

# Unbundling Standardization: Product Development Processes in Multi-Project Organizations

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# The initial question



# Agenda

- Definitions and Motivation
- Research Question
- Research Design and Methods
- Initial Research and Findings
- Ongoing Work
- Summary and Expected Contributions

# Product Development Process

- “A *product development process* is the sequence of steps or activities which an enterprise employs to conceive, design, and commercialize a product”

*Ulrich and Eppinger 2000*

- “Processes can be regarded and treated as systems that should be engineered purposefully and intelligently, facilitated by useful models.”

*Browning, Fricke, and Negele 2006*



# The issue

“Companies made up of many different business units will face an important question as they make the shift to a process enterprise:

Should all units do things the same way, or should they be allowed to tailor the process to their own needs?

In a process enterprise the key structural issue is...**process standardization versus process diversity.**

**There's no one right answer.”**

*Hammer and Stanton 1999*

# Research Question

*Product Development Organization*

Project

Project

Project

Project

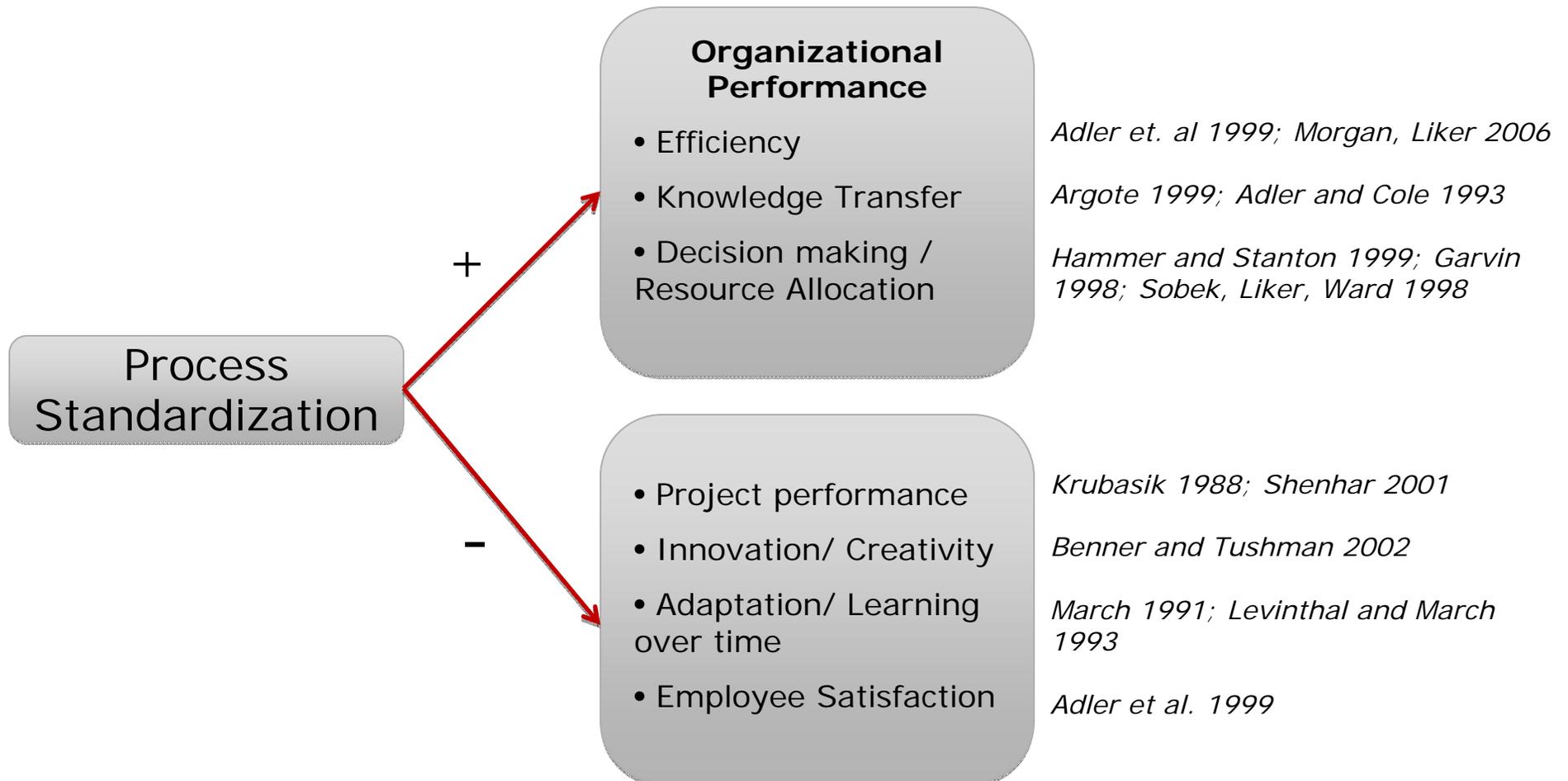
Project

Project

Project

What is the impact of process standardization on organizational performance?

# What is the impact of process standardization on organizational performance?



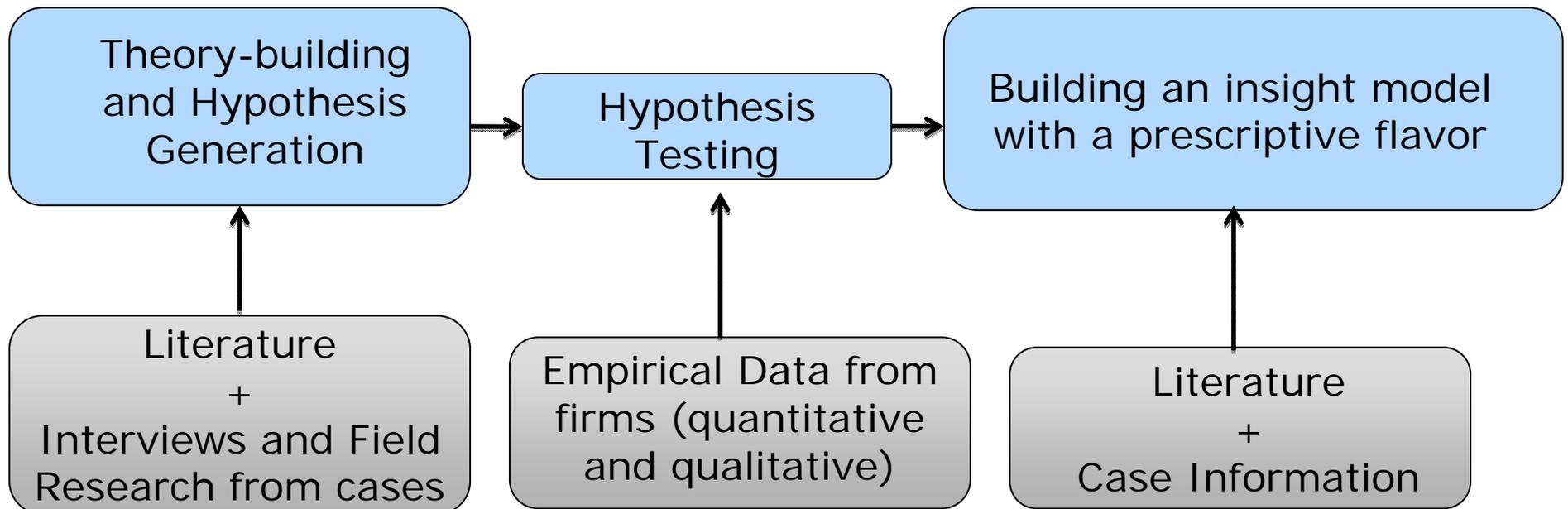
*“On both sides of the question, complex causal mechanisms play out in diverse ways in diverse situations. This might imply that we should not be aspiring to general conclusions with respect to the overall question, but rather seeking to sort out the mechanisms and the contingencies.”*

