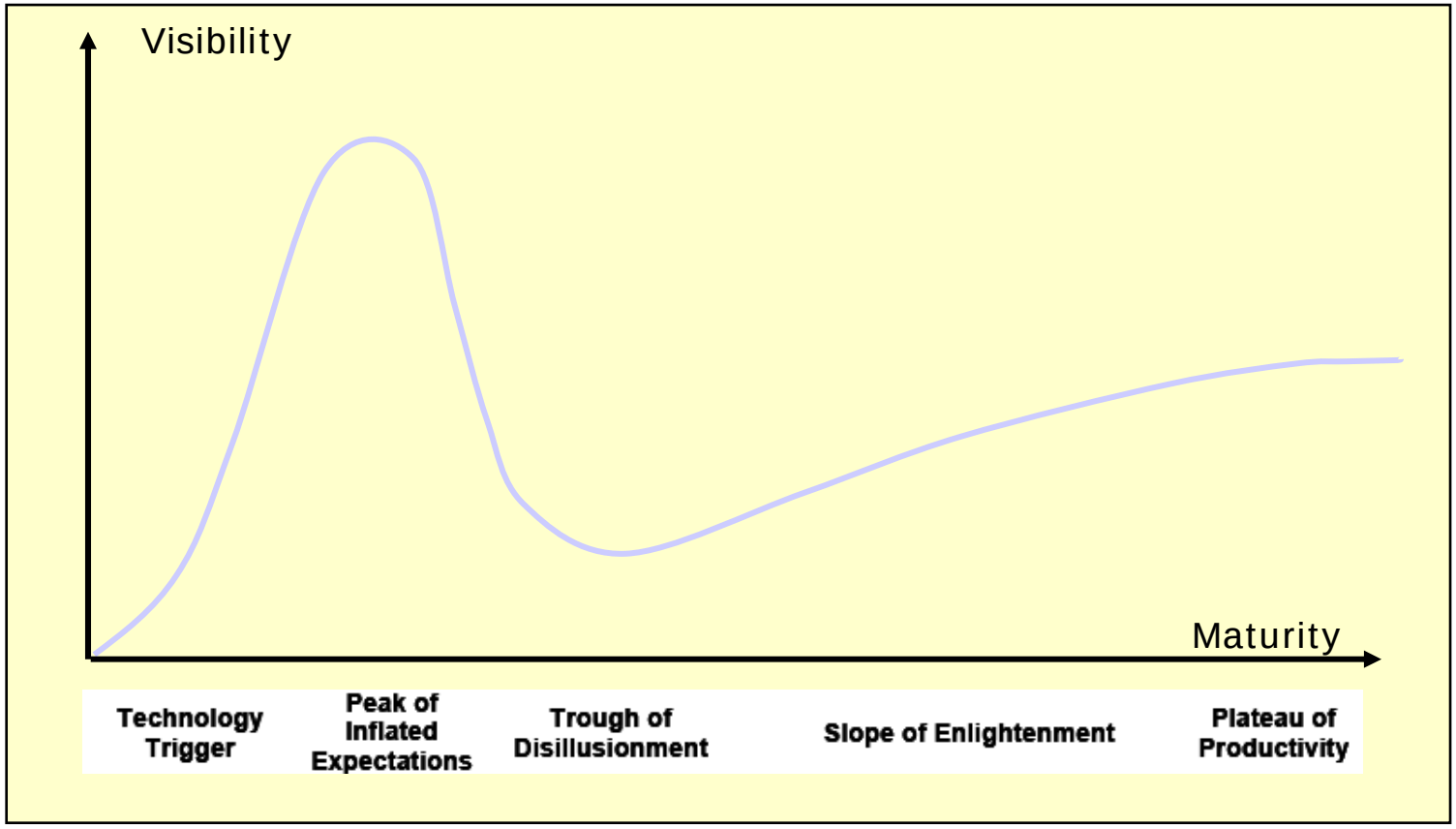
Maturity Classification: Current TRLs

NASA developed matrix to classify technology maturity



Hype Cycle: Introduction

