

# INTELLIGENT AND INTEGRATED MANUFACTURING - AND TDPs

All About the Vision

Richard Neal

President, IMTI

December 13, 2010

# This Presentation

- ▣ A vision for success
- ▣ A description of the IIM enterprise
- ▣ A plan going forward
- ▣ The imperative of TDP

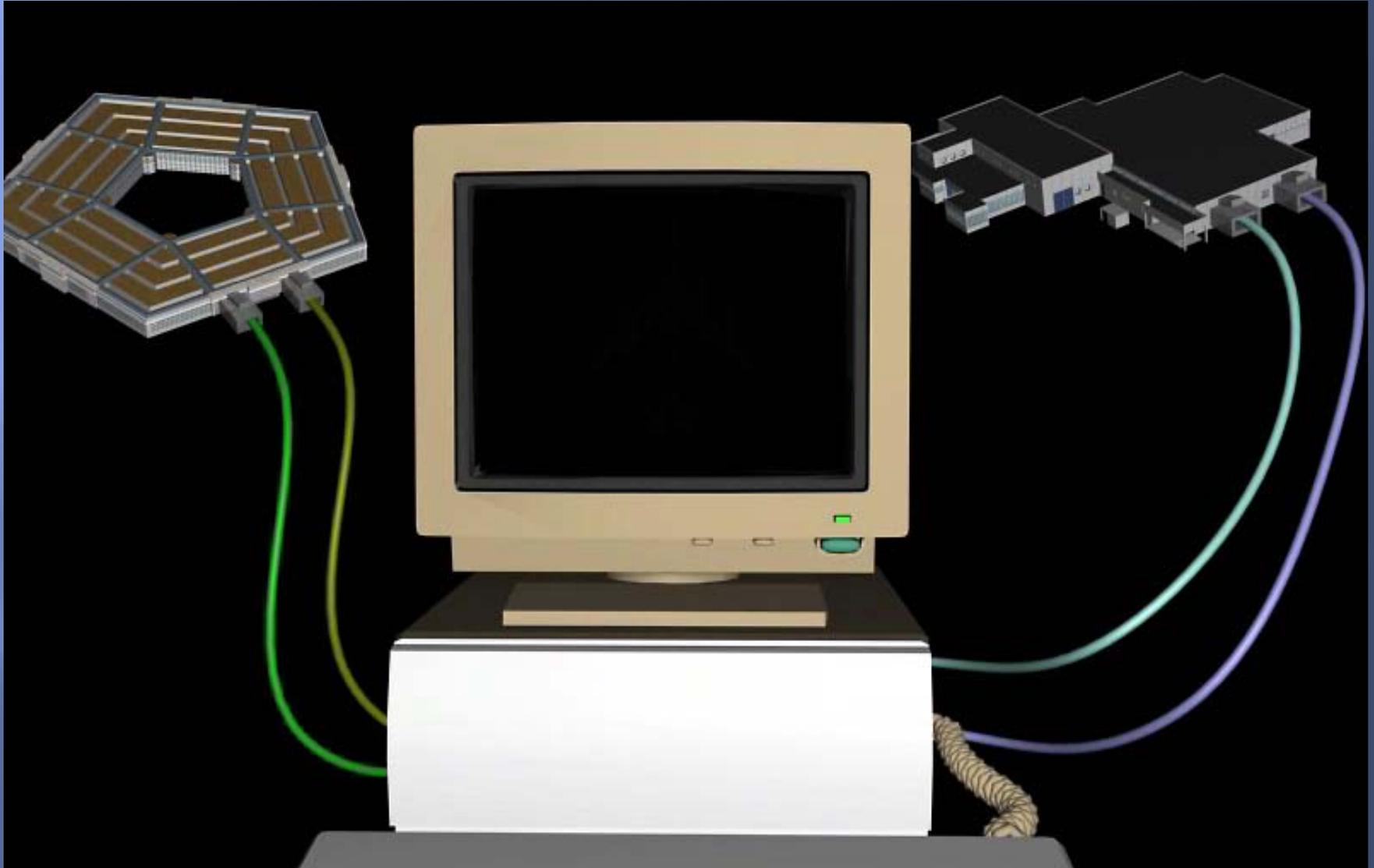
**During This Season of Reflection, It is Especially Important to Acknowledge That We Are Not Creators - But Compilers of Your Vision - Thank You**

**So Much Is Being Accomplished,  
but,**

**What If We Could ...**

**Optimize Designs for Product  
and Process – For Total Value . . .**

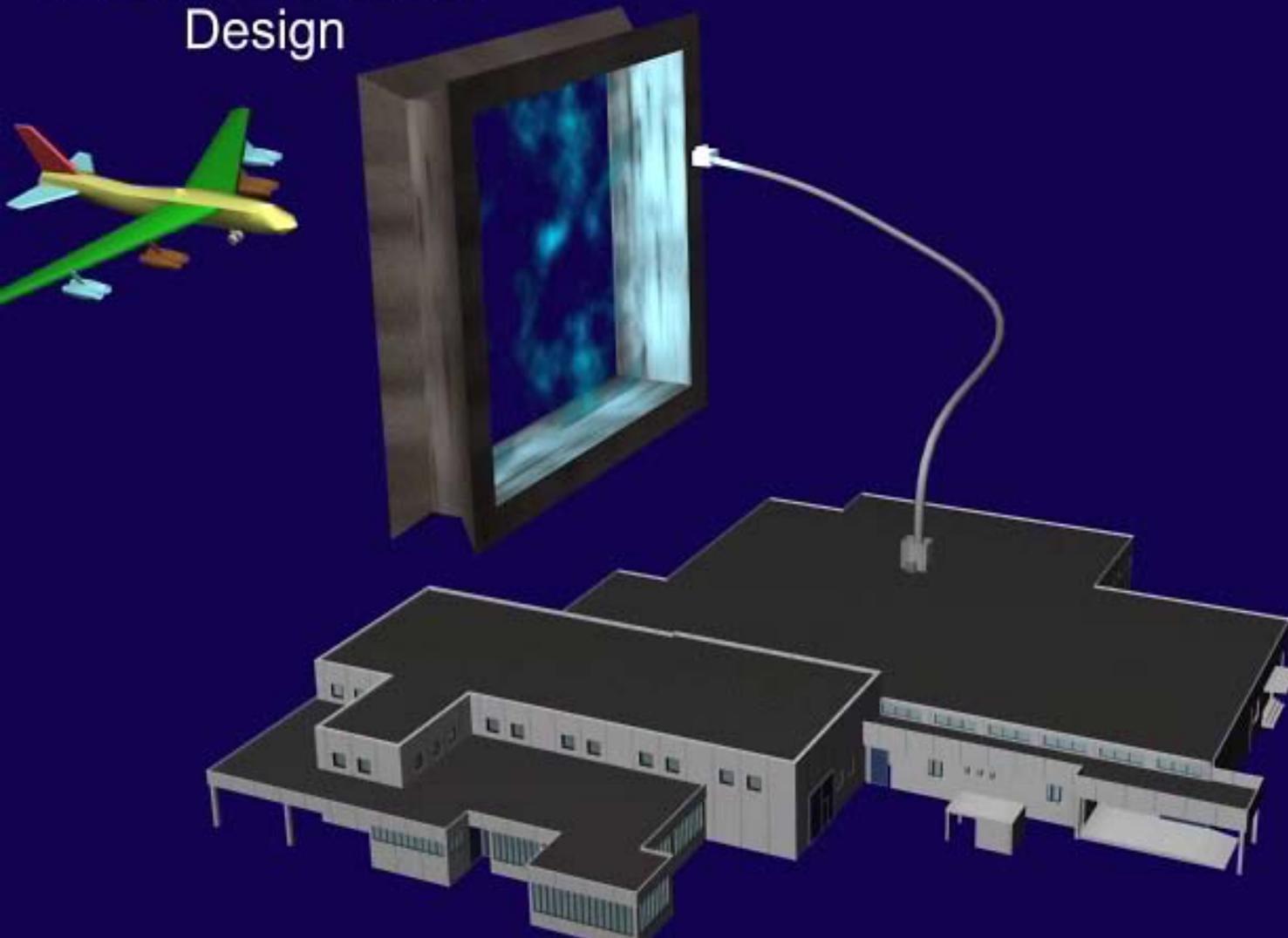
**And Capture the Data, In-Process  
in the TDP**



