Aligning Portfolio, Program and Project Management with Your DSN

Professor Raymond E. Levitt
Academic Director
Stanford Advanced Project Management Program

How are *project* supply chains unique?

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

- 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

- 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

- 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

- 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

- 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

OUTLINE

- 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

"Process-Heavy" Planning and Tracking

- 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

- 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*

- 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*

- 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*

- 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

OUTLINE

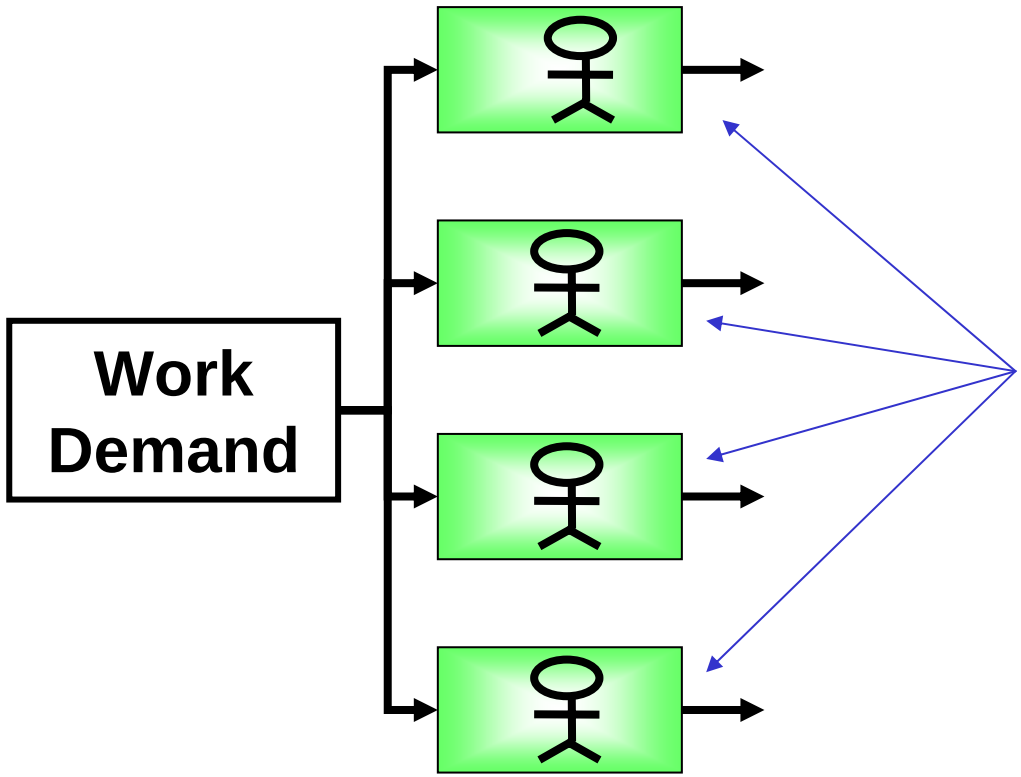
- Manage project DSN linkages at multiple levels
- Where to use “process heavy” *vs.* “process light” planning & tracking
- The impact of interdependence in project supply networks
- Challenge of innovating in project supply networks