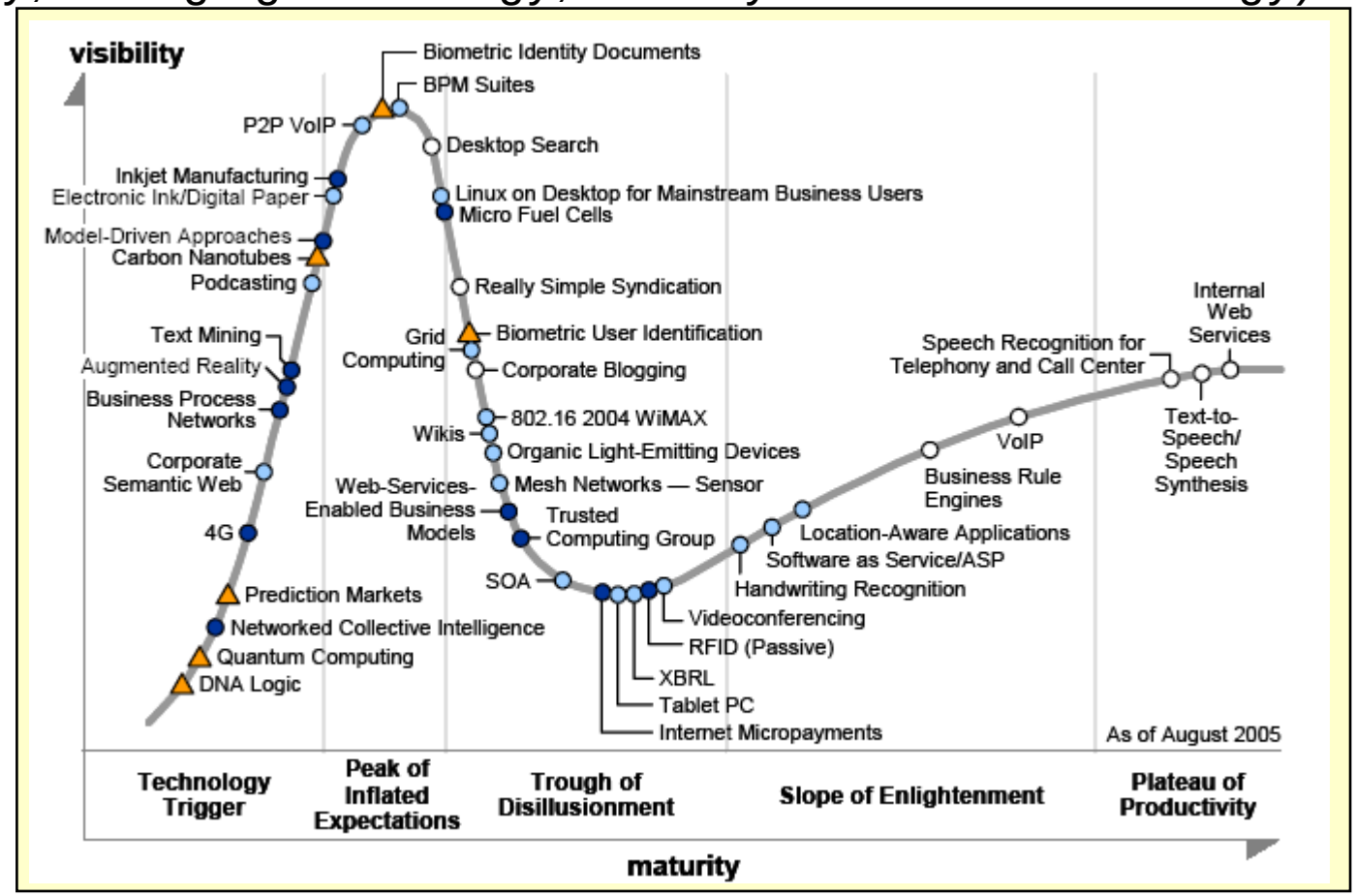
A Hype Cycle provides a snapshot of technologies, identifying which technologies are hyped, suffering disillusionment, and stable enough to study deployment.