*Sid Winter*

*in Adler et al. (2008)*

*Under what conditions and how is process standardization beneficial for organizational performance?*

# Research Approach



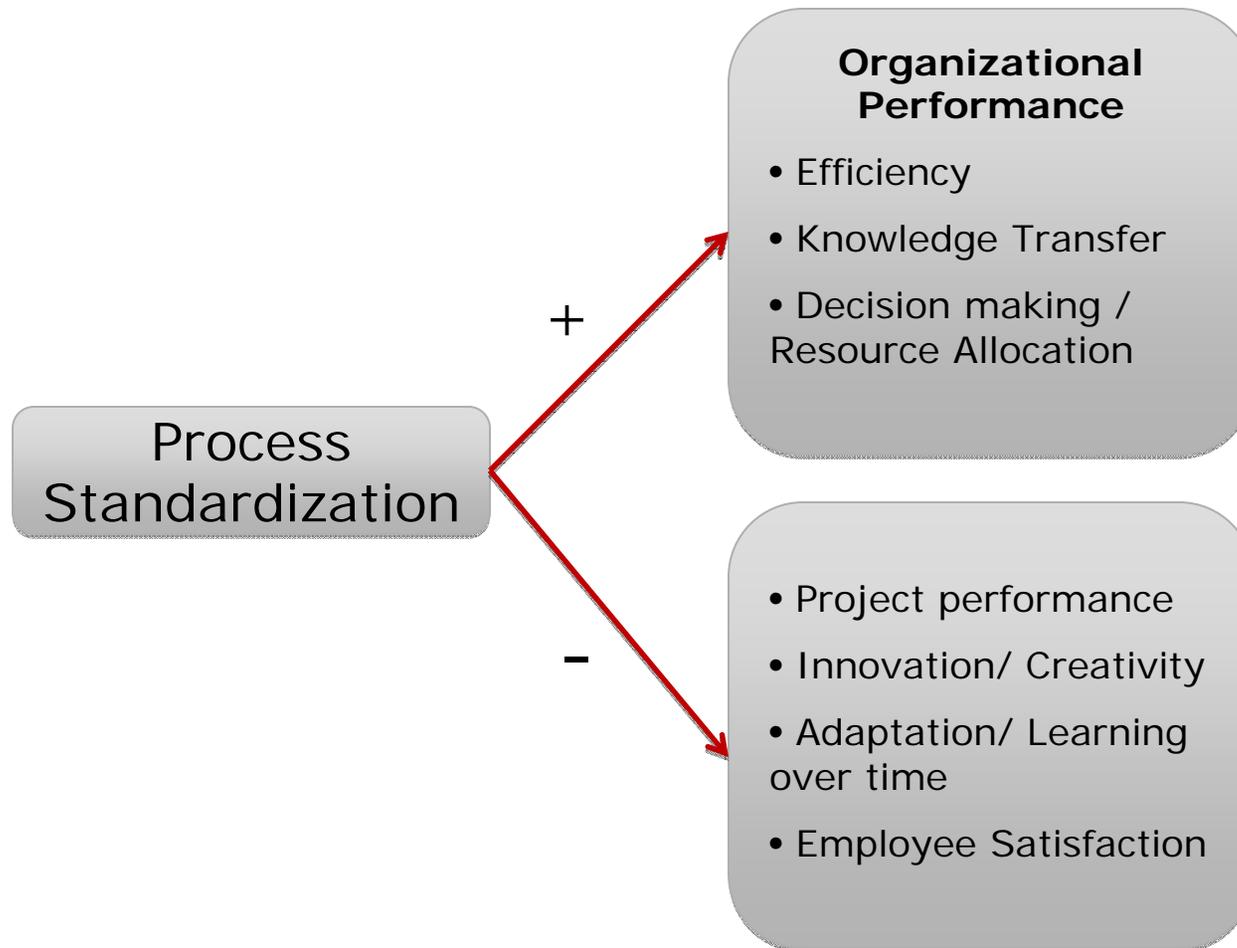
# Case Studies

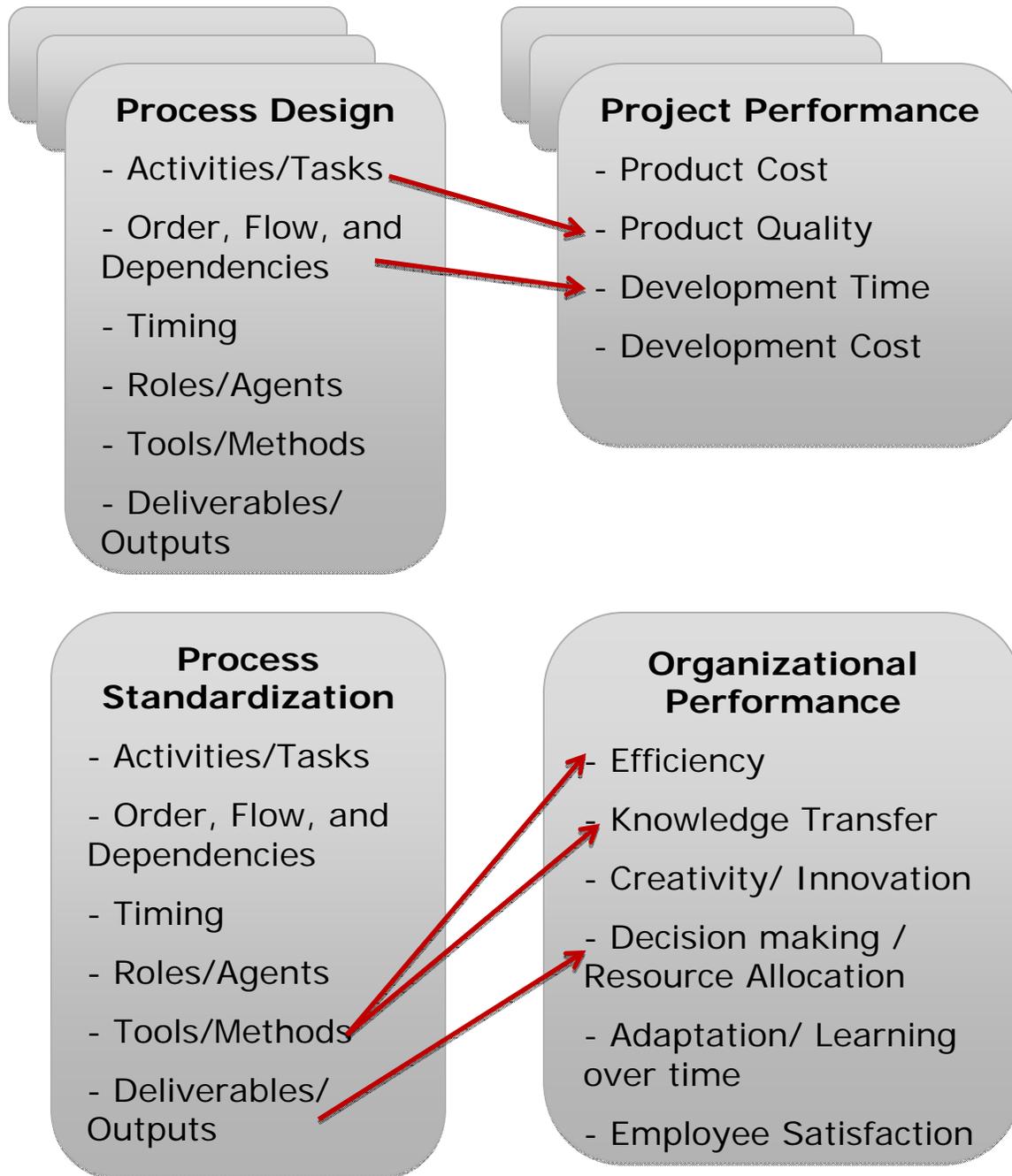
- Theory-building from case studies (*Eisenhardt and Graebner 2007*)
- Selected Cases (Theoretical Sample):
  - 4 large companies (\$5B+ annual sales)
  - Develop electromechanical assembled products
  - Different industries
  - Different approaches to process standardization