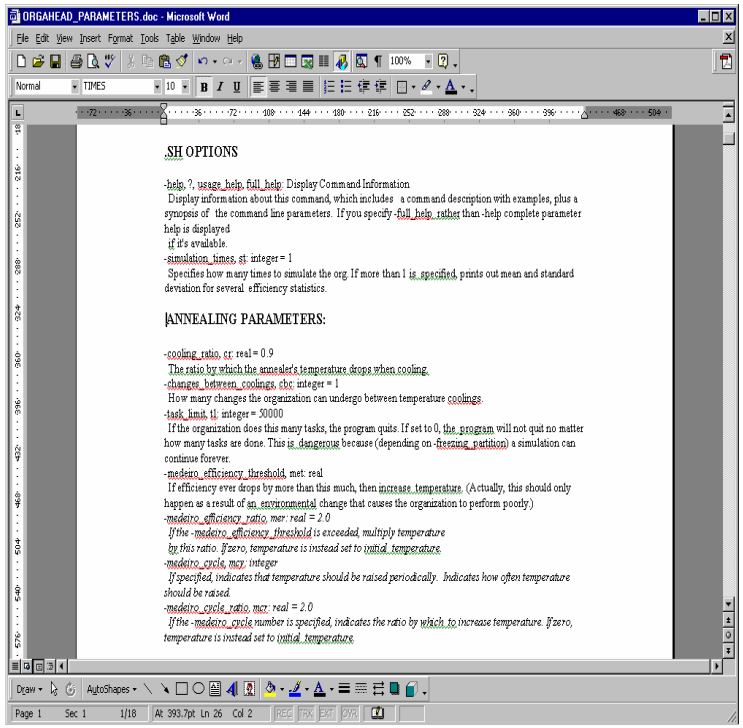
Not All Work Is Created Equal

- 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

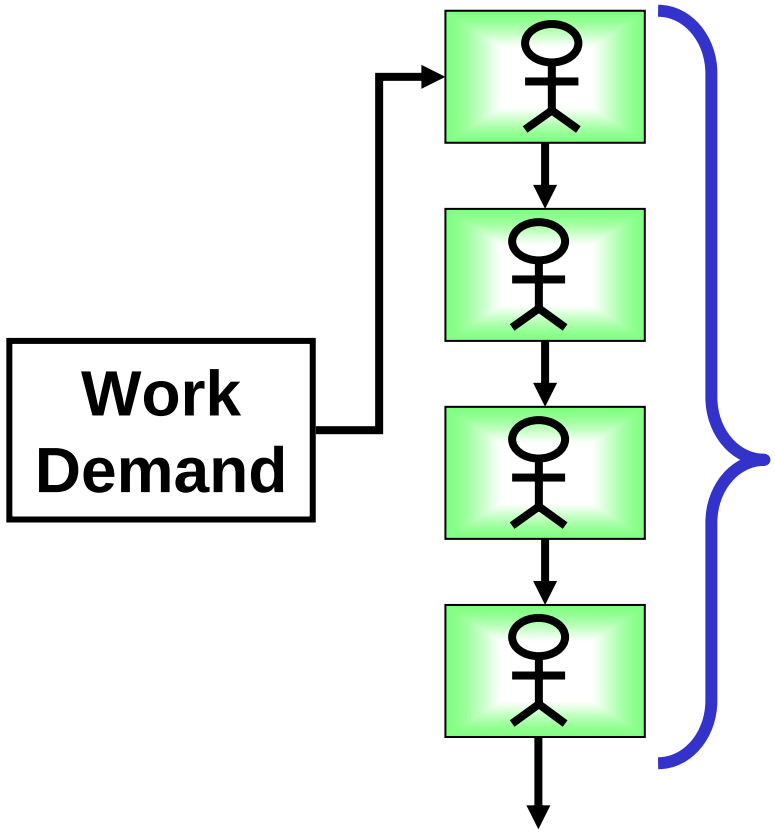
Coordinated by Rules and Standards



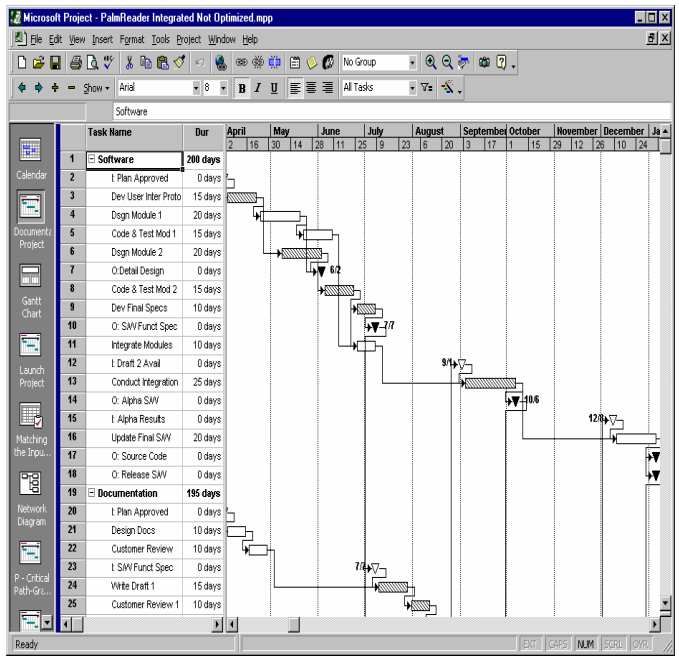


Considerations: skills, processes, outputs

Sequential (Dependent) Work

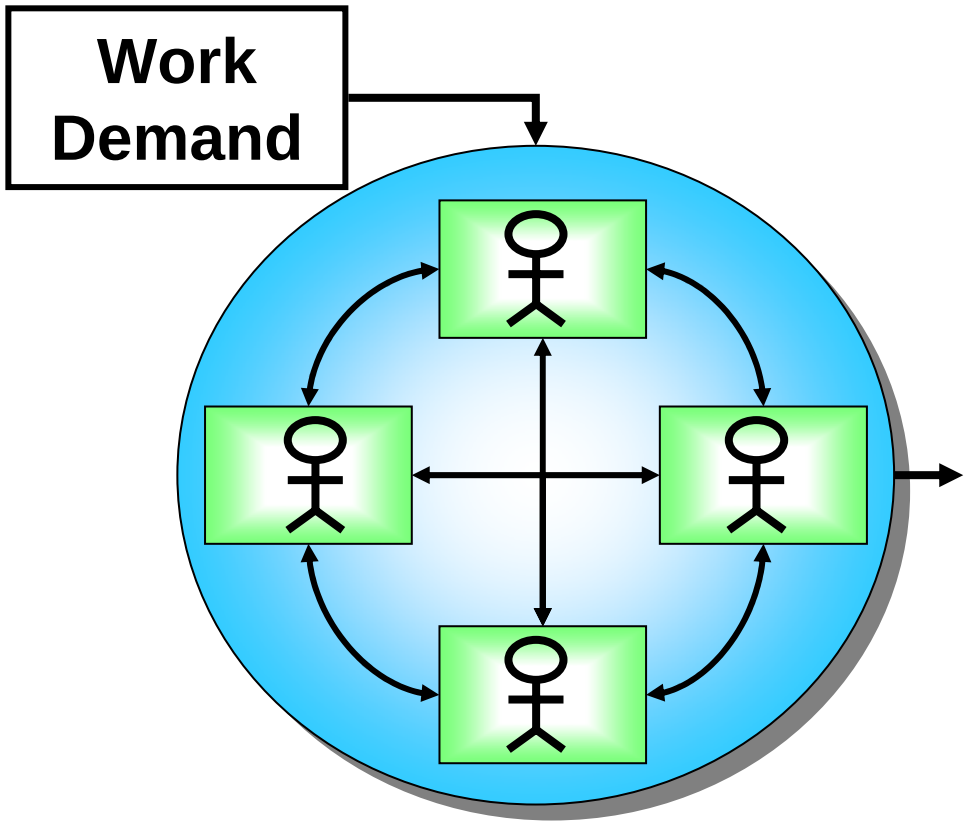


Coordinated by Hierarchical Planning



Added Considerations: sequence, completion criteria

Reciprocal (Interdependent) Work

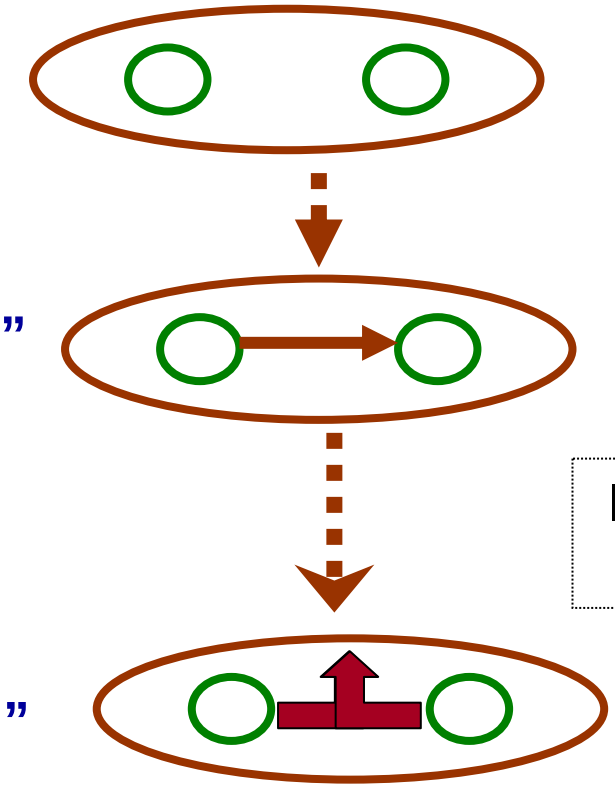