Source: Gartner, Hype Cycle for Emerging Technologies 2005

Hype Cycle: Gartner's Emerging Technology Elements

Hype Cycles are developed for different domains (e.g: government technology, emerging technology, security assurance technology)



Source: Gartner, Hype Cycle for Emerging Technologies 2005

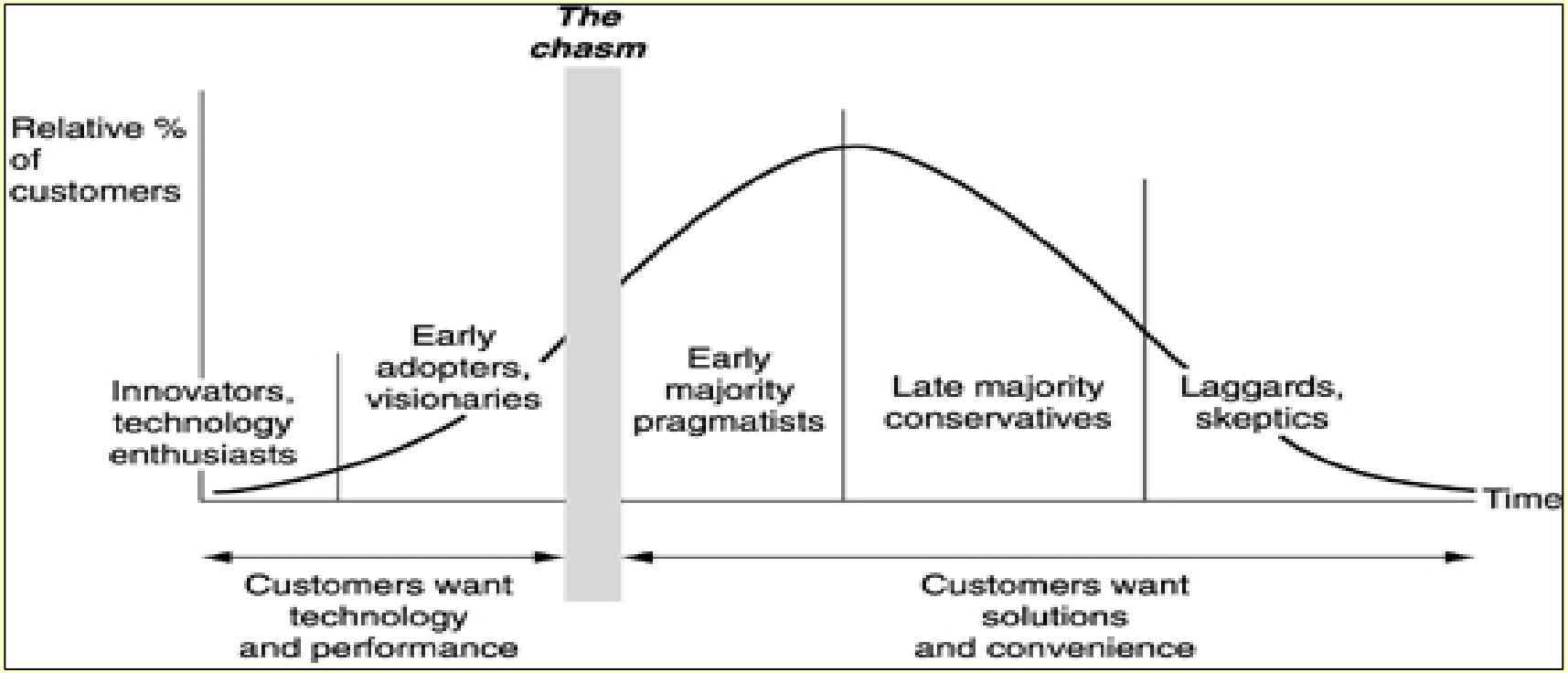
Hype Cycle: How to Use

Early Identification of Emerging Technology: Cuts through hypes and buzzwords

- **Develop:**
  - Generic hype cycles for Government-wide (DoD/FFRDC) and Commercial (Contractor, OEMs) Academic (University, Independent research) Technology Elements
  - Develop SoS Specific or System Specific Technology Elements Hype Cycle
- **Analyze:**
  - What are the core technologies? What innovative technologies are available? What are the migration (existing to proposed technology) strategies?
  - Don't get caught up in Hype / Don't ignore unfashionable technology
  - Develop technology road map
- **Select:**
  - Use the analysis as an input to TDS

Technology Adoption Life Cycle

Technology fight for survival, evolve, and undergo their own characteristic life cycle.



