



# Aligning Portfolio, Program and Project Management with Your DSN

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# How are *project* supply chains unique?

They are different from mfg. supply chains in six key ways.

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- Support a unique, non-routine product, created outside of a controlled factory environment
- Temporary systems
- Undergo simultaneous structuring & operations
- Project organizations are “learning-disabled”
- Large numbers of transactions w/ local entities
- Embedded in locally-devised institutions:
  - Buying land, Clearing customs, Applying for permits, Hiring labor, Getting replacement parts, Working with trade unions, Avoiding mafia, Hiring security.



# OUTLINE

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- Manage project DSN linkages at multiple levels
- Where to use “process heavy” vs. “process light” planning & tracking
- The impact of interdependence in project supply networks
- Challenge of innovating in project supply networks



# APM-Supply Chain Links at Portfolio Level

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- Portfolio
  - Multiple networks in different countries
    - Long range demand forecasting for Nokia and key vendors' capacity planning
    - Market and demographic indicators drive investment decisions for mid-long range supply planning



# APM-Supply Chain Links at Program Level

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- Program
  - Single network rollout
    - Medium term demand forecasting, integrated with client rollout plans
    - Capacity planning by region for near term demand



# APM-Supply Chain Links at Project Level

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- Project
  - A cell tower, etc. within a single network
    - Detailed and frequently updated procurement plan related to project schedule drives demand forecast
    - Short term tracking and expediting of specific components and materials in supply network aligns supply with demand



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# “Process-Heavy” Planning and Tracking

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- Plan tasks in great detail.
- The plan is a “good” plan, so track past performance in detail and eliminate deviance from plan
- “Success” = meeting the targets in the original plan!







# “Process-Light” Planning and Tracking

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- Plan tasks only as far ahead as you have a clear line of sight.
- Keep asking whether the goalposts have moved, and/or whether the resource base has changed?
- “Success” = meeting current strategic goals!





# Portfolio Level — *Process-Light*

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## ➤ DEMAND

- Aggregate demand based on high-level plans and progress across multiple rollouts by region/platform
- Assess demand for long-lead time equipment, components, software, services & critical internal skills

## ➤ SUPPLY

- Check supply capacity by region/platform
- Plan capacity expansion and/or engage new supply partners in key locations to supply underserved regions, platforms, high growth markets
- Develop HR recruiting and training plans to supply scarce skills, and to develop emerging critical skills



# Program Level — *Process-Medium*

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- DEMAND
  - Aggregate rollout plans;
  - Aggregate actual progress at multiple sites
  - Feed-forward and integrate with mid-range customer demand forecasts
  - Notify all vendors of mid-range demand
- SUPPLY
  - Have vendors confirm mid-range capacity
  - Perform forward-looking capacity and carry out technical/organizational/political/economic risk forecasting and mitigation



# Project Level — *Process-Heavy*

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- DEMAND

- Activity/Item-level planning and tracking
  - Detailed schedules down to activity level
  - Specific materials and components procured based on current schedule from tier one and two vendors and suppliers

- SUPPLY

- First few tiers of supply chain must be tightly coupled to project plans and actual project progress
  - Progress tracking and updating of schedule drives updates in procurement schedule for tier one, two vendors and suppliers
  - Feed-forward and integrate with customer rollout planning to drive short-term supply chain demand planning for specific kinds of of labor, materials and components
- Keep client involved in scope/schedule changes



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# Not All Work Is Created Equal

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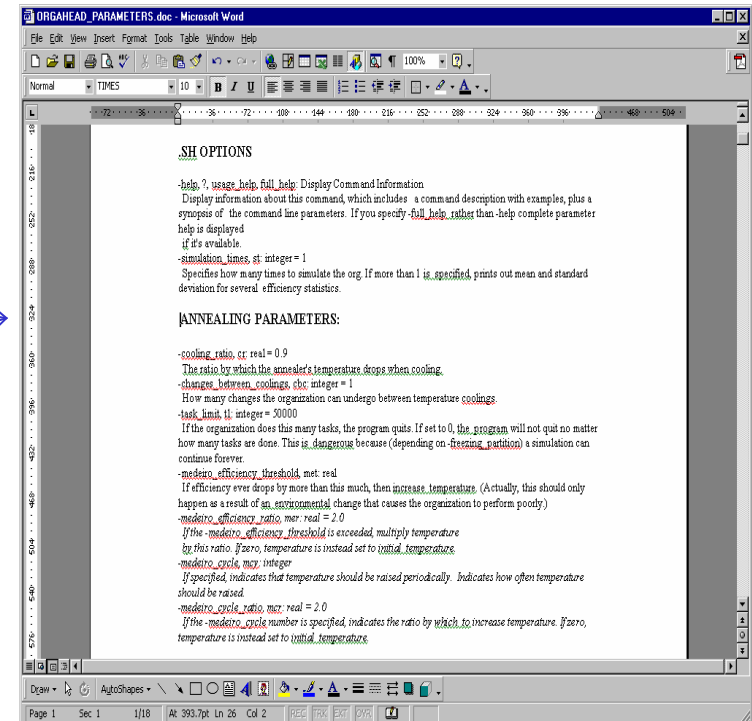
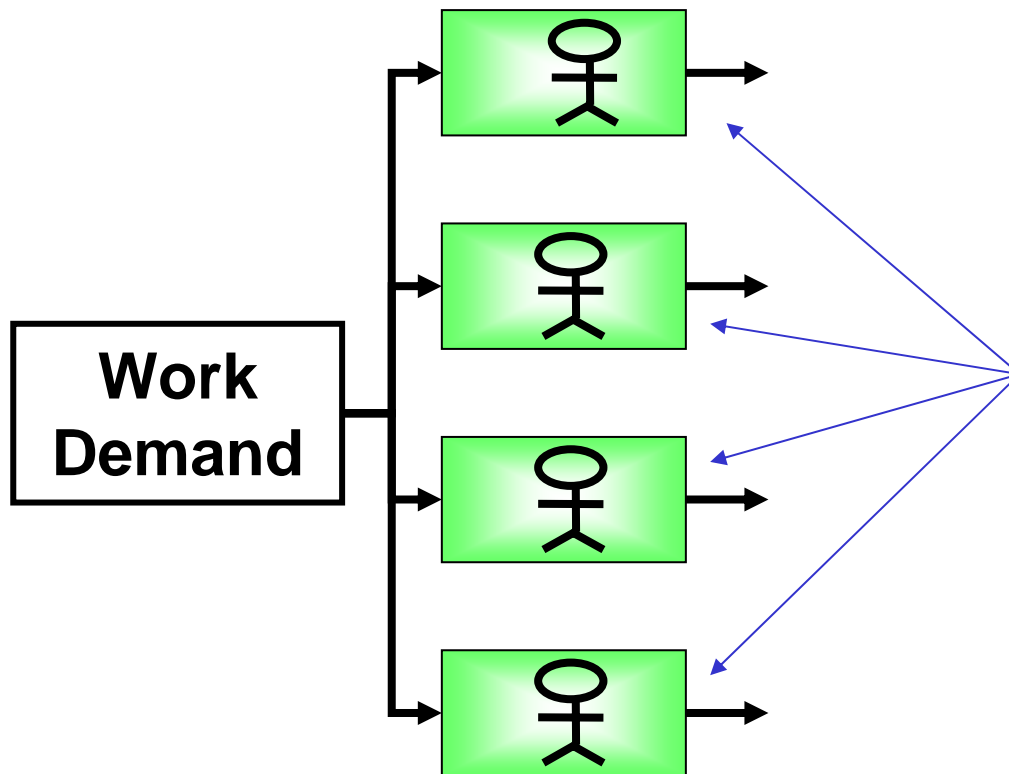
- There are 3 types of work in projects
  - Pooled work (Independent)
    - Workers accomplish their tasks independently of other workers
  - Sequential work (Dependent)
    - Workers accomplish their tasks when others have completed specified tasks on which they depend
  - Reciprocal work (Interdependent)
    - Workers accomplish their tasks in cooperation or collaboration with other workers through a series of “mutual adjustments”