# Data Collection

- Visits to companies – each visit 3 days to a week.
- Interviews (40+) with project managers, process managers, engineers, business-unit managers, functional managers
- Process documentation (corporate and project level),  
Project information
- Examples of Project-level process data
  - Documentation from Gates/Reviews
  - “Engineering Plan”, Project Information Repositories and Checklists
  - Process Customization Declarations (PCD) and Rationales for Deviation (RfD)
- Questions Driving Data Collection and Analysis
  - How do product development processes for different projects in an organization differ?
  - What factors drive these differences?
  - How do differences or standardization across processes impact performance on project-level and organization level outcomes?

# Lesson from the case studies





“The biggest benefit is that because of the **standard deliverables at the reviews**, we all talk the same language and expect to see the same things in the same format. It’s **easy for the Senior Management Team to know when a red flag comes up** or when a project is moving into exception.”

Process Manager at Company A

“One good thing was that since we started using the **same tools**, it allows us to **easily move between projects**. We didn’t have to retrain every time we switched.”

Engineer at Company A

“Because of the **tools**, we can get engineers from other projects in crunch time and they don’t spend too much time ramping up. They can be **integrated relatively seamlessly**.”

Project Manager at Company A

**Engineer**

**Project Manager**

**Process Manager**

**Business Unit Manager**

**Process Design**

- Activities/Tasks
- Order, Flow, and Dependencies
- Timing
- Roles/Agents
- Tools/Methods
- Deliverables/Outputs

**Project Performance**

- Product Cost
- Product Quality
- Development Time
- Development Cost

**Process Standardization**

- Activities/Tasks
- Order, Flow, and Dependencies
- Timing
- Roles/Agents
- Tools/Methods
- Deliverables/Outputs

**Organizational Performance**

- Efficiency
- Knowledge Transfer
- Creativity/ Innovation
- Decision making / Resource Allocation
- Adaptation/ Learning over time
- Employee Satisfaction

# Cognition and Hierarchy (Gavetti 2005)

- Costs and Benefits of standardization on different dimensions felt by different parties
- Process is executed in a mindful manner by goal seeking individuals
- Location of 'decision rights' impacts which dimensions vary across projects

“Our goal is to get decision authority as low in organization as possible.”

Business Unit Manager, Company B

“We aim to make it so that as much is decided centrally as possible, so project managers don't have to worry about what activities they should perform or not”

Process Manager, Company C

# Ongoing Work – Project Data

## Project Characteristics

- Complexity
- Newness
- Type of Product
- Budget
- Target Market

## Process Design

- Activities/Tasks
- Order
- Timing
- Roles/Agents
- *Tools/Methods*
- *Deliverables/Outputs*

## Project Performance

- Quality
- Cost
- Delivery

- Data: 51 projects from one company (getting 50 more)
- Method: Multiple Regression
- Questions:
  - What factors explain the variation in process design?
  - Do project characteristics predict process variation in accordance with theory?
  - Does process customization influence project performance goal achievement?