Source: Norman (1998: The Invisible Computer)

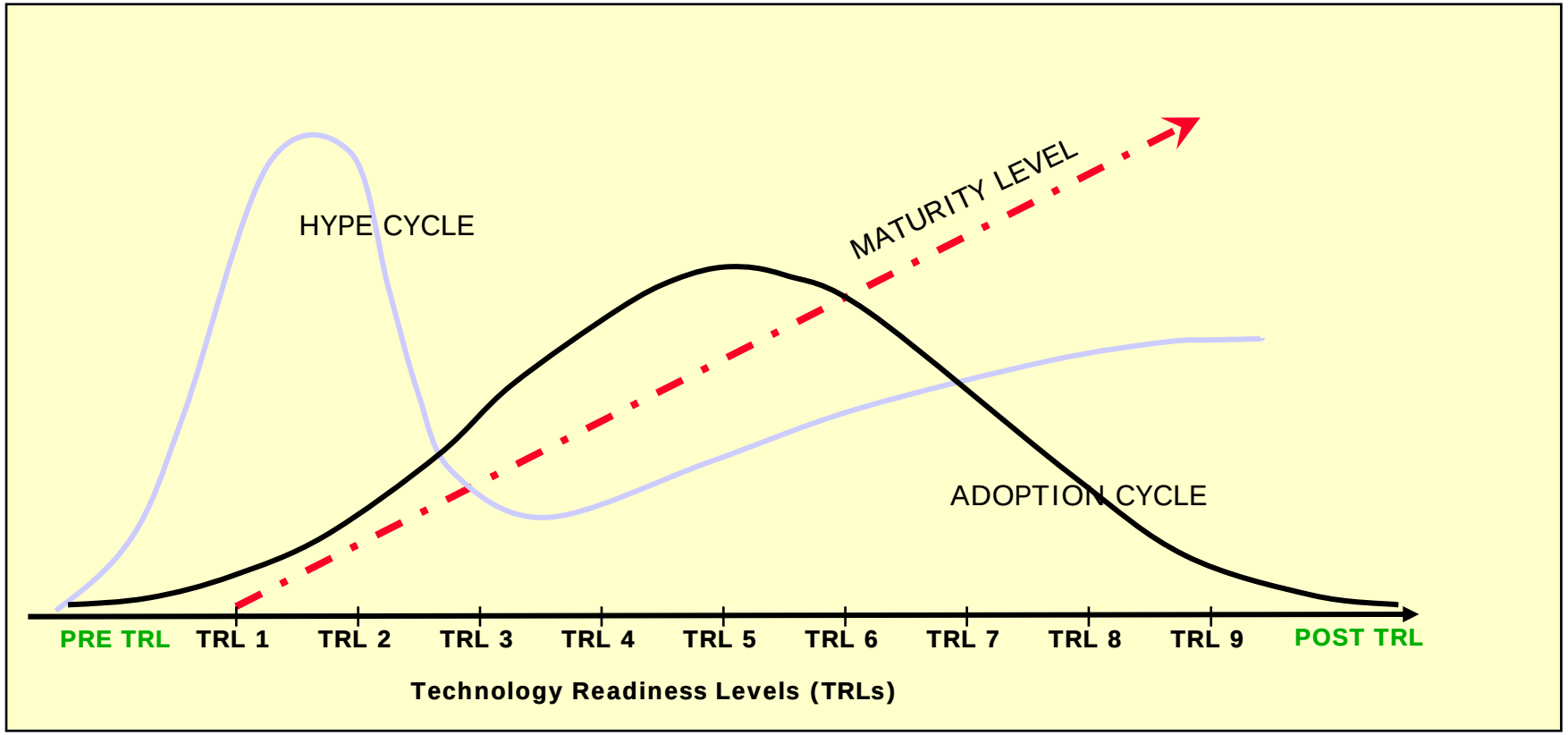
Adoption Cycle: How to Use

Why good technology fail; inferior technology succeed

- **Develop:**
  - Link Technology Maturity to different User types.
    - Early stages – Technology dominates
    - Later stages – Usability, convenience and value
  - Technology insertion/integration strategies for different technology maturity levels
- **Analyze:**
  - Understand Different User Needs and Position Technology selection and budget to meet their requirements and perceptions.
  - Difficulties in adopting disruptive technology
  - Link demonstrations and implementations to appropriate User types.
  - Innovation in Processes to support selected Technology
- **Select:**
  - Use the analysis as an input to TDS