# Pooled (Independent) Work

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## Coordinated by Rules and Standards

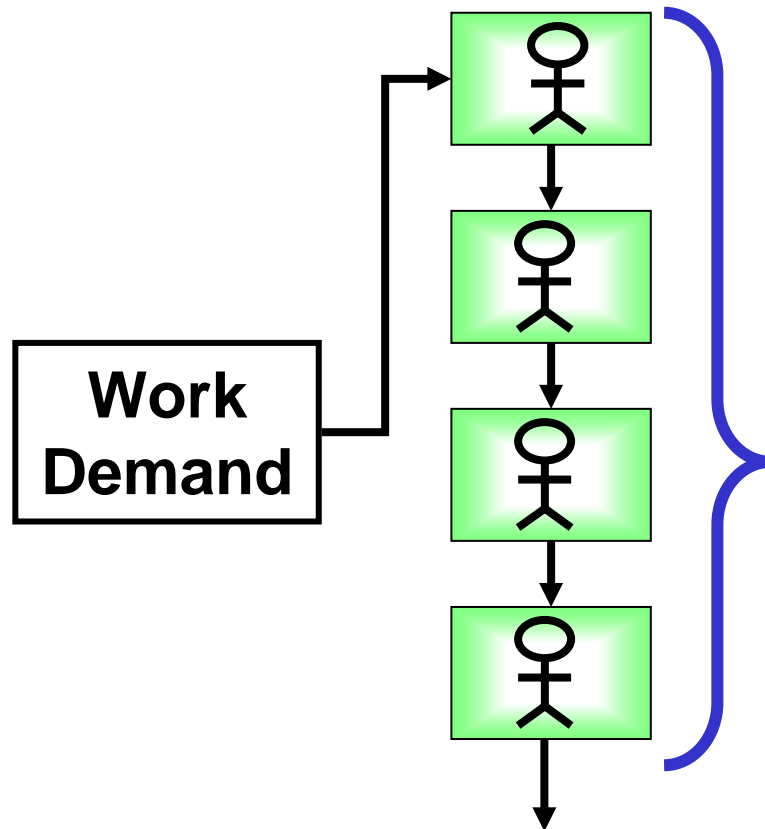


**Considerations: skills, processes, outputs**

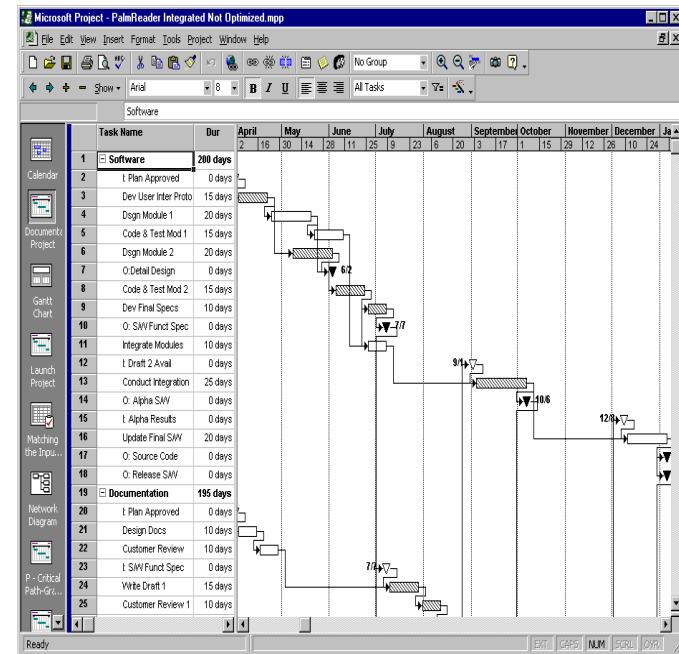


# Sequential (Dependent) Work

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## Coordinated by Hierarchical Planning