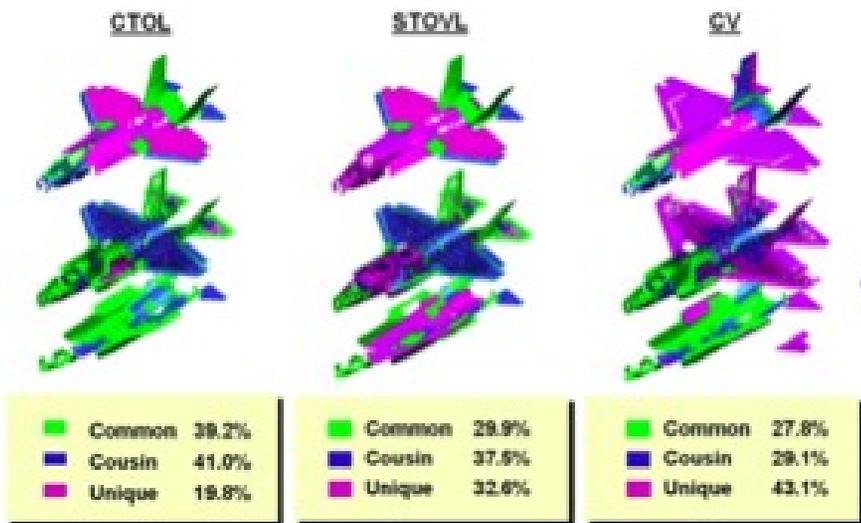
# Ongoing Work - Simulation

- Model: NK Landscape Model with Agents searching (Gavetti 2005, Levinthal 1997, Rivkin and Siggelkow 2004)
- Built on literature and conceptual insights from case studies
- Test the performance effects of:
  - Different allocations of decision rights, incentives
  - Changes to actors' cognitive frames
  - Standardization on different process dimensions

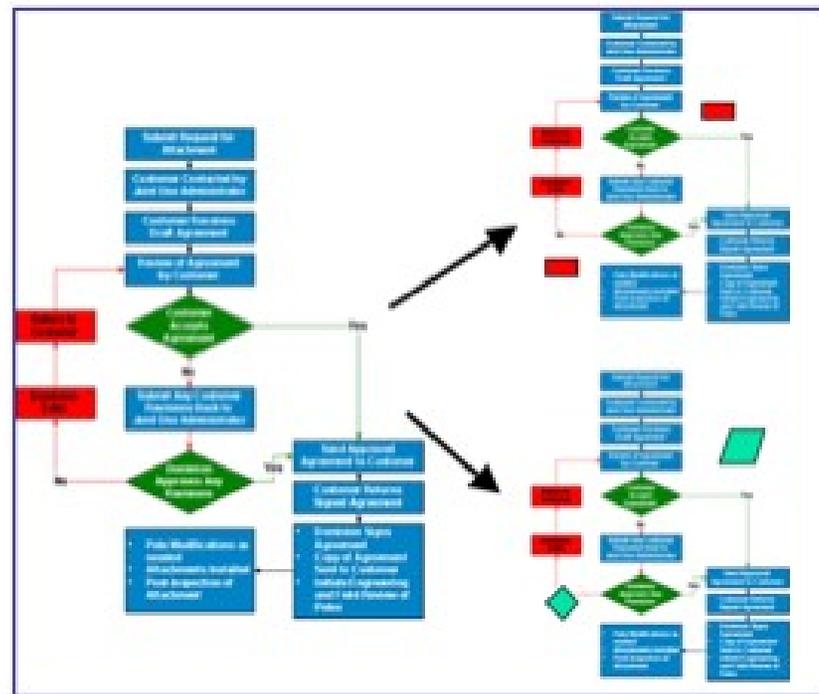
# Summary and Contributions

- Finer-grained understanding of performance impacts of process standardization, considering:
  - individual process dimensions
  - stakeholders' decision making (cognition)
  - allocation of decision rights (hierarchy)
- Model to help firms with decision making about process standardization

# Thank You!



Source: <http://www.jsf.mil/>, accessed July 6, 2006



Questions? Comments?