tManager: Technology Manager

Maturity Levels should be linked to related technology evaluation cycles

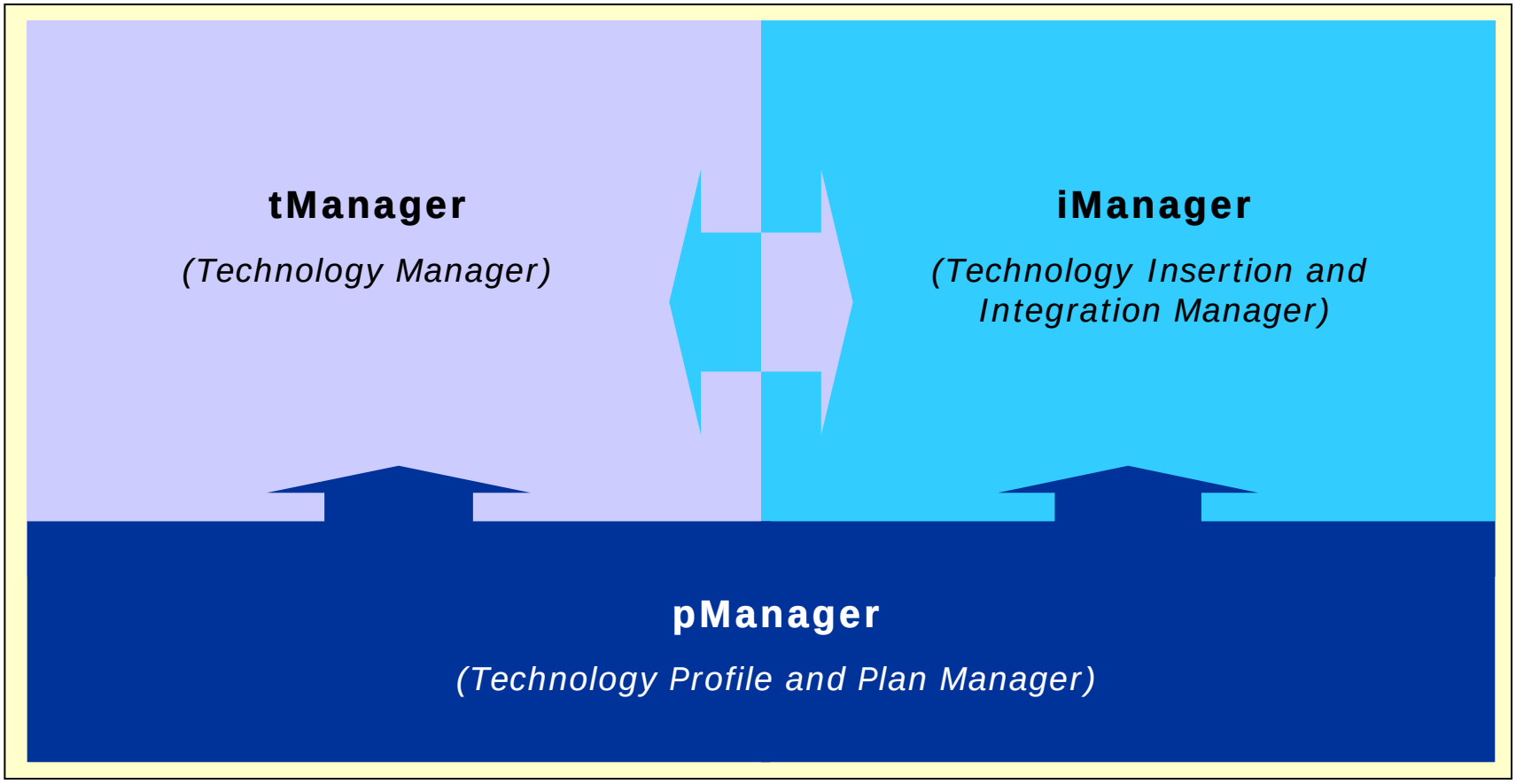


tManager: How to Use

- **Develop:**
  - Pre-TRL activities
  - Post-TRL activities
- **Analyze:**
  - Technology Cycle results
  - Contractor incentives (and associated performance requirements) to maintain and implement “Live TDS” through complete SoS/System life cycle
- **Select:**
  - Incorporate in to TDS

TechIP Methodology

The TechIP methodology provides a framework for the management of technology through its lifecycle. TechIP consists of three components which are tManager, iManager & pManager