Coordinated by Mutual Adjustment

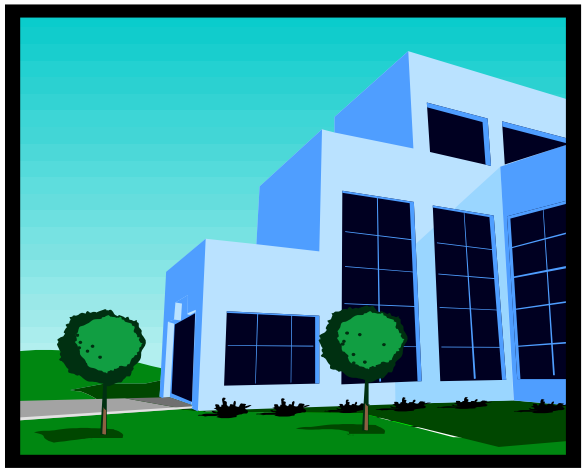
Added Considerations: interface agreements, organization structure

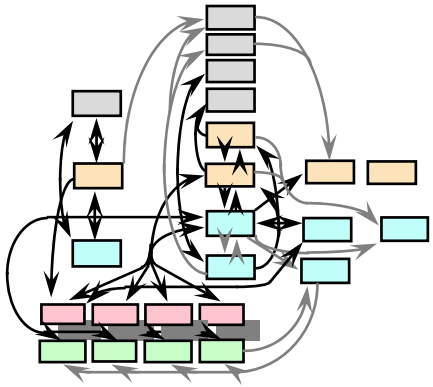
Interdependence Continuum

Type of Interdependency	Coordinated By:
"Pooled"	Rules and Standards
	Hierarchical Supervision
"Sequential"	Plans and Schedules
	Increasingly Frequent Updating of Plans and Schedules
"Reciprocal"	Meetings, "Mutual Adjustment"



Interdependencies Add Significant Amounts of Unplanned "Hidden Work" on Fast-Track Projects