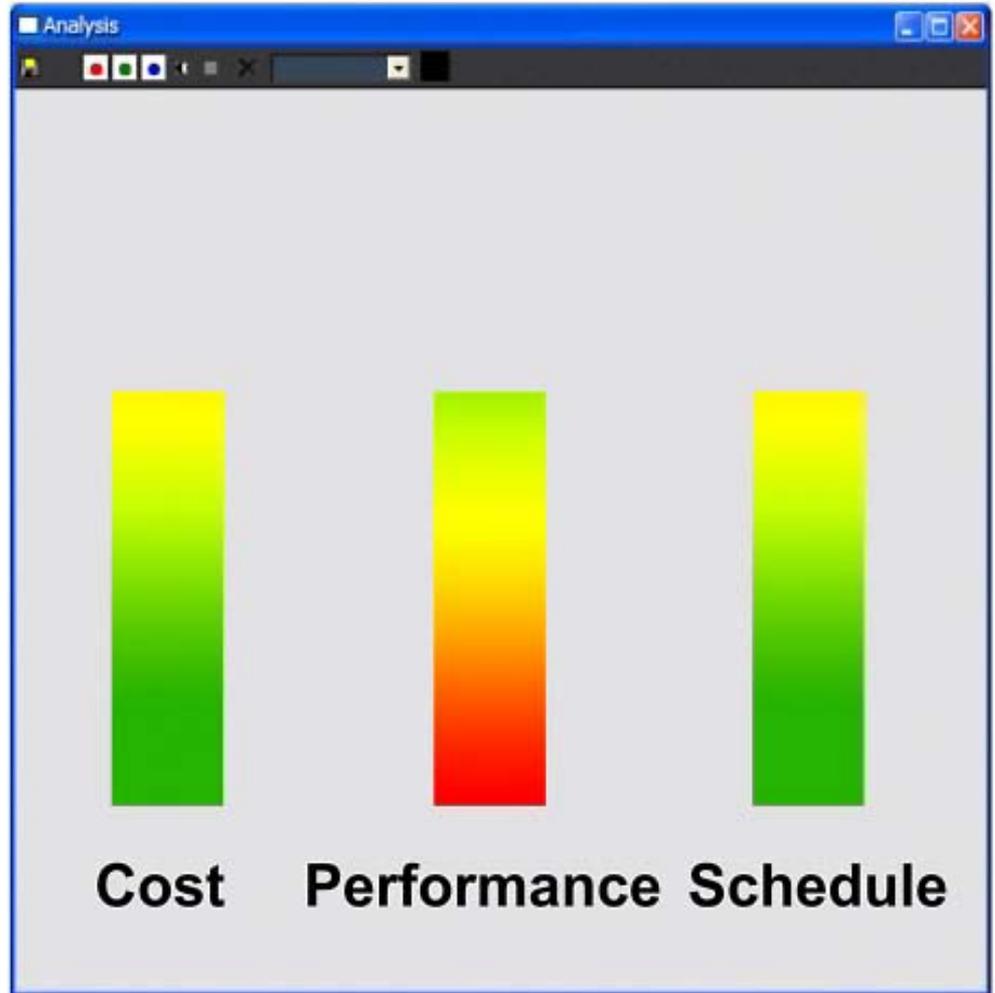
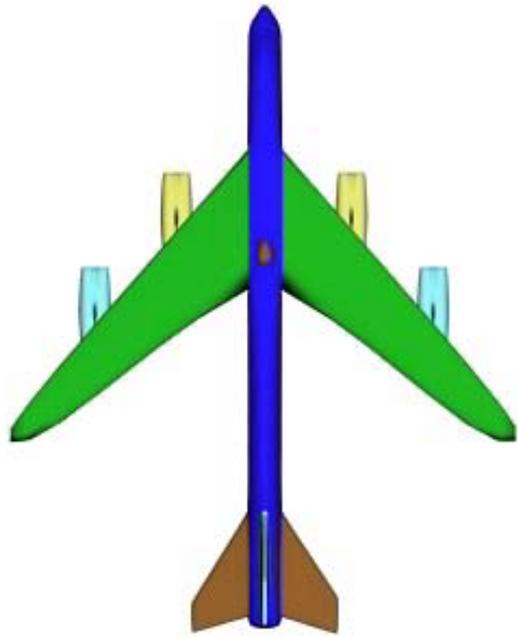
Produce All Needed Information  
For Process Execution (automatically) . . . .

And provide all of the annotations  
Required for process definition in  
The TDP

Product & Process  
Design



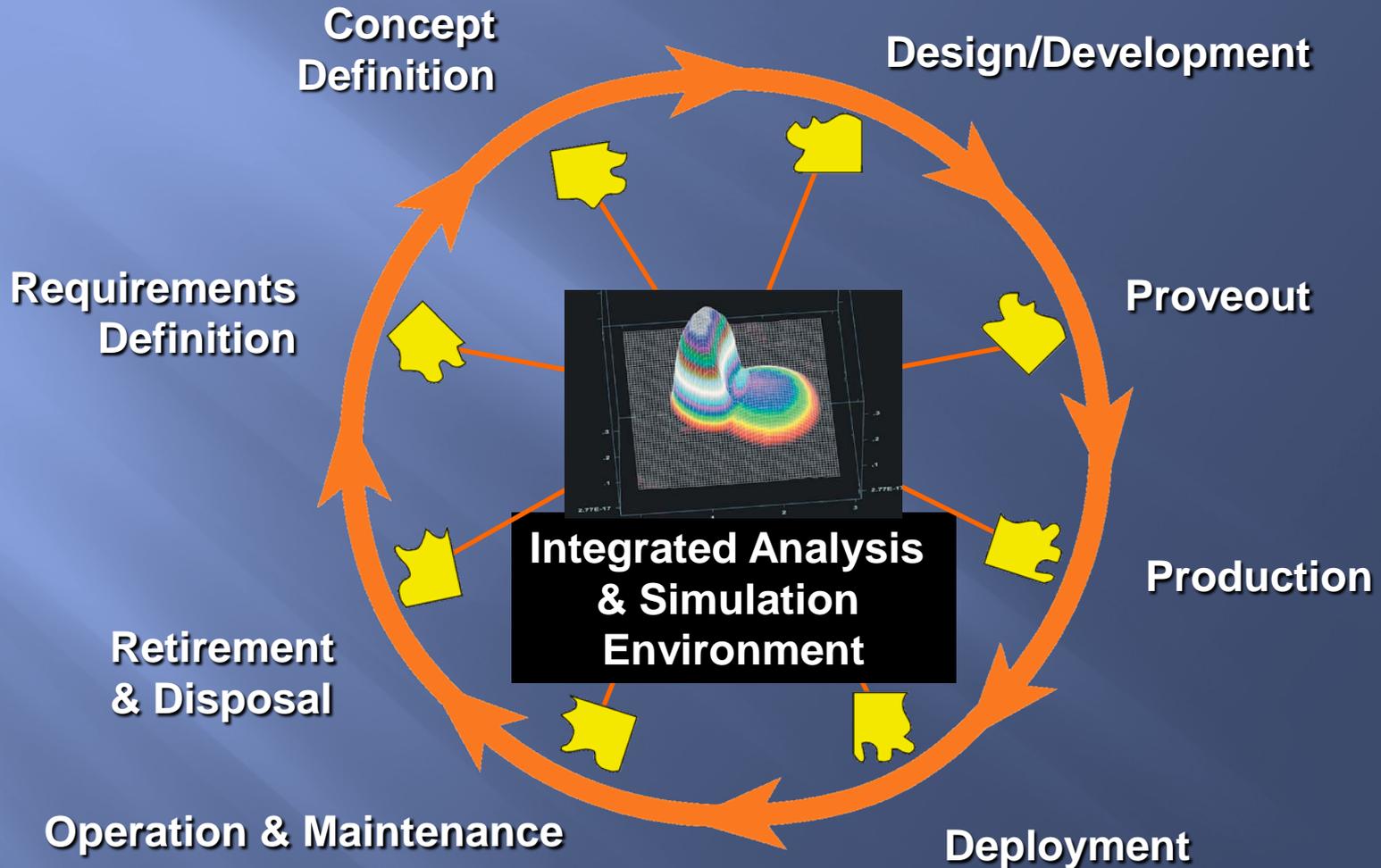
# Design for Best Total Value . . . And document changes and decisions in the TDP