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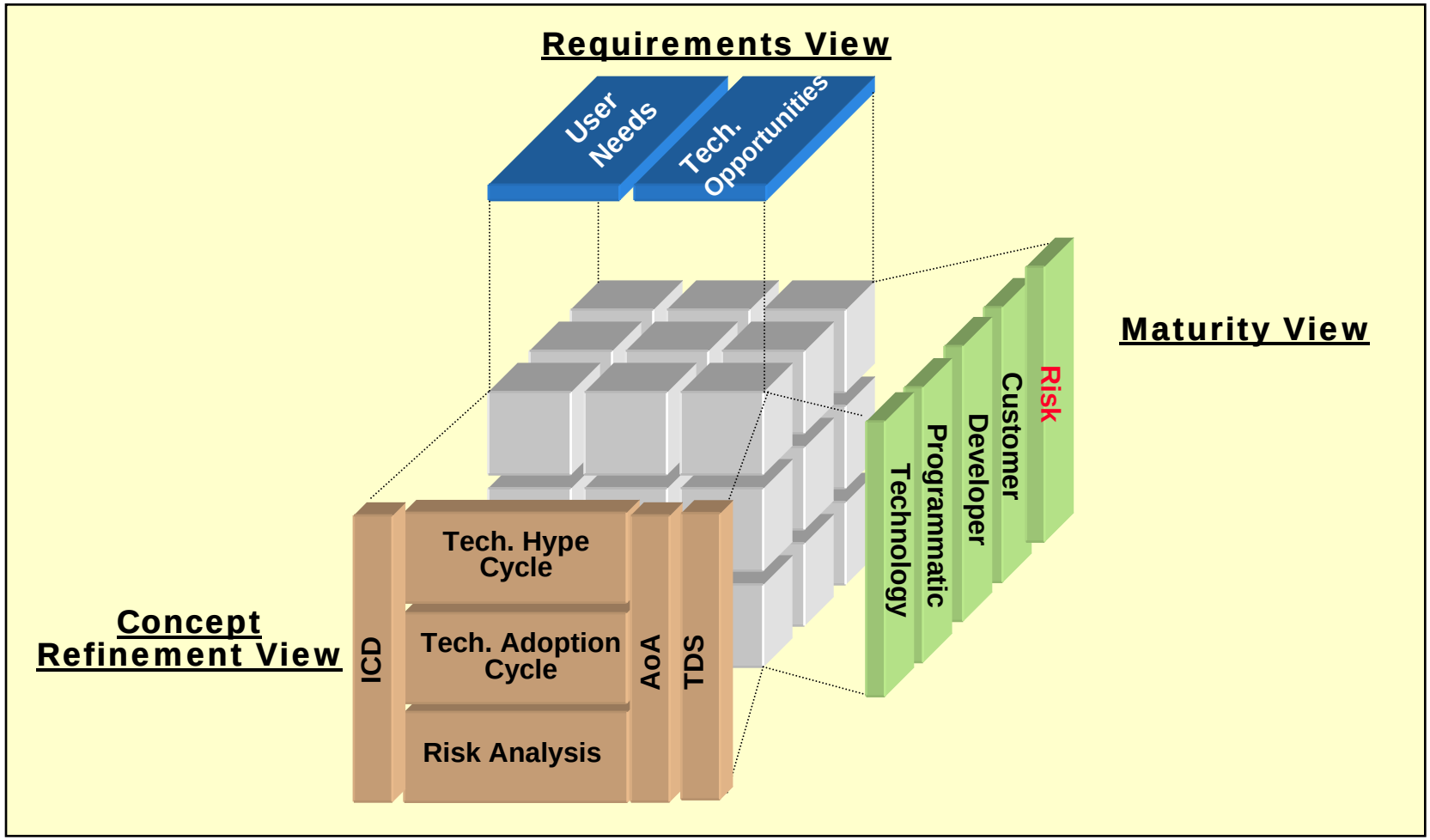
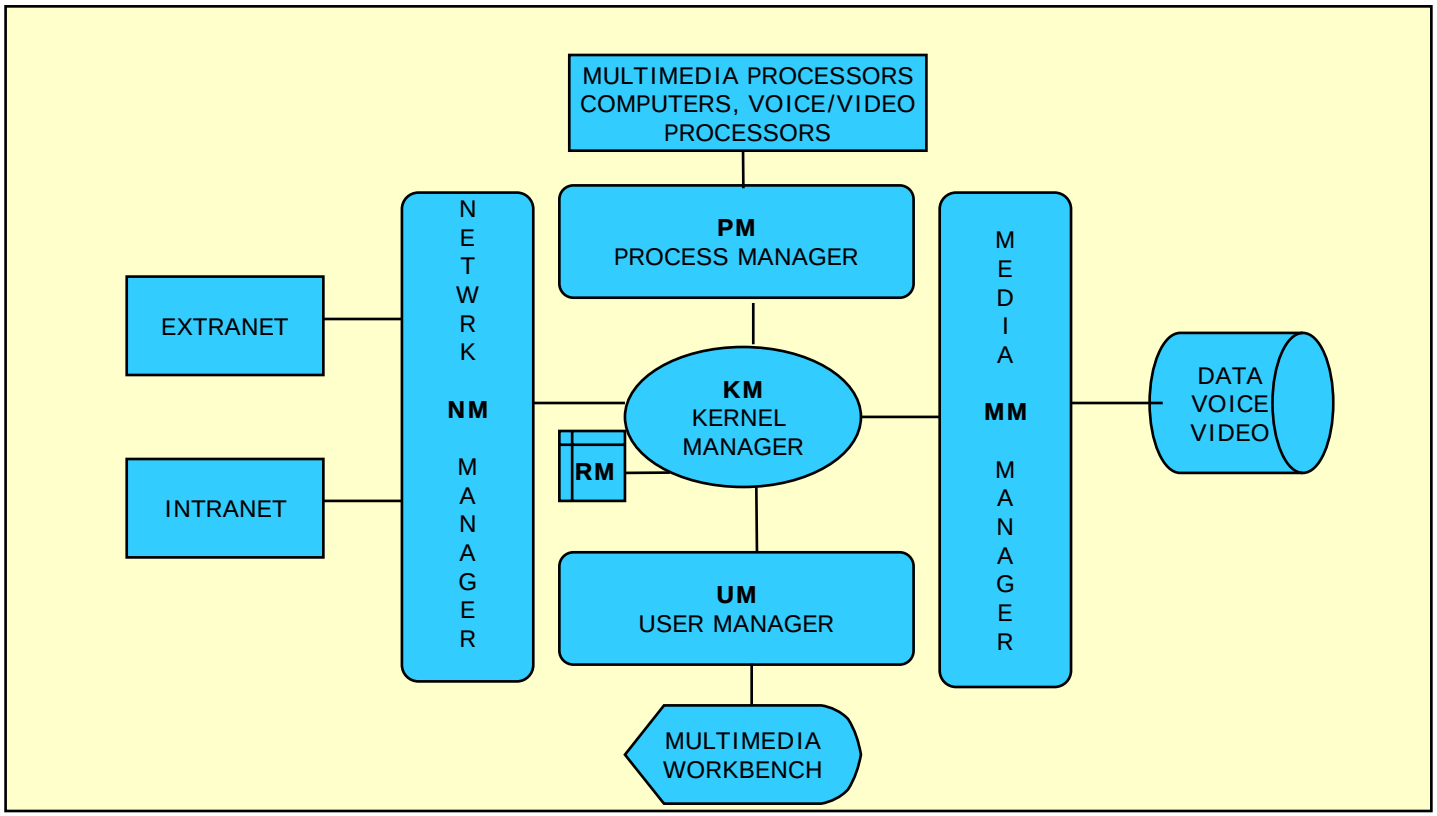