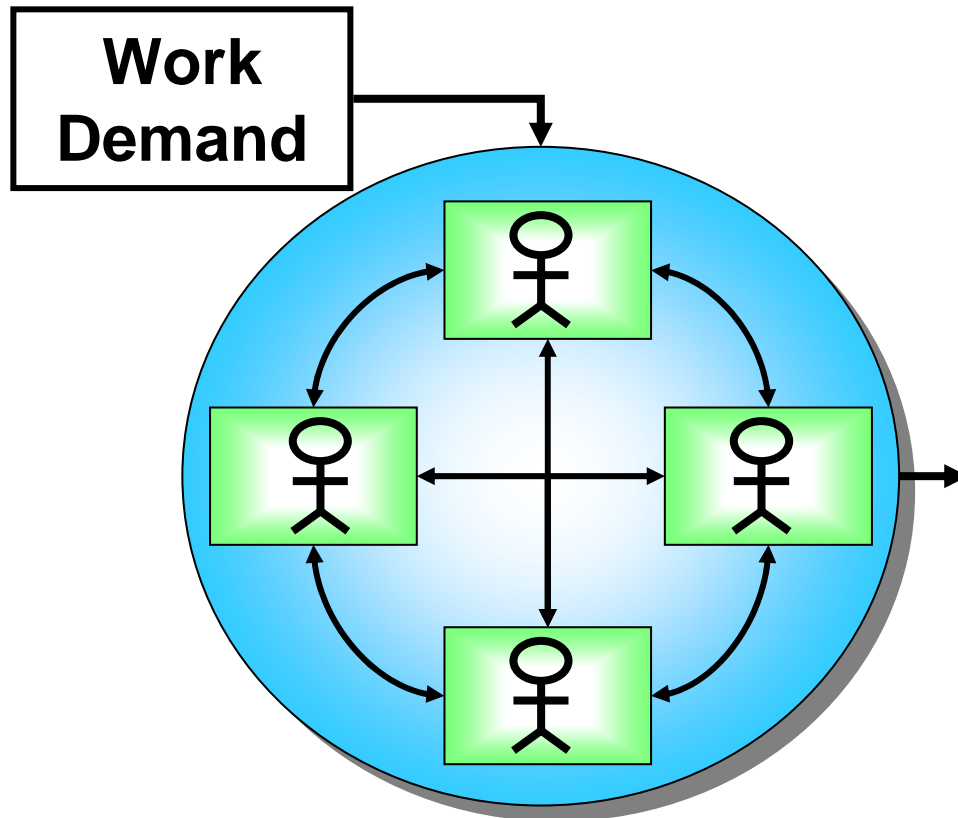
**Added Considerations: sequence, completion criteria**





# Reciprocal (Interdependent) Work

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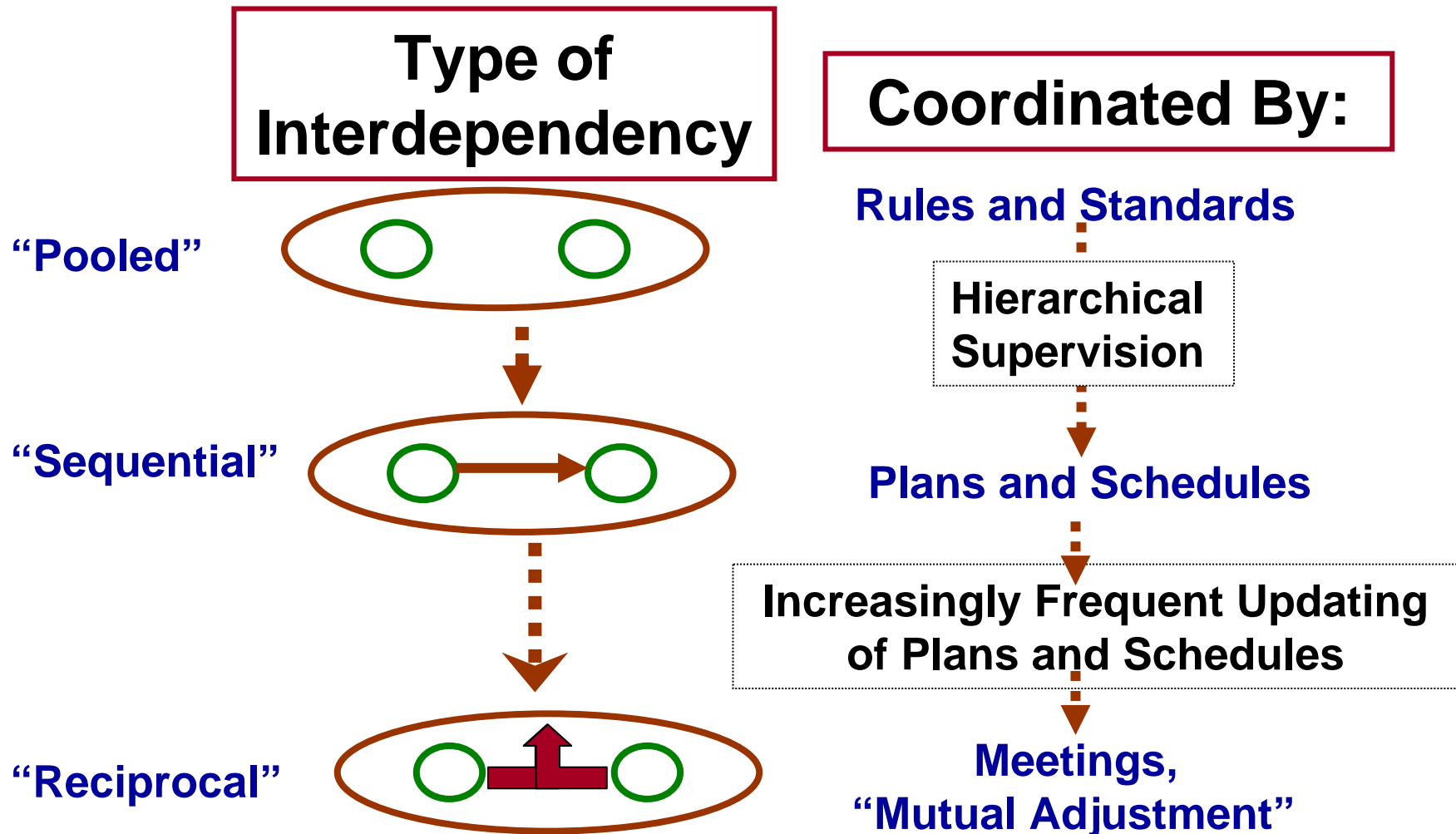
**Coordinated by  
Mutual Adjustment**