**We Can!**

Such an Enterprise Is . . .

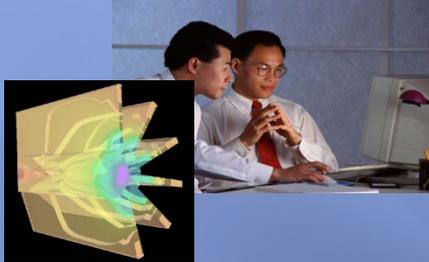
# Simulation Based



***Science-based analysis supporting every aspect of the life cycle***

# Knowledge Rich

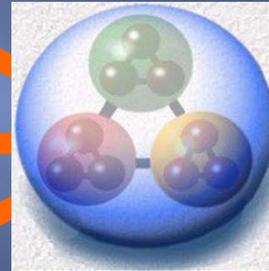
## *Product Design & Engineering*



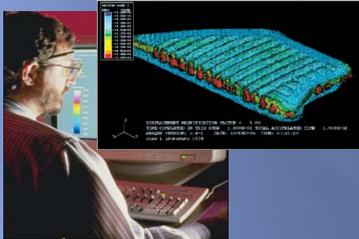
## *Manufacturing Operations*



## Shared Knowledge



## *Process Design & Engineering*



## *Inspection, Acceptance & Certification*



## *Production Planning*



## *Product Assurance*

***Continuous feedback and enrichment of information across the life cycle***

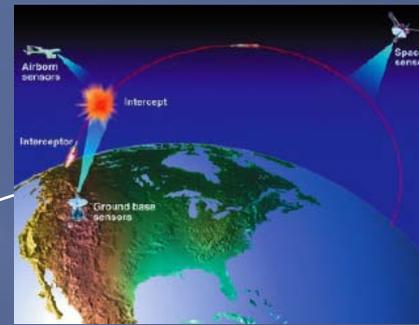
## Totally Connected



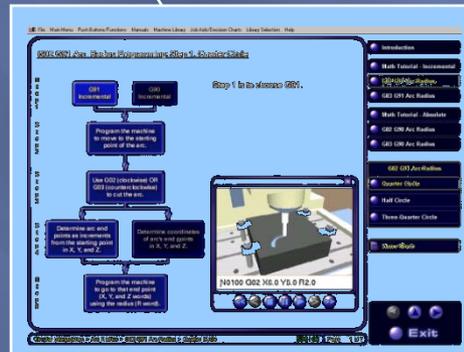
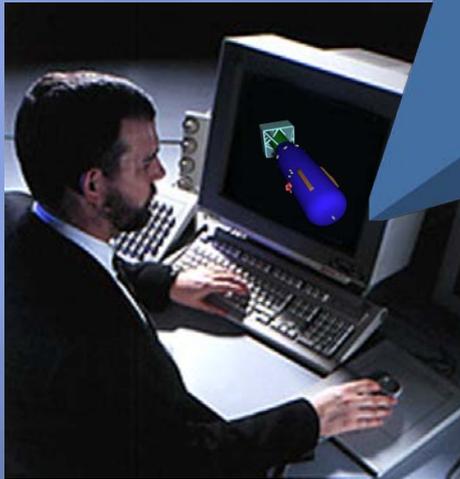
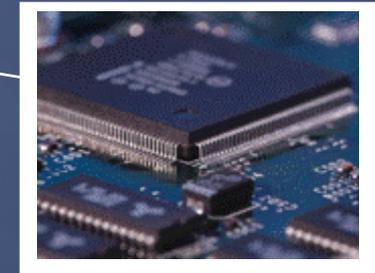
***An Integrated Seamless Flow of Information and Knowledge***

Instantly Responsive with . . .

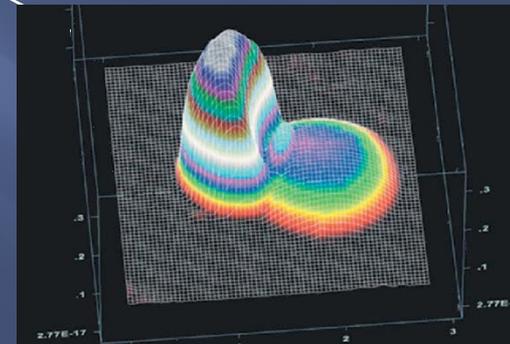
**Requirements  
Analysis**



**Performance  
Assessment**



**Producibility**



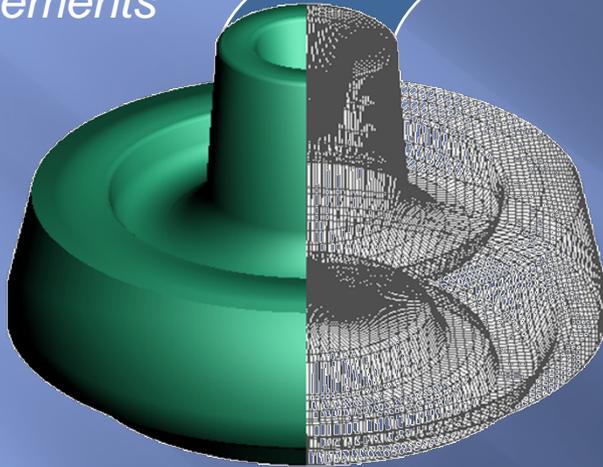
**Material Behavior**

***One-click access to all needed analysis capabilities***

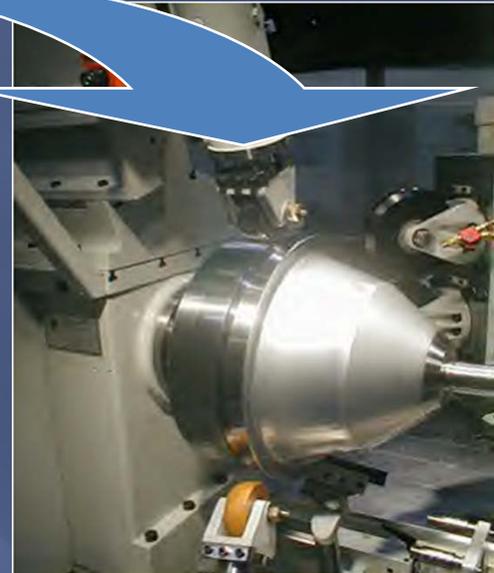
## Capable of Supporting Adaptive, Flexible, Closed-Loop Operation