Product → **Process** → **Organization**

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

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

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

Hidden Work is Difficult to Predict & Manage

- **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

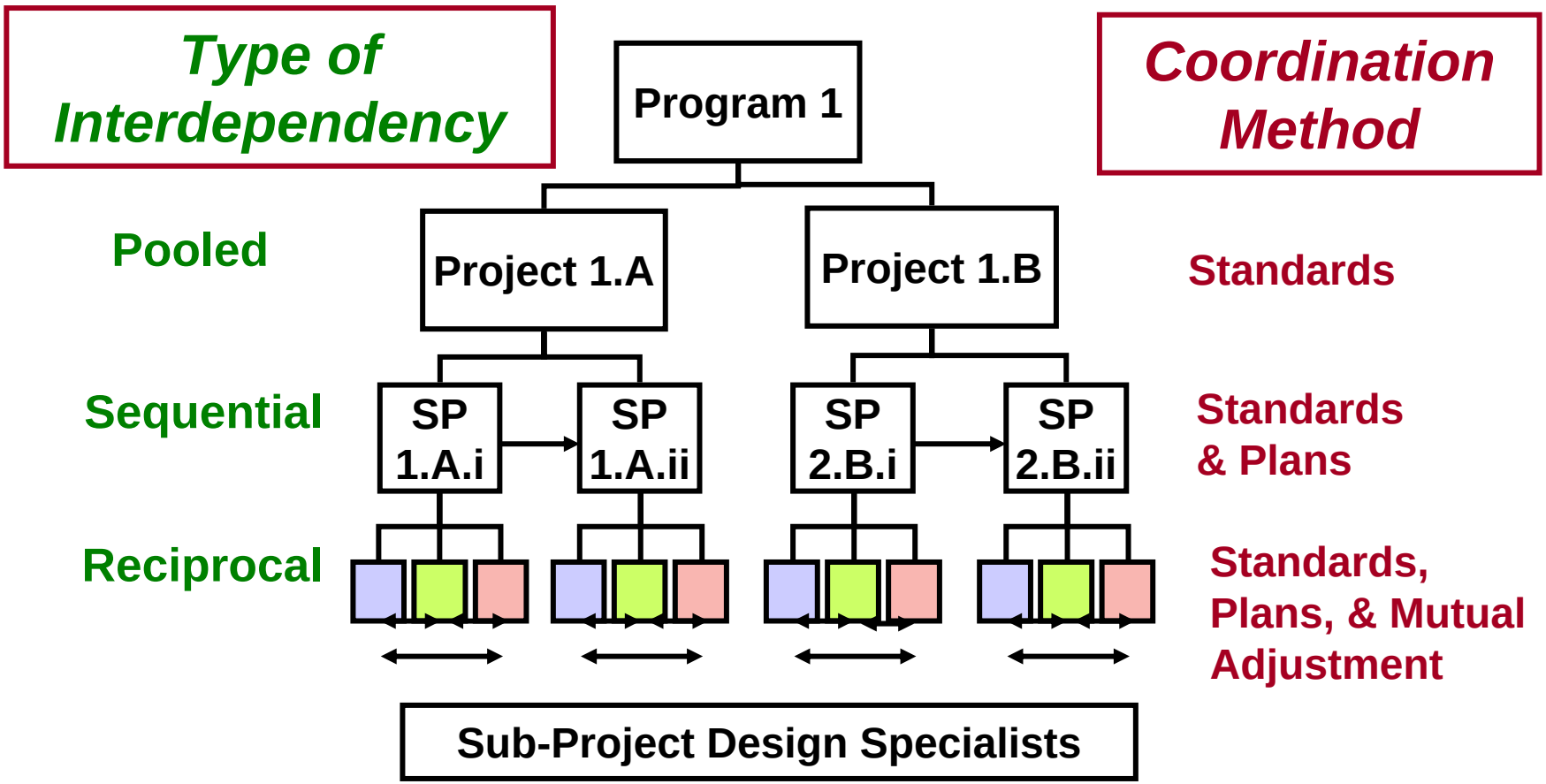
Takeaway: Fast-tracking overwhelms project organizations!