**Added Considerations: interface agreements, organization structure**



# Interdependence Continuum

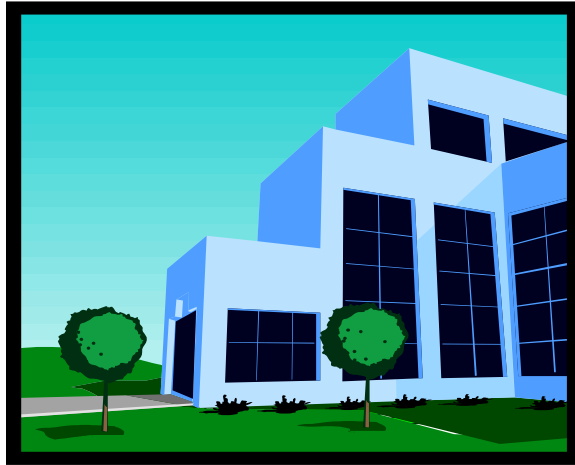
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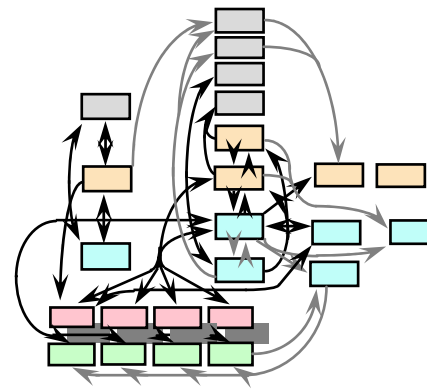
# Interdependencies Add Significant Amounts of Unplanned “Hidden Work” on Fast-Track Projects

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**Product**

High performance, complex products have high levels of reciprocal interdependency between subsystems



**Process**

Fast-tracking highly interdependent tasks creates a great deal of extra coordination and rework



**Organization**

Project fails because team cannot process required volume of information fast enough



# Hidden Work is Difficult to Predict & Manage

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- **Managers tend to greatly underestimate the magnitude of extra coordination, and especially of extra rework, in fast track projects!**
  - The degree of activity stacking and interdependence often lies way outside of their previous experience
  - Linear extrapolation greatly underestimates workload
  
- **CPM-Based Tools reinforce managers' optimism**
  - CPM-based tools do not model coordination
  - They do not model errors or changes, and thus cannot model the rework that they cause

**Takeaway: Fast-tracking overwhelms project organizations!**



# Organize DSN based on nature of work

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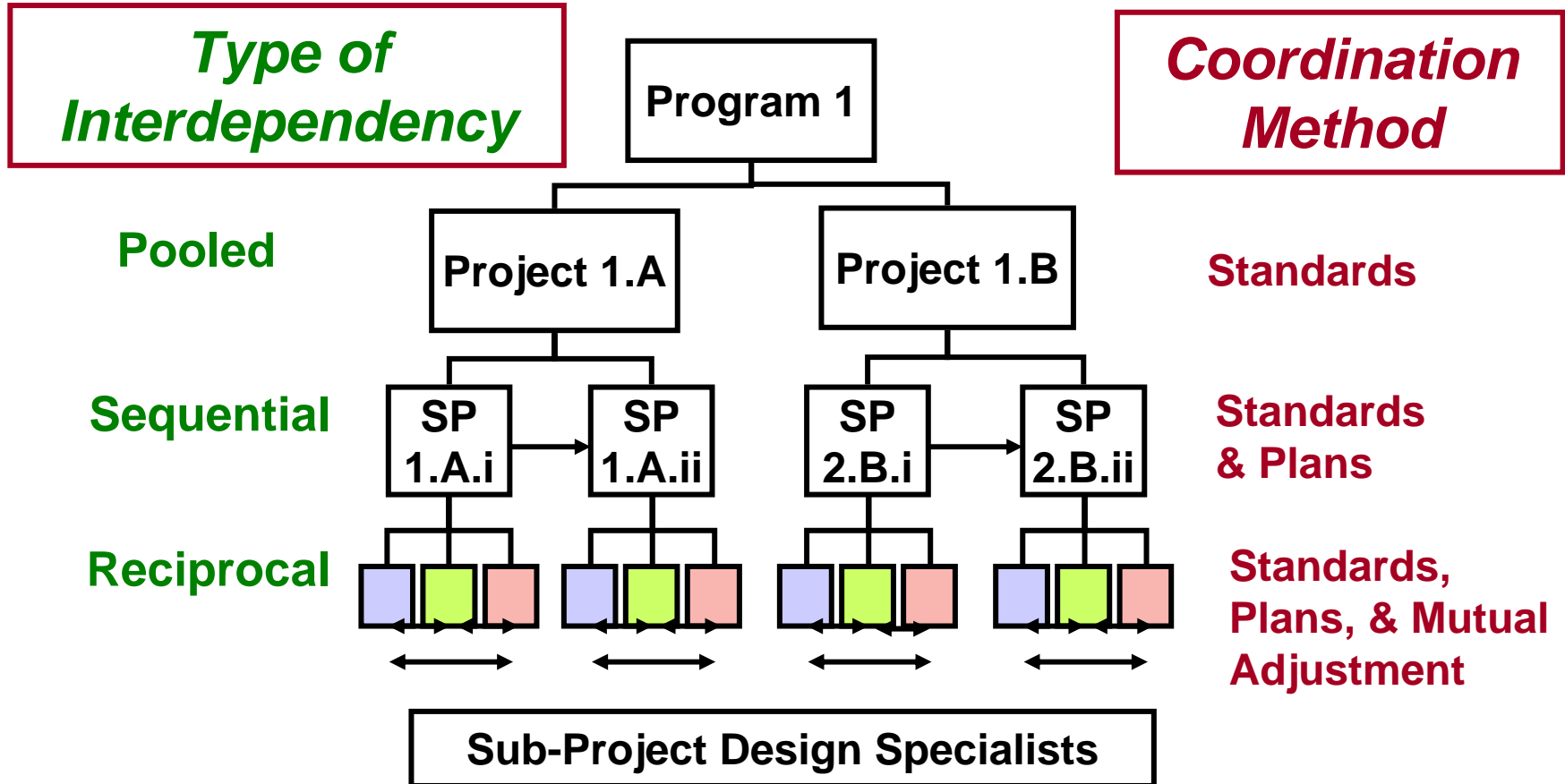
- **Pooled work is easily organized as ATO**
  - Cross docking warehouses supply unique mix of standard, non-schedule-critical, components to each project site periodically
- **Sequential work needs tighter BTO coordination**
  - Use standard CPM tools and planning/tracking processes
  - Tightly couple first 2-3 tiers of supply chain for critical items
  - Define escalation procedures and roles for expediting
    - Shared planning tools give high visibility to DSN imbalances
    - Client can often add its “weight” in expediting local suppliers/vendors
- **Reciprocal work needs ETO coordination**
  - Set up collaborative-design processes and supporting tools for communicating and resolving interface issues across supply chain
  - Create program infrastructure to “connect the white spaces” — e.g., design reviews, phase reviews, PMO, detailed interface tracking...
    - Auto-configuration tools increase agility of ETO supply networks
    - Long term relationships incorporate “shadow of the future”