- *Product & process definition*
- *Specs & control parameters*
- *Resource & schedule requirements*

**As-Designed**



**As-Built**



- *As-built configuration & properties*
- *Process performance & material behaviors*

**Digital feedback deepens the knowledge base for future products**

Bottom Line . . .



*Validated Models*

*Validated designs*

*Validated Processes*



In a totally managed enterprise . . .

Captured in the TDP for sustained  
ability to produce and support

*Validated Products*

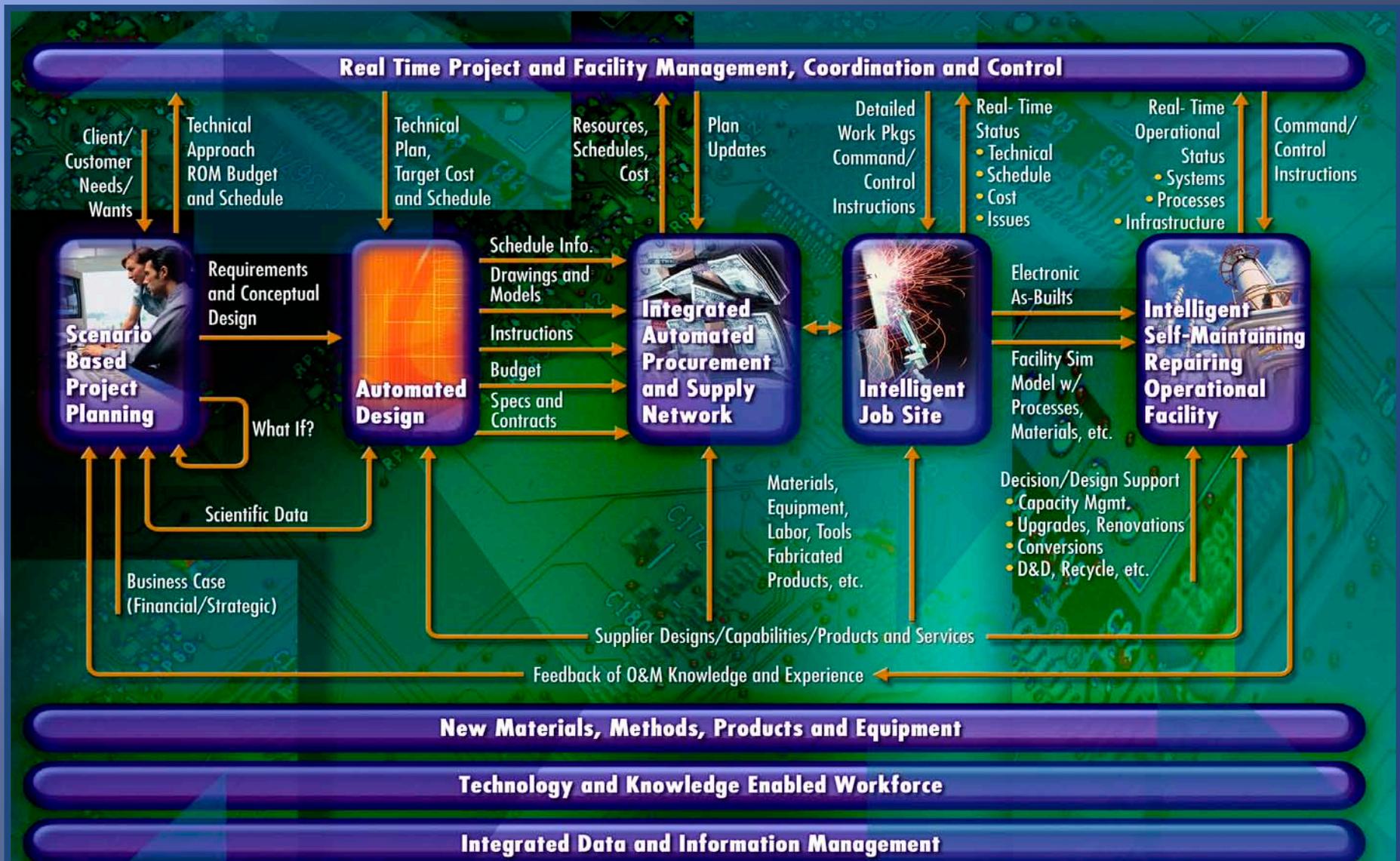
# Imperatives for Achieving Intelligent and Integrated Manufacturing

1. **Intelligent conceptualization & visualization capability supporting innovation in product and process design**
2. **Requirements-driven, enterprise wide, lifecycle cost and risk modeling in an environment that supports trades for optimization**
3. **A complete, intelligent, product definition model capable of driving all downstream applications**
4. **Automated, integrated, knowledge-based design and planning advisors**
5. **Interoperable, accurate, and pervasive models that enable integration of processes across the enterprise**