Organize DSN based on nature of work

- **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 1st-level



Lab 1: Using the Language of Interdependence

- 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

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

Interdependence over the Product Lifecycle

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

Decoupling Point in Project Supply Chain

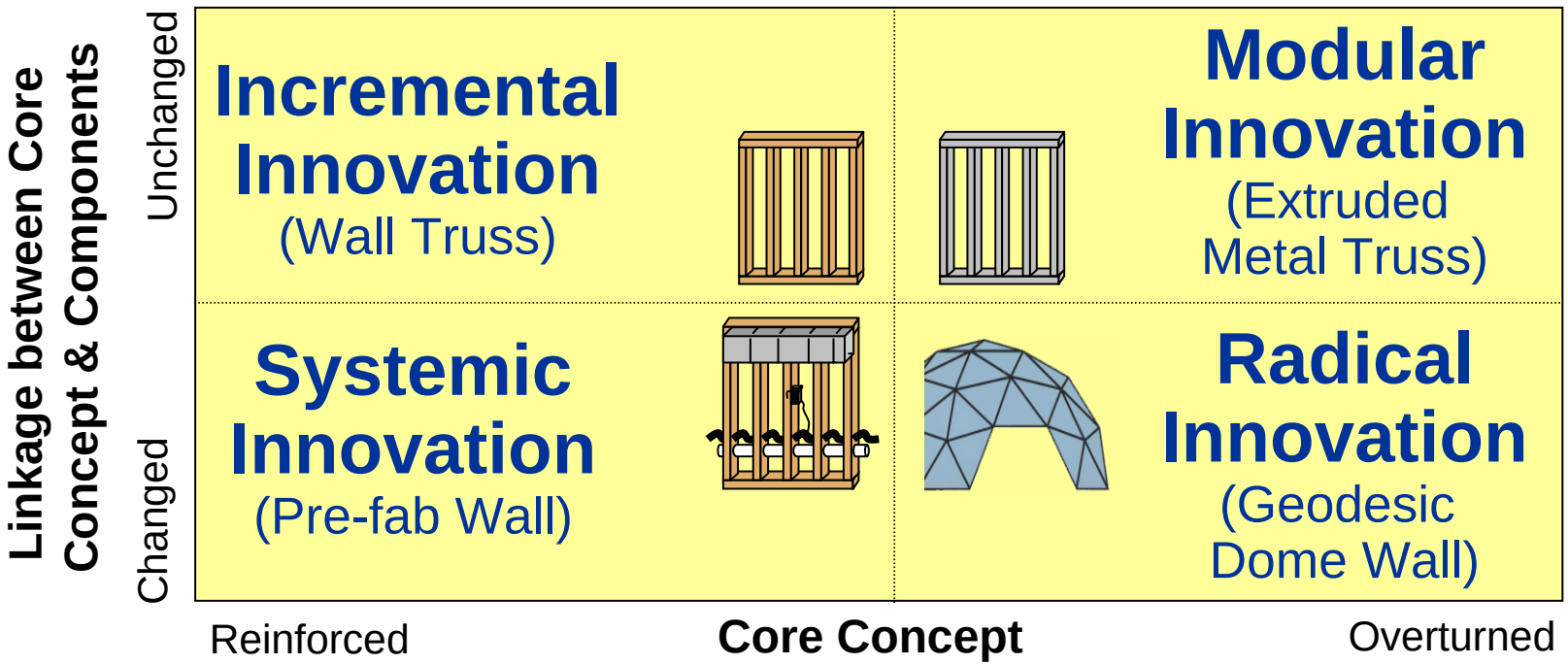
	Custom Solution	*Early Adopter Product*	*Mainstream Market Product*	*Mature Modular Product*
Information	Fully Coupled	Tier 2-3 Suppliers	Tier 1-2 Suppliers	Tier 1 Vendors
Materials/ Components	Fully Coupled	Tier 2-3 Suppliers and Vendors	Tier 1-2 Suppliers and Vendors	Tier 1 Vendors

"**Suppliers**": provide customized components and materials
"**Vendors**": provide standardized components and materials

OUTLINE

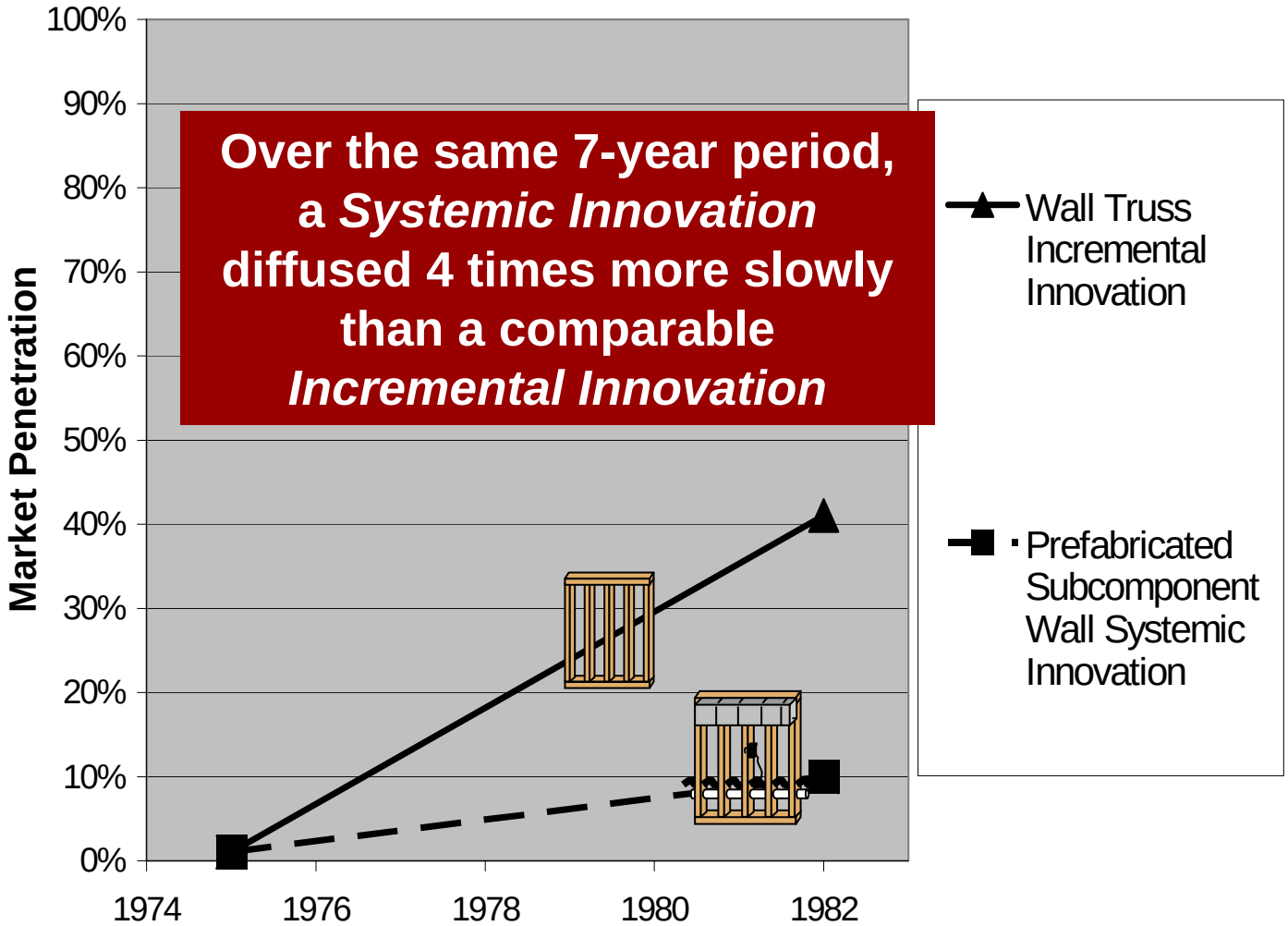
- Manage project DSN linkages at multiple levels
- Where to use “process heavy” *vs.* “process light” planning & tracking
- The impact of interdependence in project supply networks
- Challenge of innovating in project supply networks