# Organization Design Strategy:

## Organize to Group Key Reciprocal Interdependencies at 1<sup>st</sup>-level

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# Lab 1: Using the Language of Interdependence

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- Consider a project or program that one of your team members recently completed.
- Try to identify examples of each type of interdependence between different components or modules in this program
- How was each type of interdependence coordinated?
- Did the coordination occur smoothly? Why or why not?



# “Matrix Swing” over the Project Lifecycle

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	<b>Conceptual Design</b>	<b>Detailed Design</b>	<b>Implementation</b>	<b>Start-up/ Testing</b>	<b>Operations</b>
<b>Team Size</b>	Small	Medium	Large	Med-Small	Med-Large
<b>Decision Making</b>	Highly Centralized	Partially Decentralized	Very Decentralized	Centralized	Decentralized
<b>Type of Interdep.</b>	Reciprocal	Reciprocal, Sequential	Sequential	Sequential, Reciprocal	Pooled, Sequential
<b>Coord'n Mech'sm</b>	Meetings	Standards, Plans, Meetings	Standards, Plans	Standards, Meetings, Plans	Standards, Plans





# Interdependence over the Product Lifecycle

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	<b>Custom Solution</b>	<b>Early Adopter Product</b>	<b>Mainstream Market Product</b>	<b>Mature Product</b>
<b>Market Size</b>	Single Customer	Medium, Growing Slowly	Large, Growing Fast	Large, Stagnant or Shrinking
<b>Industry Organization</b>	Alliances	Alliances and selected bidders	Selected and open bidders	Delayed DSN, Open bidders
<b>Type of Interdep.</b>	Reciprocal	Reciprocal, Sequential	Sequential, Pooled	Pooled
<b>Supply Chain Strategy</b>	Collaborative Design, <b>ETO</b>	Meetings, Plans, Project DSN <b>BTO</b>	Plans, Standards Project/Mfg. <b>ATO</b>	Standards, Quotes, <b>DSN</b>



# Decoupling Point in Project Supply Chain

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	<b><i>Custom Solution</i></b>	<b><i>Early Adopter Product</i></b>	<b><i>Mainstream Market Product</i></b>	<b><i>Mature Modular Product</i></b>
<b>Information</b>	Fully Coupled	Tier 2-3 Suppliers	Tier 1-2 Suppliers	Tier 1 Vendors
<b>Materials/ Components</b>	Fully Coupled	Tier 2-3 Suppliers and Vendors	Tier 1-2 Suppliers and Vendors	Tier 1 Vendors

“**Suppliers**”: provide customized components and materials

“**Vendors**”: provide standardized components and materials



# OUTLINE

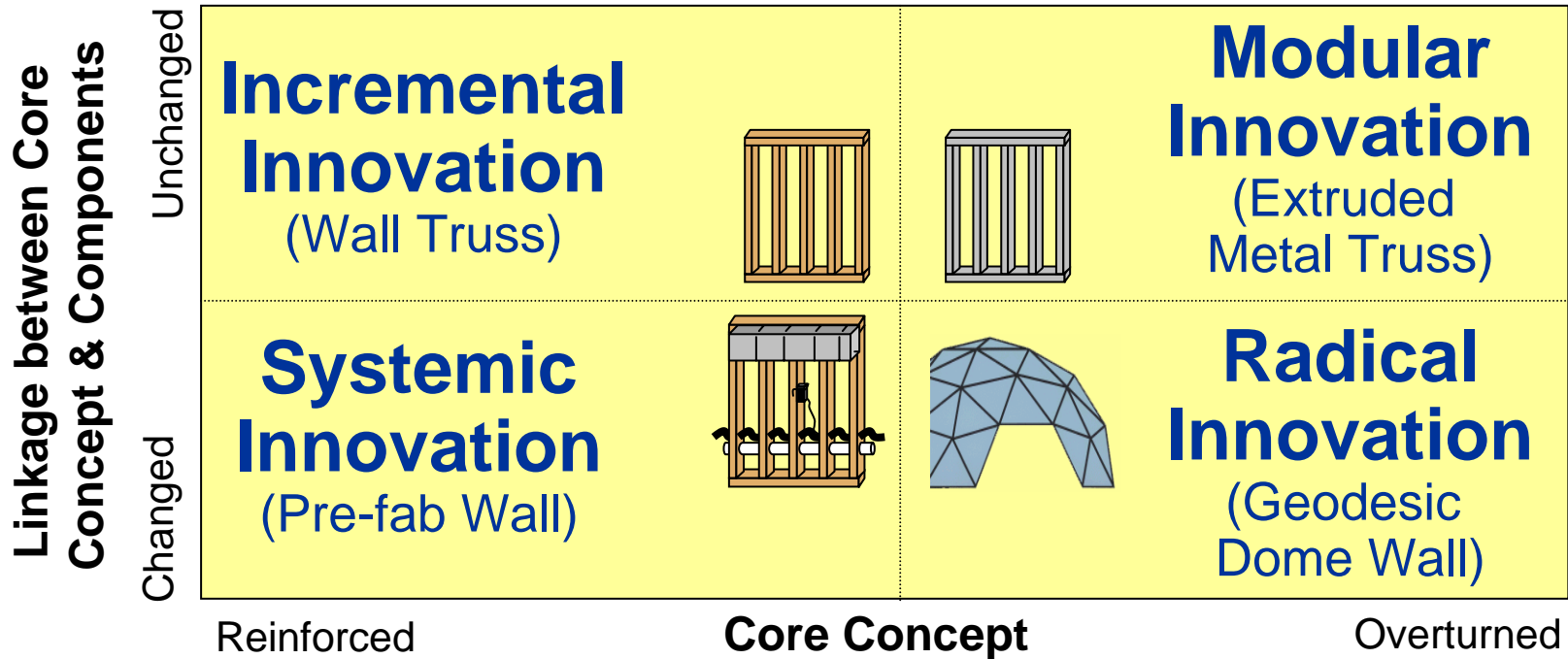
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- Manage project DSN linkages at multiple levels
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# Point of Departure: Innovation Framework