# Imperatives for Achieving Intelligent and Integrated Manufacturing

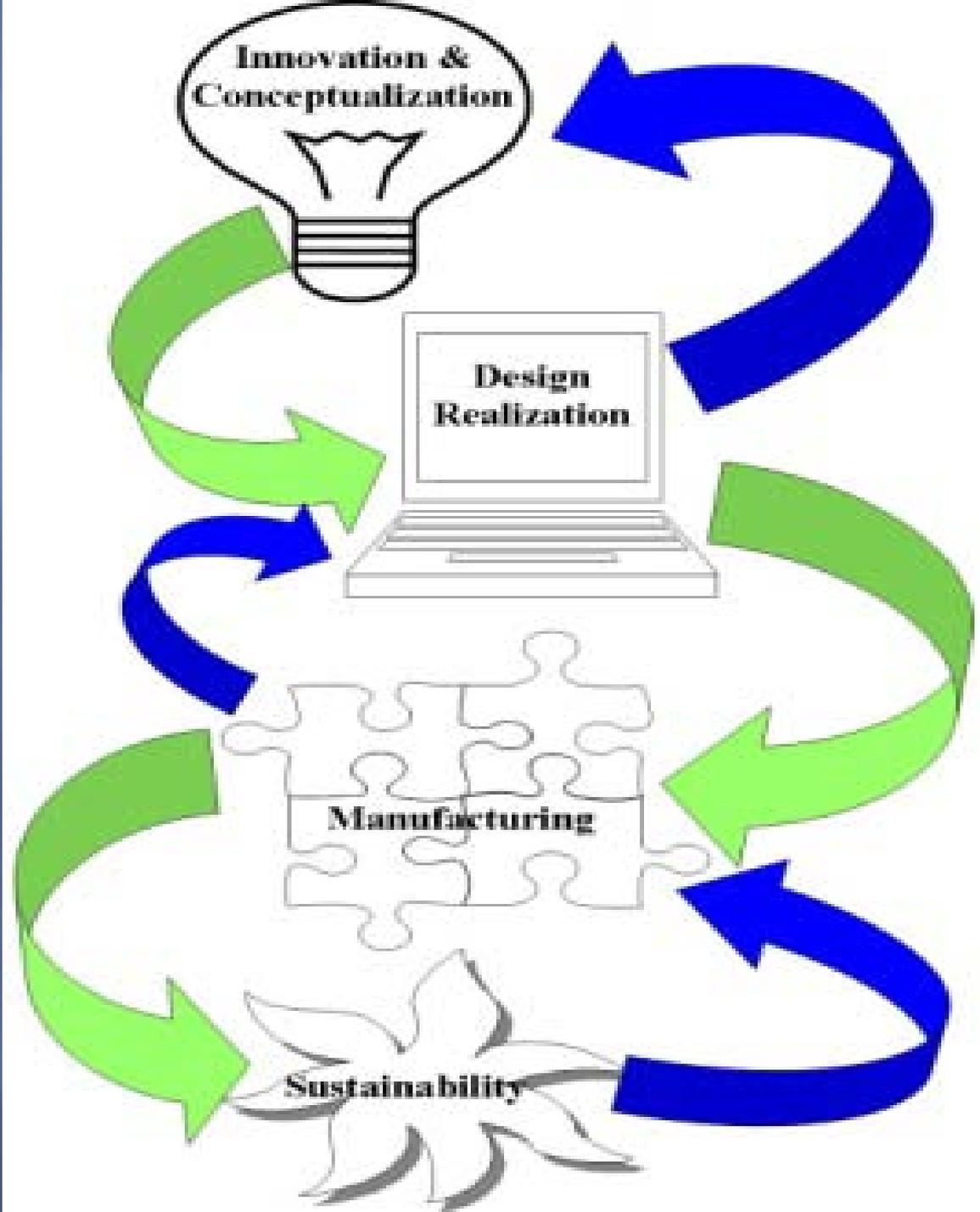
6. **Integration of business, product realization, and operations functions**
7. **Model-Ready Supply Network that functions in a globally collaborative environment**
8. **Complete virtual product development and documentation that provides a comprehensive Technical Data Package integrating as-designed, as-planned, as-built, and as-used**
9. **Model-Based operations systems that drive production and sustainment, including model-based control**
10. **A flexible, well trained workforce, enabled for model-based design and manufacturing**