# Supplementary Slides

# Storyline

- Many PD organizations today – multiple projects
- Standard question for multi unit: should all units do things the same way or should they do things differently?
- This leads to our overarching research question. How should an organization set its level of product development process standardization across multiple projects? Seek help on wording of research question. Perspective of process architect, VP of engineering, etc.? Two of the companies, VP of engineering, is really the champion.
- Let us consider individual project. Wants to meet its goals. Needs to execute set of activities. How do? Good research Mgt Sci.
- In our case, the projects are quite different. Considering they are different (on a number of dimensions), why should they all execute the same process, same set of activities? In fact, process choice should be contingent! (Loch, Shenhar, MacCormack) Achieve their own project goals by doing activities that suit it best.
- However, not just considering outcomes at the individual project level, considering them with all projects together at the organization or portfolio level, there are performance effects of process choice. These generally drive towards standardization. Efficiency, learning across projects, .Performance effects are not necessarily just aggregate of individual project outcomes. Long time horizon, effects not captured in individual project outcome effects, knowledge generated etc. Work to internalize what is external, but far from implemented. What is good for one project may not be good for organization/all projects. Standardization helps. There's also debate about innovation.
- Research on standardization – Practitioner, praising and preaching. Academic – undifferentiated and typically studying impact on one outcome, Routines, Capabilities – abstract and undefined to particular context. Really, blend all of these perspectives to answer engineering question of how design product development process standardization.
- How doing this. 4 companies, studying development processes, central and project level, interviewing various stakeholders who interact with process, some data source examples, some interview questions. Building an understanding of what are the important dimensions, links between them etc. Mention driving questions.
- What have I learned? Process should not be considered at aggregate level. Really get a lot of power from unpacking. Individual dimensions of process. Product Platforms. Second, considering stakeholders cognitive representations and who has decision rights important. Essential for implementation. In line with lot of research from routines, capabilities. Do project managers actually tailor process to their project's benefit? etc. Evidence would suggest not. Abdel-Hamid etc. Use graphic.
- Things to test. Data on performance of projects and the process executed. Controlling for a number of variables. Project differences, project manager etc. Does customization actually improve performance target meeting? Also, seeing how project characteristics drive process changes and if that is in accordance with extant theory.
- Use research flow to show how they all build on each other. Building model. Simulation. Basic framework n. In line with Gavetti, Siggelkow and Rivkin, etc. Some from Product platforms literature. Will allow to test various levels of standardization, decision structures, project portfolios, importance of goals to see what allows consistently high performance. Simulation will have to somehow consider how the individual project level outcomes and the organization outcomes, so particularly over the long run, feed into each other. Model some learning effect, etc. Test for long run performance.

# Benefits of Standardization

- Process standardization enables true concurrent engineering and **provides a structure for synchronizing cross-functional processes** that enables unmatched vehicle development speed...
- standard development processes are the only conceivable way to run a multi-project development factory and **gauge the performance and progress of any individual program.**”

*Morgan and Liker, Toyota Product Development System, 2006*

- The standardization increased the relevance of knowledge acquired in one part of the establishment for another and the documentation served as a **conduit for knowledge to flow** from one part of the organization to the other.

*Adler and Cole (1993), Argote (1999)*

# However...

- Projects are different!

PD projects differ in factors like scale, complexity, technology uncertainty, schedule, environments, goals, domain, available resources, and project team capability.

*MacCormack and Vergnanti, 2003; Dvir, Shenhar, and Alkahr, 2003; Cockburn, 2000; Glass, 2000; Lindvall and Rus, 2000.*

- A 'one-size-fits-all' approach is difficult to work in product development.

*MacCormack and Vergnanti, 2003; Glass, 2000; Lindvall and Rus, 2000.*

- "...process diversity offers one big advantage: it allows different kinds of [projects] to be managed in different ways"

*Hammer and Stanton, 1999*

# The standardization extreme

- “...many organizations’ standard processes tend to be detached from the way work is actually done. Many of those doing so-called ‘real work’ may see the standard process as irrelevant, too generic to be helpful”

*Browning, Fricke, and Negele 2006*

- Standard process is often bureaucratic and cumbersome, lacks buy-in from employees, and project teams often circumvent the process or only pay lip-service to it.

*Cooper 2005*

- GM example: “the more they attempt to define the process of product development, the less the organization is able to carry out that process properly.”