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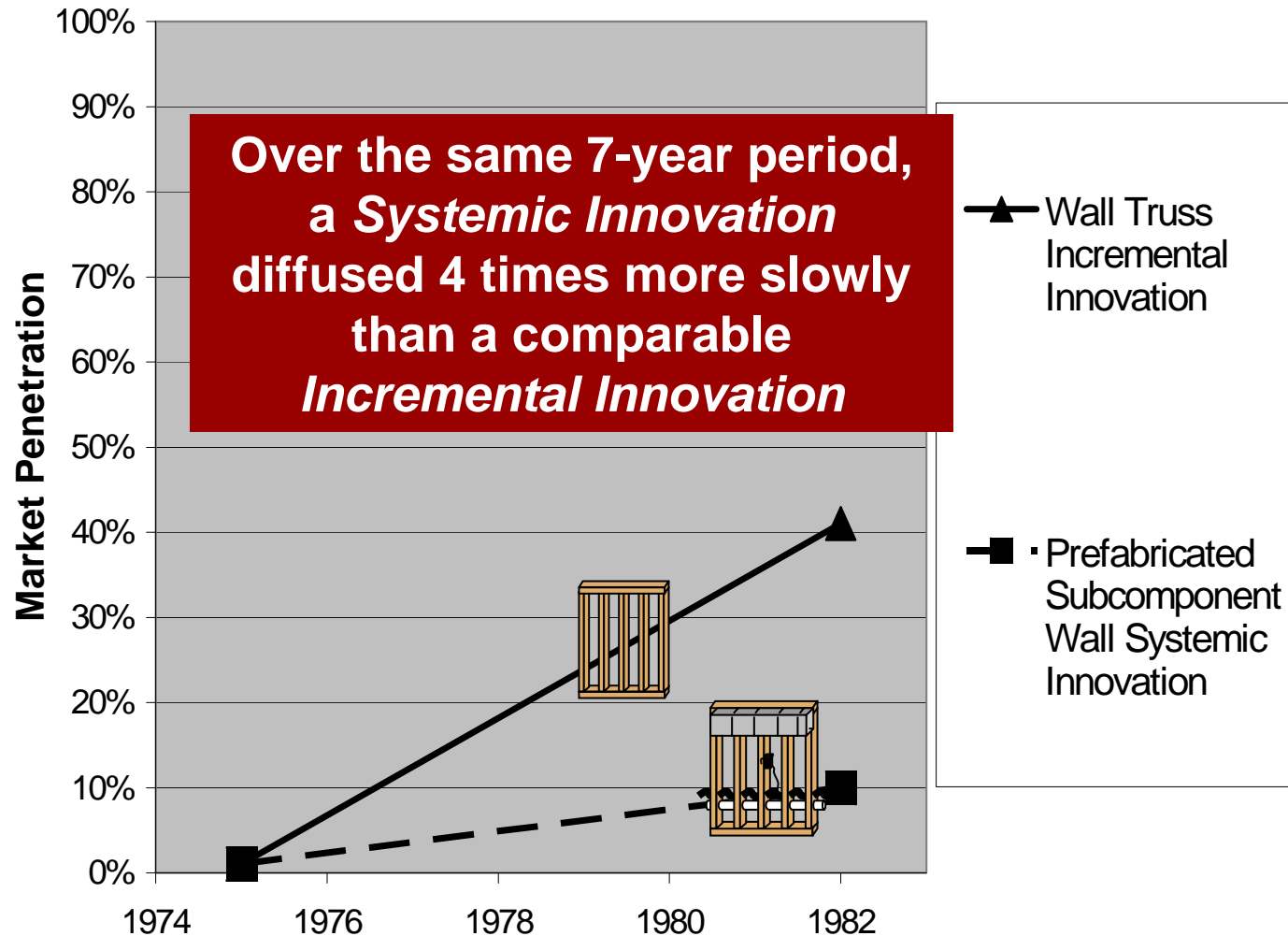


Systemic Innovations have the greatest impact on productivity with only a modest impact on the existing product



# Observation: Systemic Innovations Diffuse Slowly in Project-Based Industries

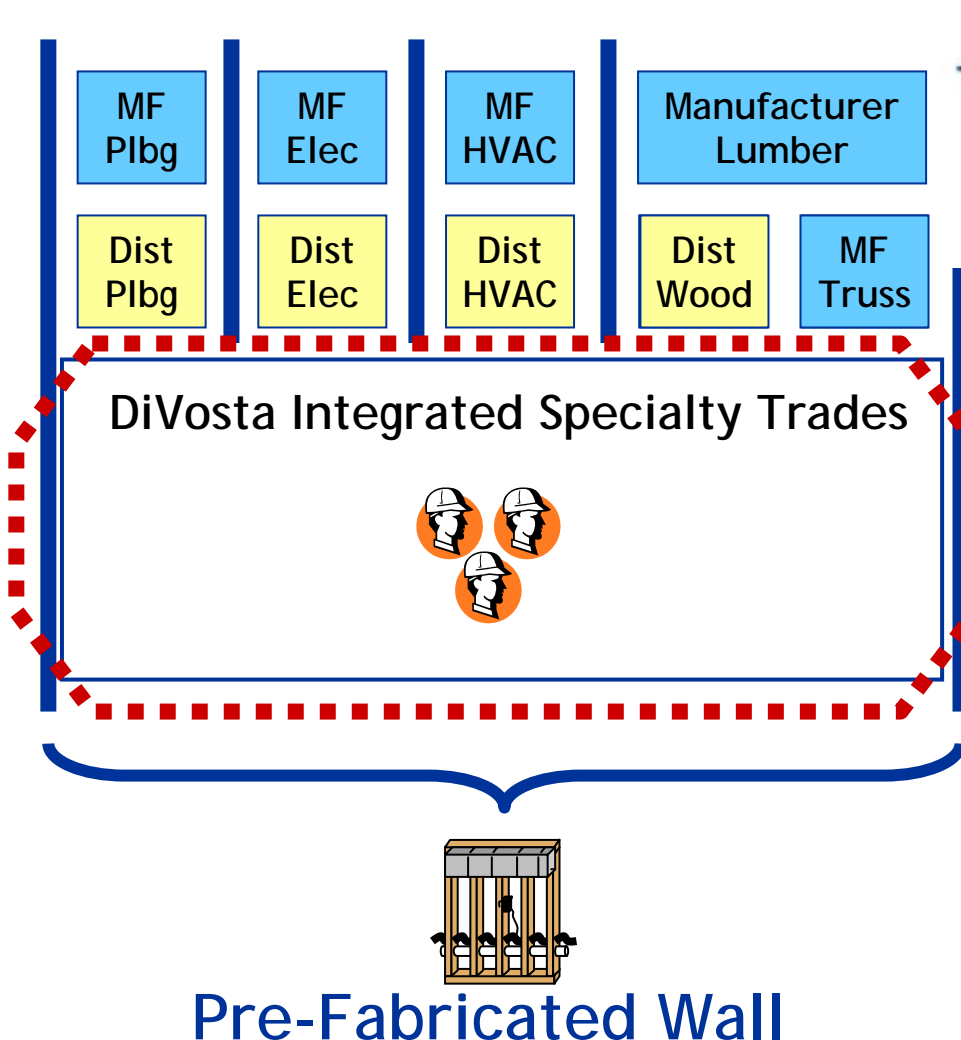
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# Motivating Case 1: Prefabricated Walls for Homes