# Fully Integrated and Automated Technology (FIATECH)

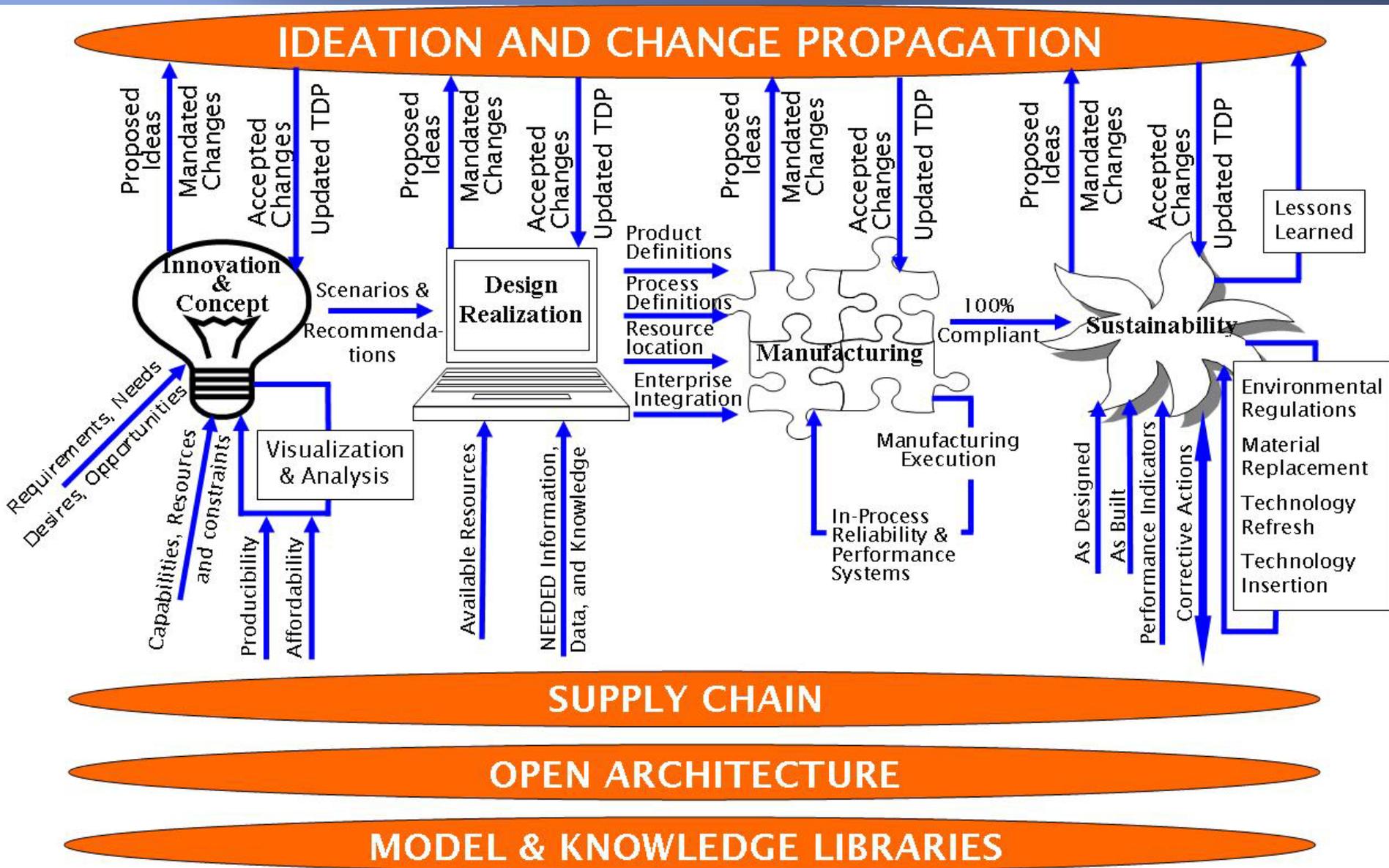


# A PLAN

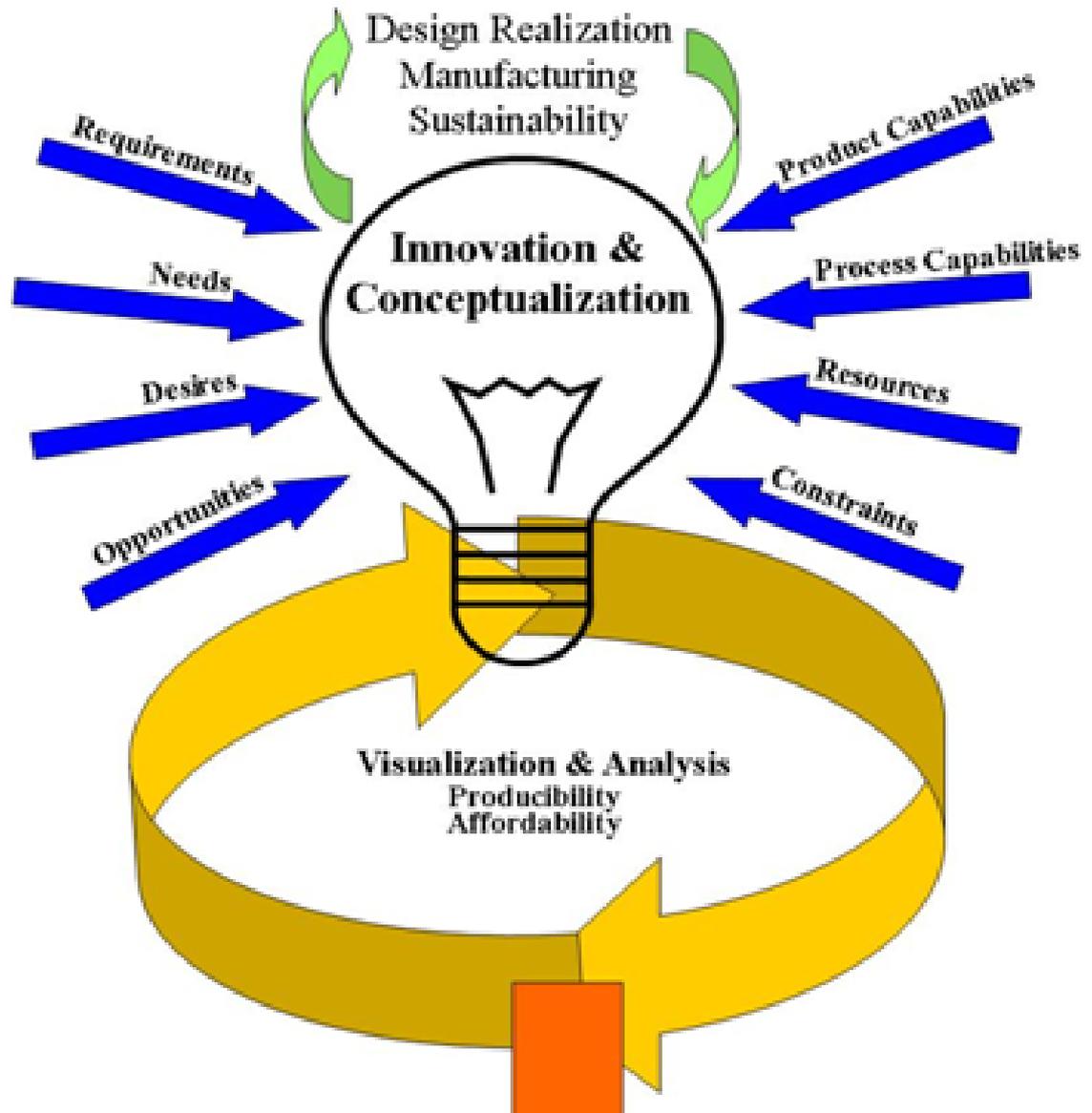
The IIM enterprise is a total optimization environment, driven by requirements and focused on innovation across the product lifecycle.



# The Intelligent and Integrated Manufacturing Enterprise

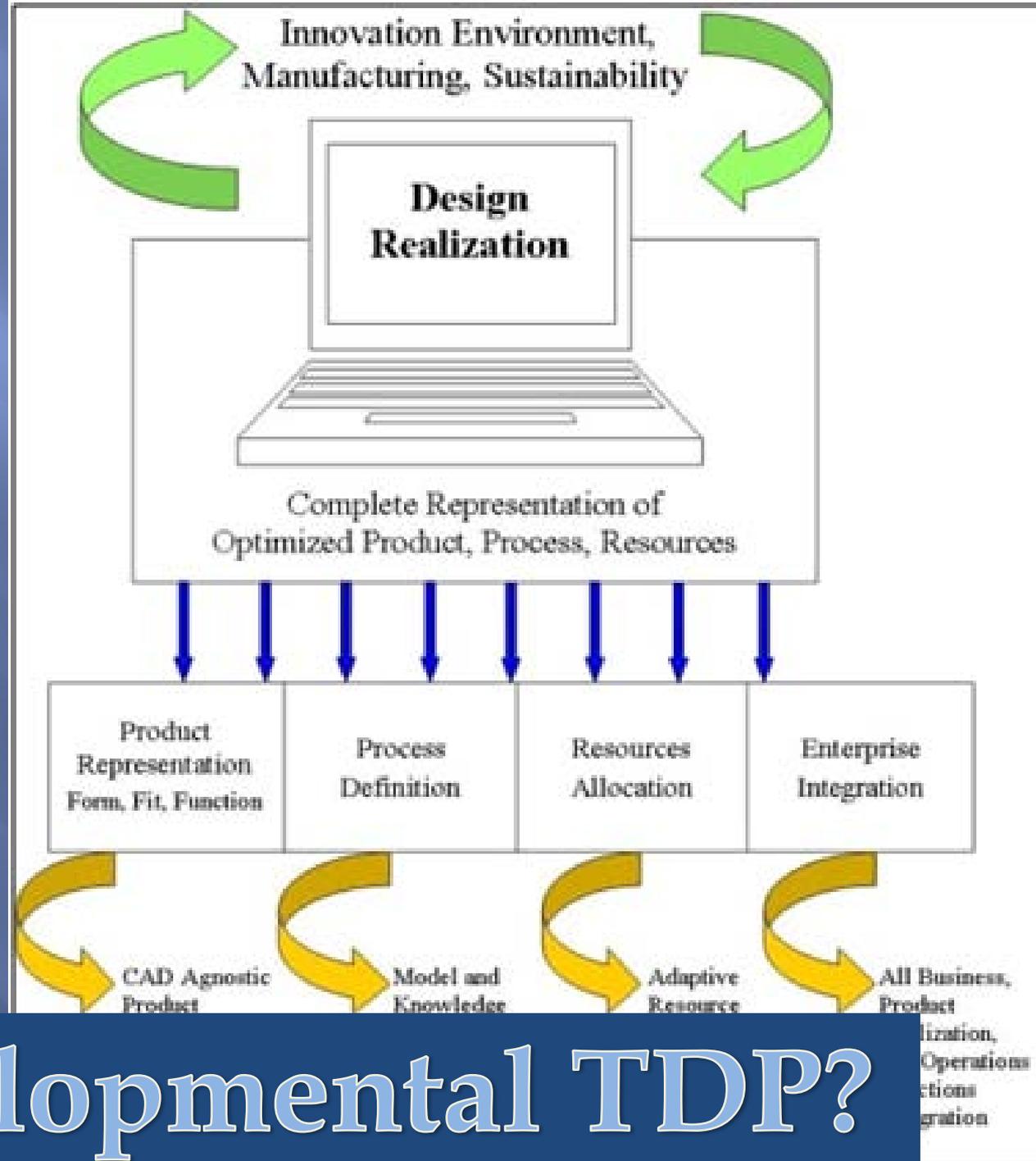


Innovation and conceptualization is requirements-based and focuses on total optimization for performance, affordability, and sustainability.