*Sobek, Liker, and Ward 1998*

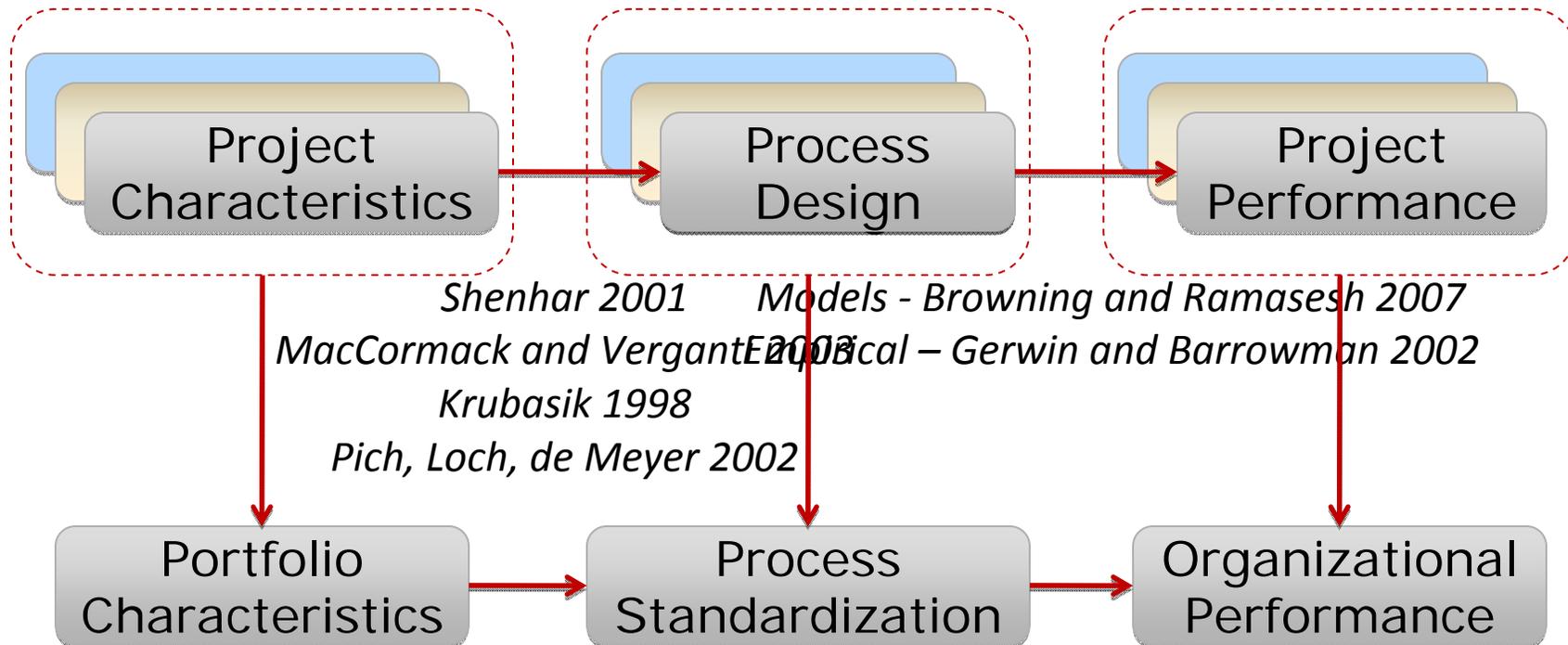
# Standardization and Innovation

- Routinization creates a risk: when organizations are guided by old knowledge, they do not create new knowledge.

*Brunner, Staats, Tushman 2009*

- In a 20-year longitudinal study of patenting activity and ISO 9000 quality program certifications in the paint and photography industries, we found that **increased routinization associated with process management** activities increases the salience of short term measures and triggers selection effects that lead to increases in exploitative technological innovation, **at the expense of exploratory innovation.**

*Benner and Tushman, 2002, 2003*



*Practitioner-targeted:* Cooper 2005, Morgan and Liker 2006, CMMI  
*Firm-level regressions:* Benner and Tushman 2002, Tatikonda and Rosenthal 2000  
*Routines and Capabilities:* Gavetti 2005, Szulanski and Winter 2000, Becker 2005