Point of Departure:
Innovation Framework

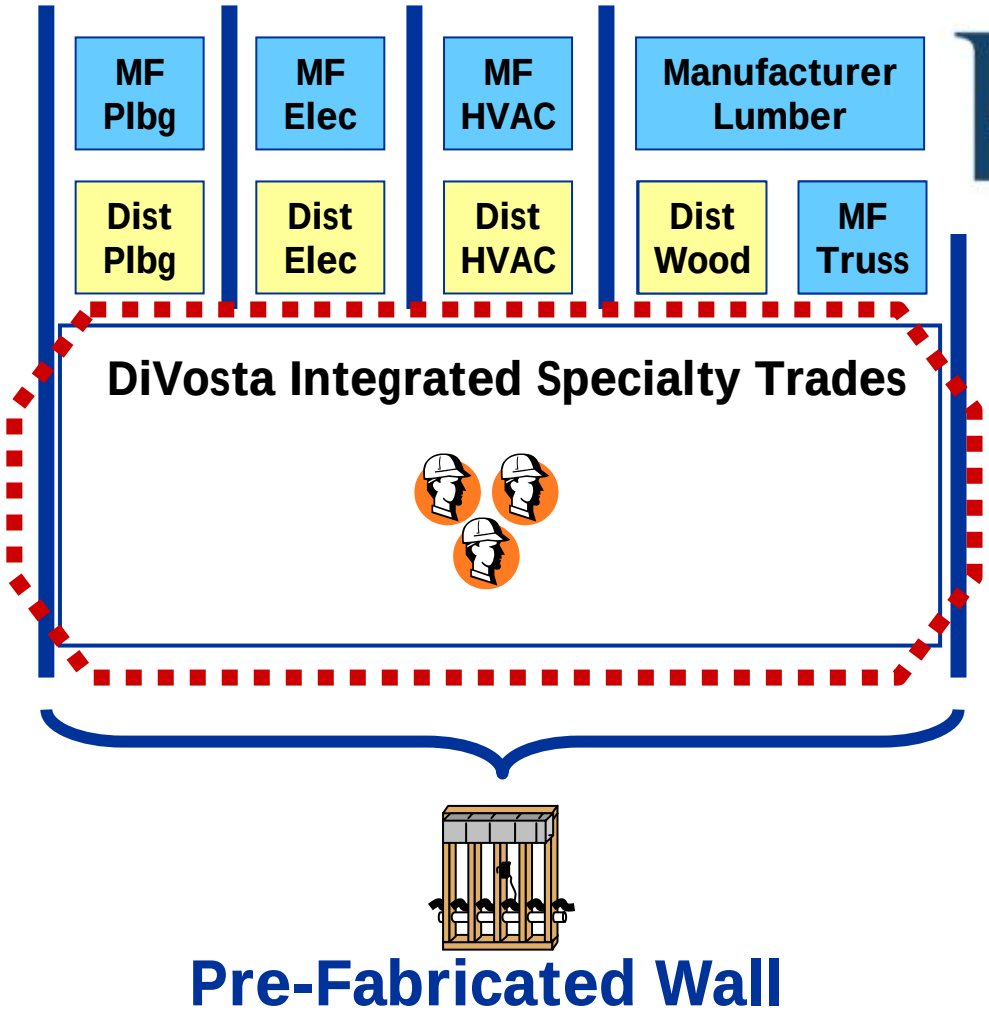


Systemic Innovations have the greatest impact on productivity with only a modest impact on the existing product