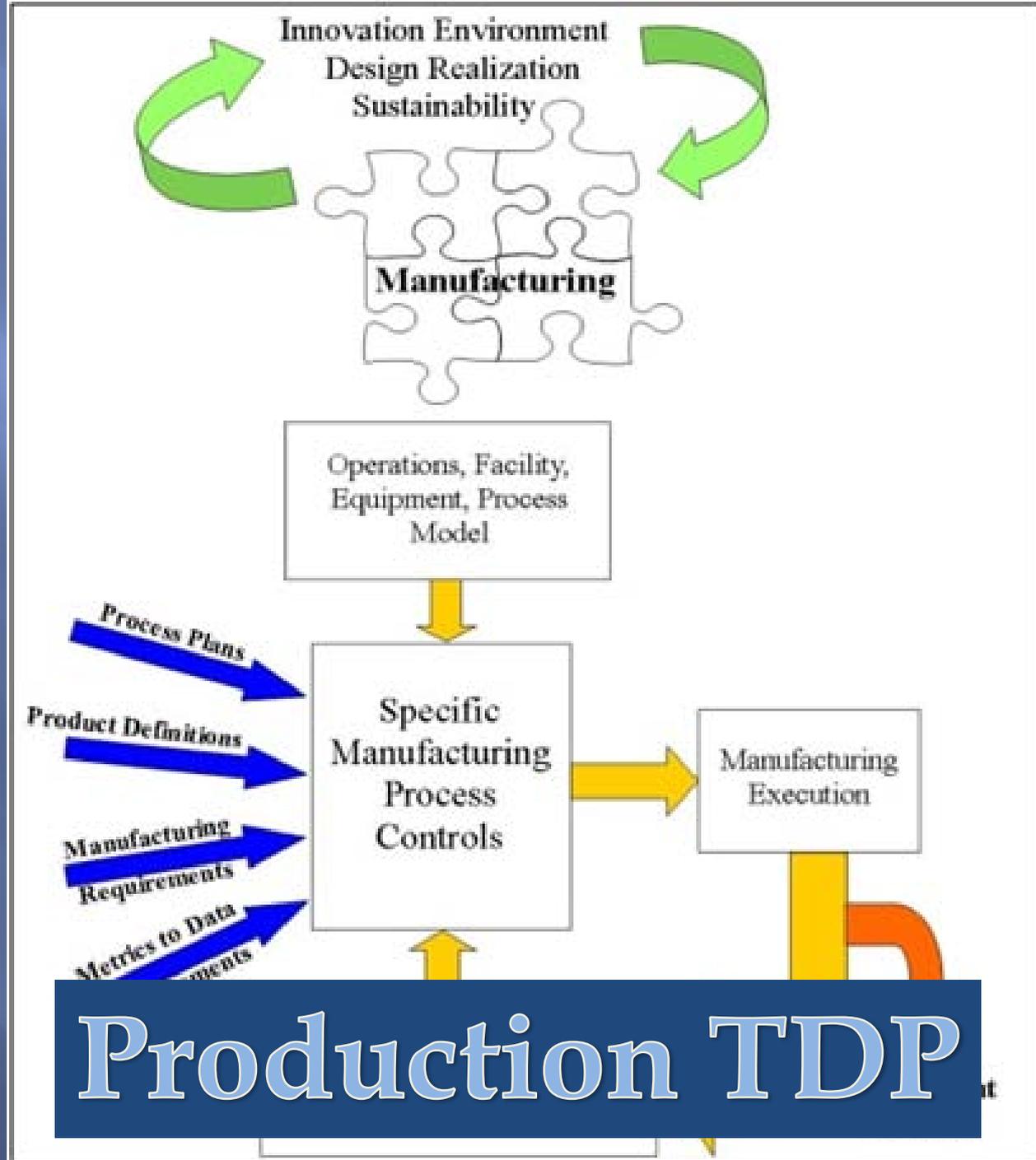
# Conceptual TDP

Design realization is the process of utilizing the baseline TDP from the innovation process to configure all information to drive manufacturing operations.

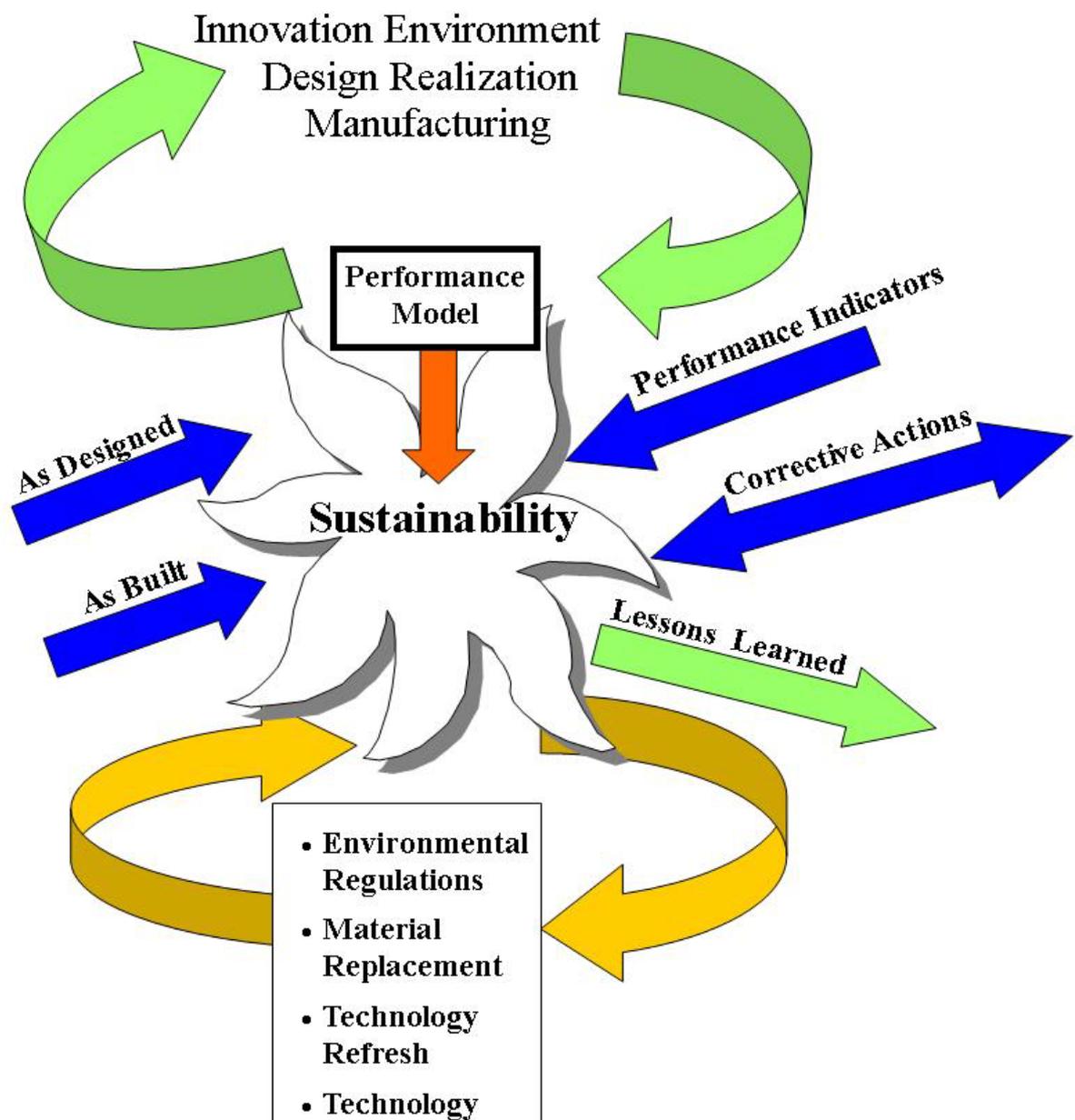


# Developmental TDP?

Manufacturing is a service that is reliably provided because of the richness of the design content and the excellence and closed loop operation of the manufacturing environment.