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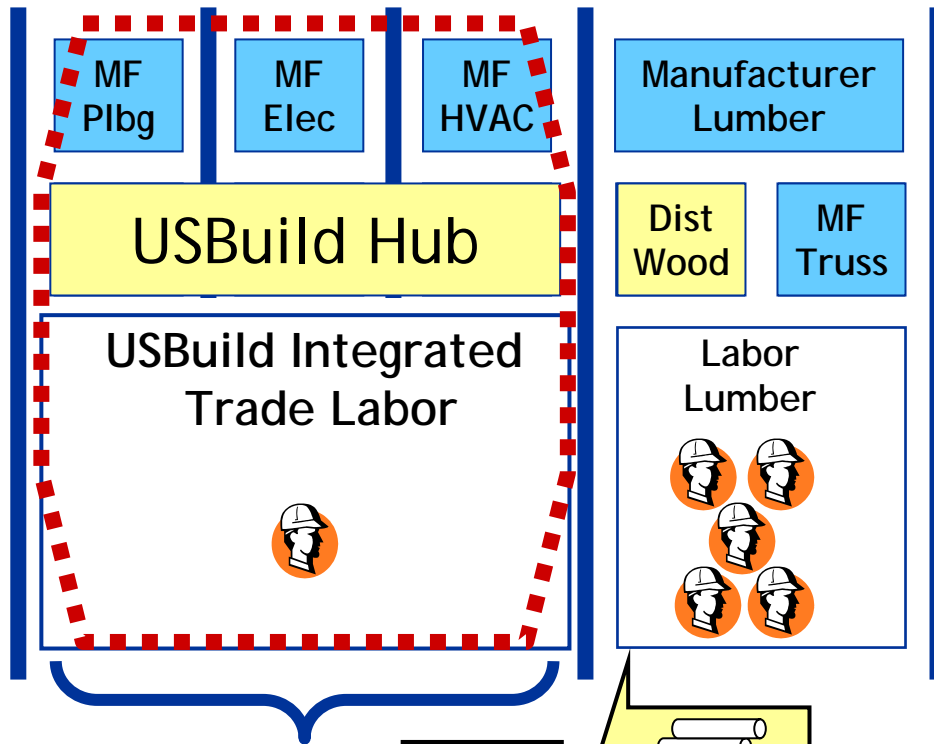


- Largest Homebuilder in USA
- Builds ~30,000 Homes / Yr
- Purchased DiVosta Homes to capture profitable build process
- DiVosta improved **OVERALL** productivity significantly by prefabricating walls in plant
- Multiple trades required to change... therefore DiVosta integrated trades.
- ***Pulte unable to diffuse DiVosta pre-fab wall innovation without integrating***

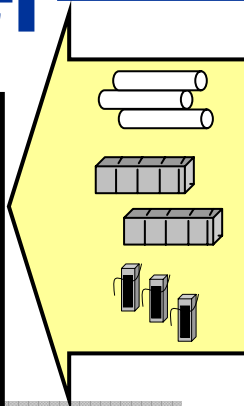


# Motivating Case 2: USBuild Integrated Supply Chain Solution

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Integrated Supply Chain



# USBUILD

## Integrated Supply Chain for Production Homebuilders

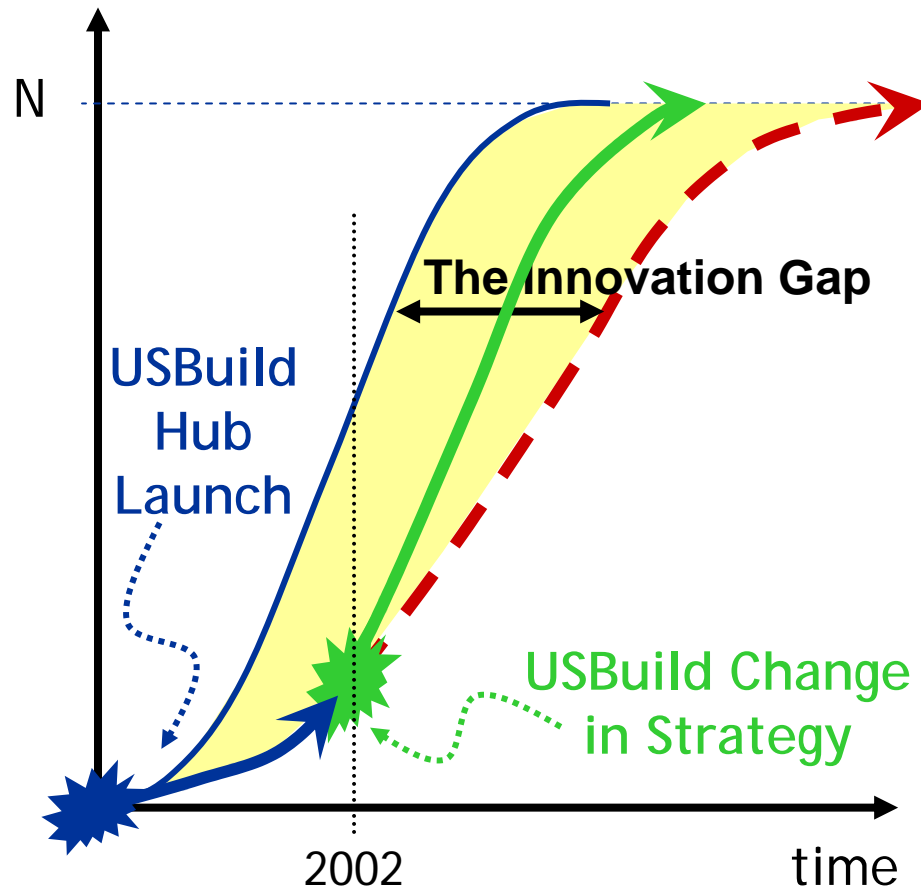
- Increased Logistics Efficiency with Plbg/Elec/HVAC Hub
- Strong overall productivity gains
- Multiple labor trades required to change work process
- Diffusion not tied to benefits
- Very slow diffusion of innovation
- USBuild changed strategy in 2002 and integrated trade labor