Observation: Systemic Innovations Diffuse Slowly in Project-Based Industries

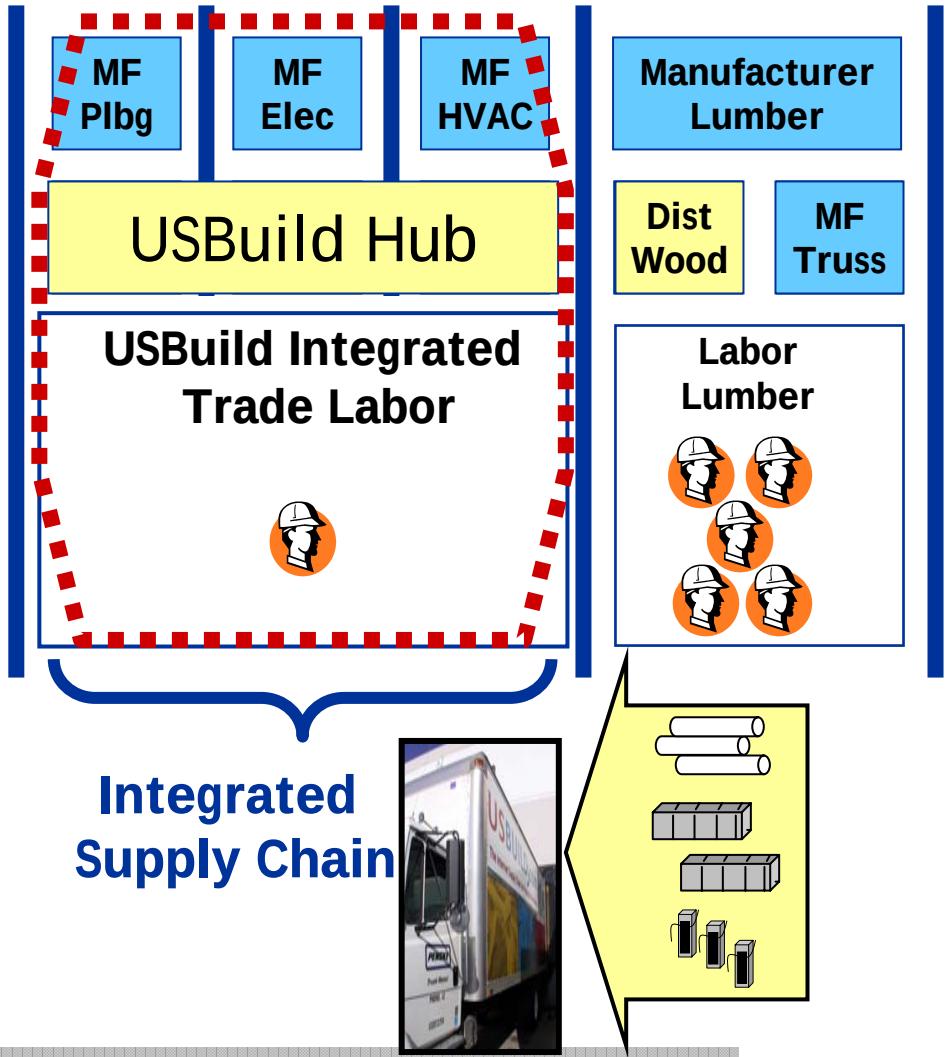


Motivating Case 1:
Prefabricated Walls for Homes



- 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

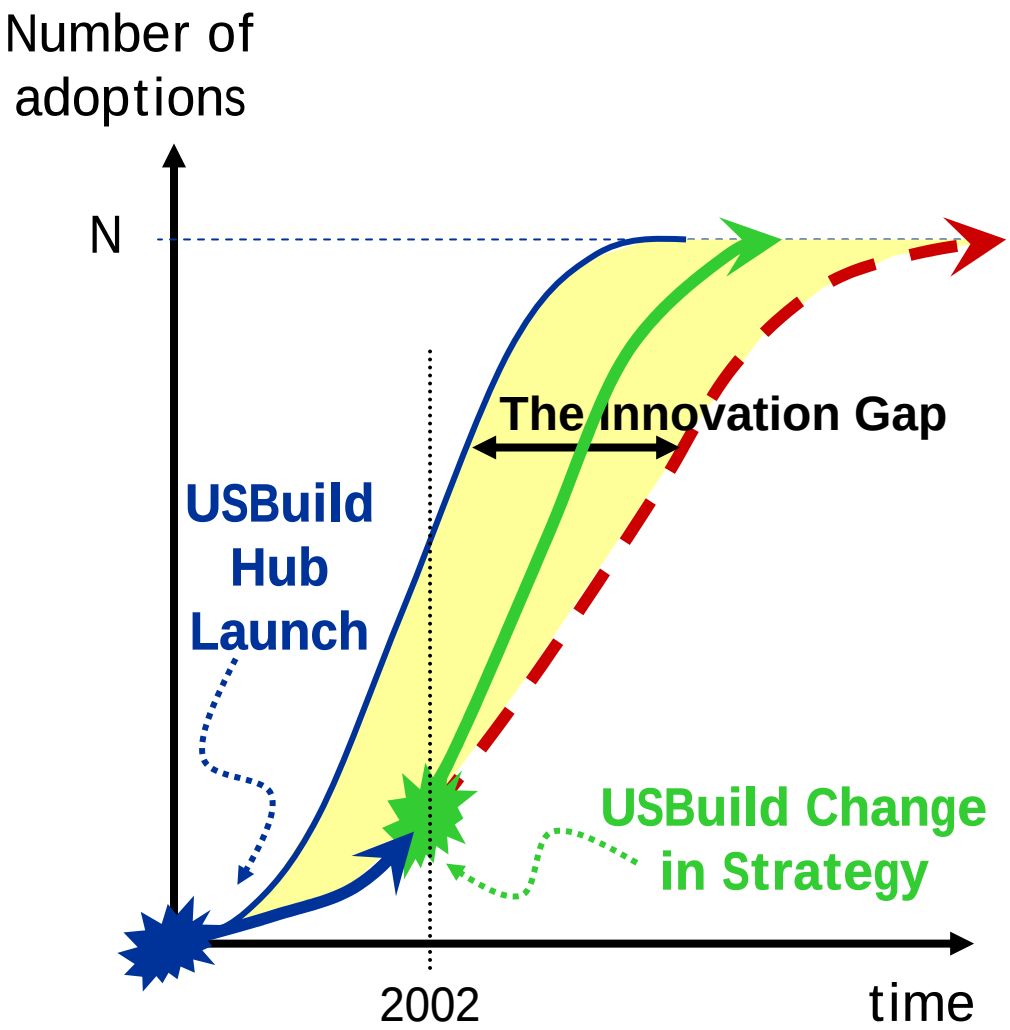


USBUILD

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



Integrated Supply Chain for Production Homebuilders