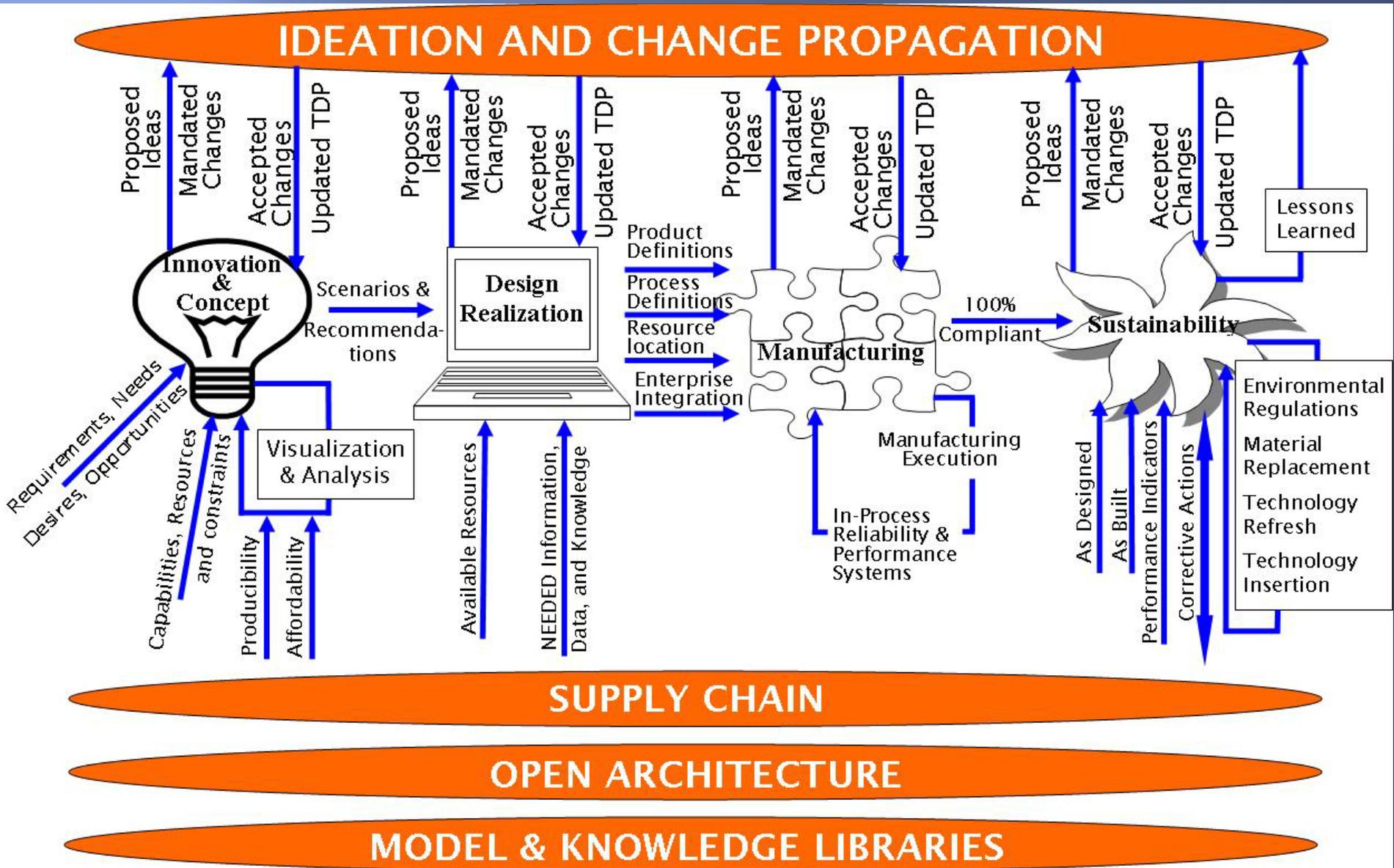


Sustainability embraces the optimization of total lifecycle value in all aspects of innovation



# Production TDP ?

# The Intelligent and Integrated Manufacturing Enterprise



# The IIM Architecture

- ▣ A key enabler for IIM success
- ▣ An open architecture approach to building and managing all data, information, and knowledge needed for seamless product realization, including lifecycle management – supporting interoperability
- ▣ Made manageable through focus on specific product domains and workflow models
- ▣ Houses data, information and knowledge including interface definition
- ▣ Provides needed security in an environment of need to know access
- ▣ Standards utilized where available. Needed standard approaches and standards developed

# Change Management

- ▣ Scholarly approaches in models that predict the impact of changes
- ▣ Matrices and rules systems that support analysis of the proposed design changes and the prediction of propagation
- ▣ Change propagation from any point in the design and manufacturing process – sounds good
  - Change propagation has multiple levels, and needs the appropriate response
  - Change propagation and tracking to requirements - unified

In an all digital, integrated environment, why not propagate all changes to “innovation and conceptualization” and press the “go button?”

# The Supply Chain

- ▣ Rich in models and knowledge that support clear and unambiguous communication of requirements, metrics, and expectations
- ▣ Clear in its business relationships based on standard business models
- ▣ Focused on metrics for definition of capabilities – across all aspects of the business
- ▣ Validated in its ability to function in the enterprise
- ▣ Supported by training and workforce development

In the IIM enterprise, the supply network is model enabled and strategically positioned to plug and play in providing a manufacturing service. The supply base capability is quantified and available for evaluation.



# Workflow Models and Product Applications

- ▣ The workflow model is an integrated process model plus knowledge of information exchange requirements
  - Workflow models define the tools used to make product, the sequence of their interaction, data exchange requirements, models and analytical services. . .
- ▣ They are foundational in building the IIM toolsets because they enable focus and manage the transition strategies
- ▣ Products provide the targets for the workflow models and targets for technology development
- ▣ Products assure demonstrated value delivery and relevance to customer needs

# Product Applications?

- ▣ Technical teams build a toolset
- ▣ Product managers define the tools that will be used to build product
- ▣ Technical managers “sell” their tools to the product manager
- ▣ Product demonstrations support tool development and integration
- ▣ Commercialization and deployment follows

# The Project Slate

1. **Architecture for IIM**
2. **Complete visualization and conceptualization environment**
3. **Creation of a complete product definition capable of driving all downstream applications**
4. **Complete integrated process modeling and knowledge applications**
5. **Model-based operations and control systems that drive production and sustainment of the facility**
6. **Model-ready supply network supported –strategically prepared and validated**
7. **Systems to support sustainable products, processes, and resources**
8. **Product application**

# TDP Linkage to the IIM Vision

- ▣ There is a stretch in mindset!
- ▣ Accomplishments? WOW
- ▣ The direction that is being taken
  - Industry
  - DARPA
  - AME
  - Services
  - Other agencies

The TDP work is foundational to today's improvements and tomorrow's successes

# Summary of Message

- ▣ The work that is being done is critical
- ▣ The enjoyment of the first two days will be reflected in great work on Wednesday and Thursday
  - The opportunity to write into DoD practice the right way to manage data . . .
- ▣ The TDP is at the core of today's realities and positioned as a key enabler for future visionary successes
- ▣ We encourage your feedback as we seek a vision for the future

**THANK YOU!**