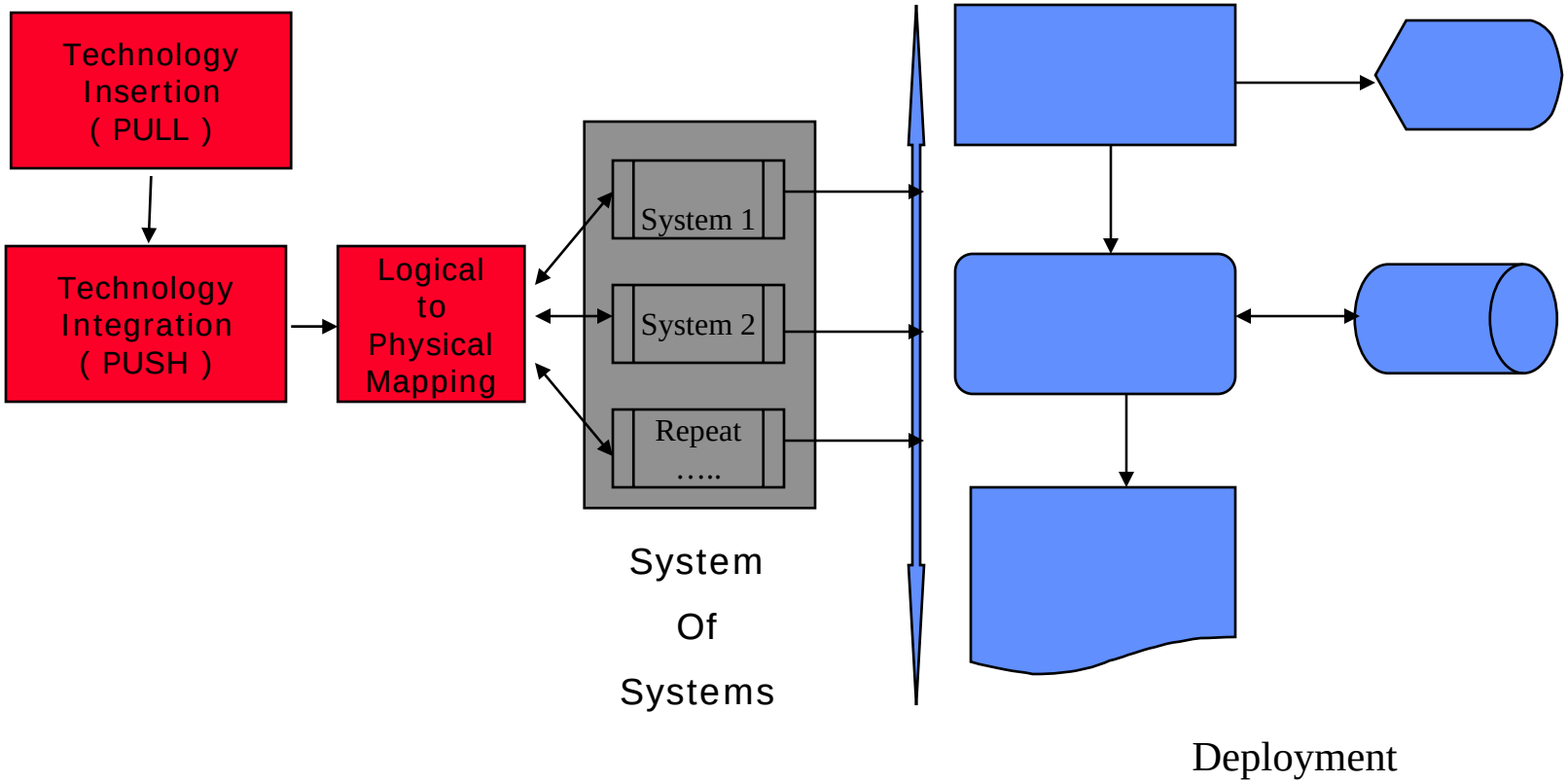
iManager : Overview

Generic Model (IT System) to map Critical Technology Elements (CTEs) derived TDS into SoS



iManager: Technology Insertion & Integration Activities

Create a Technology specific iManager model by PULLing CTEs from tManager; create iManager models for each system component of SoS, and integrate these CTEs in to SoS by PUSHing into individual systems.



pManager : Overview

The objective of pManager (which is a set of processes and software tools) is to manage the technologies identified by the tManager and iManager components of TechIP.

Technology Profile	• Metadata (definitions) of CTEs, systems, subsystems, etc. • Live Technology life cycles
Technology Plans	• Live TDS • Technology Roadmaps • Technology Migration Plans • Technology Maturation Plans
Management & Collaboration	• Forrester Value Network • Collaboration Platform • EA/SD Procedures • CMMI
Tools	• AFRL/Bill Nolte's TRL Calculator • SEI (IDEAL – based New technology Rollout) • Technology Portal • Modeling and Simulation

Profile

Has Patel

- Founded Infologic, Inc.
- Previous experience:
  - Bell Labs
  - Software Company
  - Various Industries
- Research Interests:
  - System Architecture
  - Technology Insertion
  - Emerging Technologies
- Education: MS/BS

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Conclusions

I. Role of Technology Cycles (Hype Cycle and Adoption Cycles) in identifying technologies for a System or Project

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Any Questions, Comments,
Disagreements and Constructive Suggestions

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