# Motivating Case 2 (continued): Effects of USBuild Change in Strategy

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Number of  
adoptions



## USBUILD

**Integrated Supply Chain for  
Production Homebuilders**

- USBuild changed strategy in 2002 and integrated trade labor
- Diffusion rate increased markedly

**An “Innovation Gap”  
Exists for Systemic  
Innovations**

**Academic & Business  
Literature Do Not Address  
this Problem**

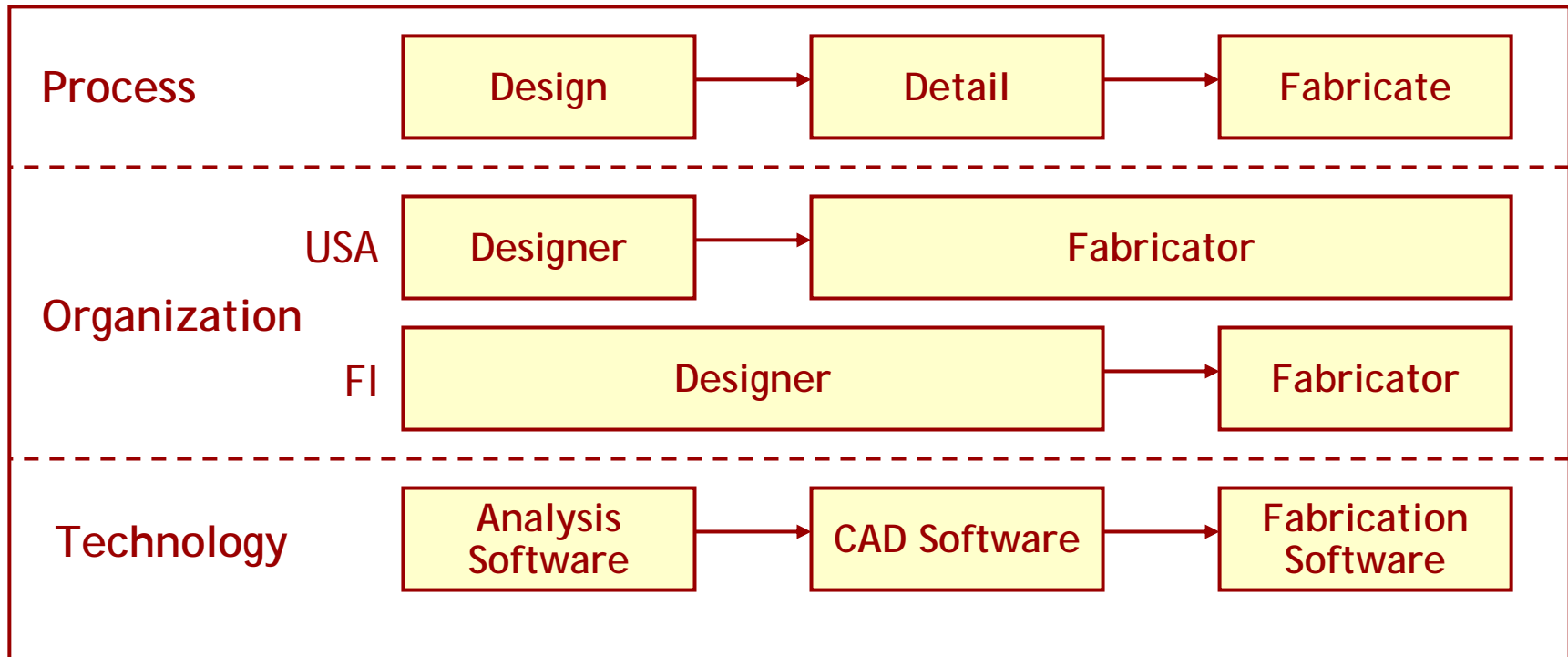
**Strategy Can Positively  
Influence Diffusion**





# Motivating Case 3: Integrated Design-Detailing-Fabrication Software

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FI: ~100% diffusion in 10 years vs. USA: ~20-30% diffusion in 7 years!

We must compare firm networks across countries to understand how to organize to effectively diffuse systemic innovations.



# Conclusions

## Implications for Technology Vendors

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- Alignment of innovations to project networks varies from country to country
- Understanding allocation of work in target markets can:
  - Inform global marketing and product distribution strategies to maximize returns on investment
  - Provide a measure for addressable global market
  - Inform product development and DSN decisions



# Summary of Takeaways

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1. Link PM Processes and Tools to DSN at three levels—Project, Program & Portfolio
  - Use “Process-lighter” planning and tracking approaches at Portfolio & Program levels to maintain agility
2. Match project supply chain strategy (ATO, BTO or ETO) to type of interdependence between project components
  - Tighter (ETO) coordination of reciprocally interdependent work is needed in:
    - non-routine projects;
    - early (conceptual design) and late (system integration) in project life cycle; and
    - early in product/platform life cycle.
3. To diffuse systemic innovations through project supply networks, consider organizationally integrating the involved team members, or de-scoping the innovation



# Comments and/or Questions?

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