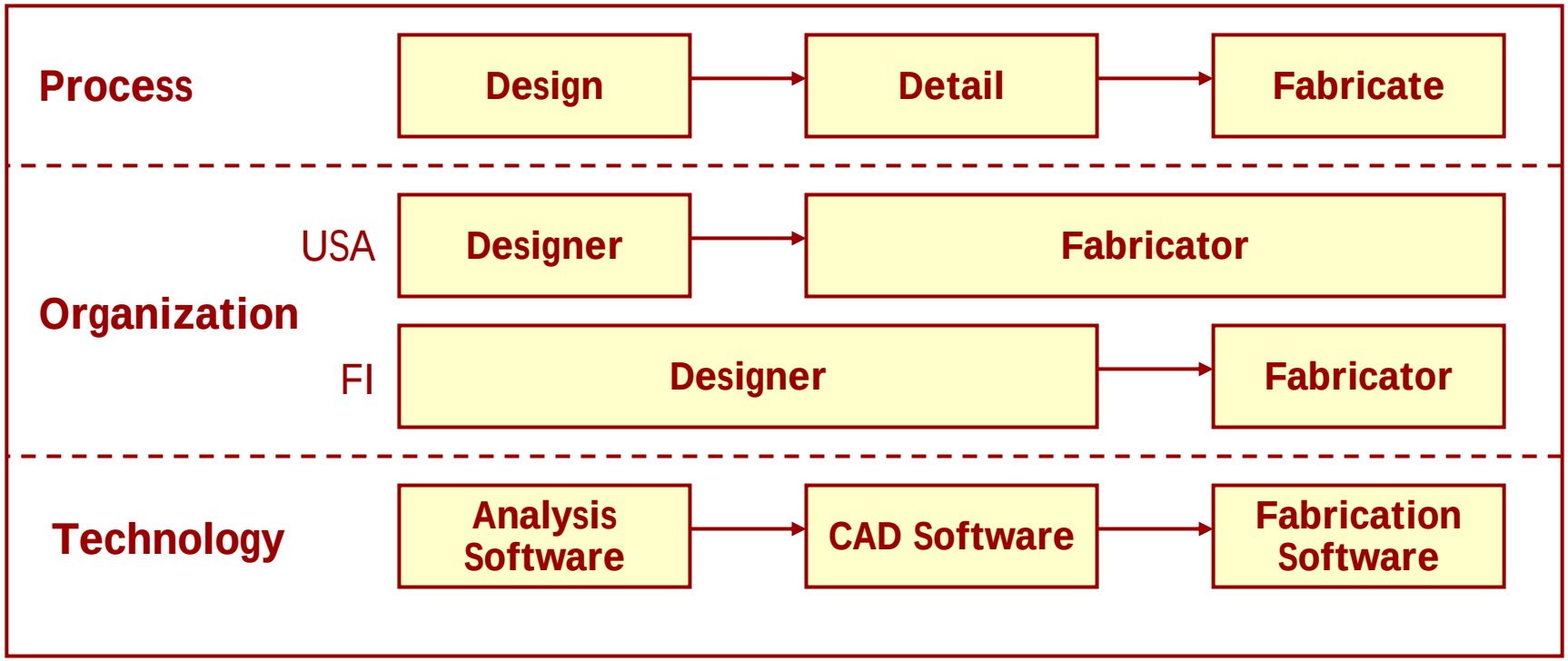
- USBuild changed strategy in 2002 and integrated trade labor
- Diffusion rate increased markedly

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



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

- 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

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 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?

?