

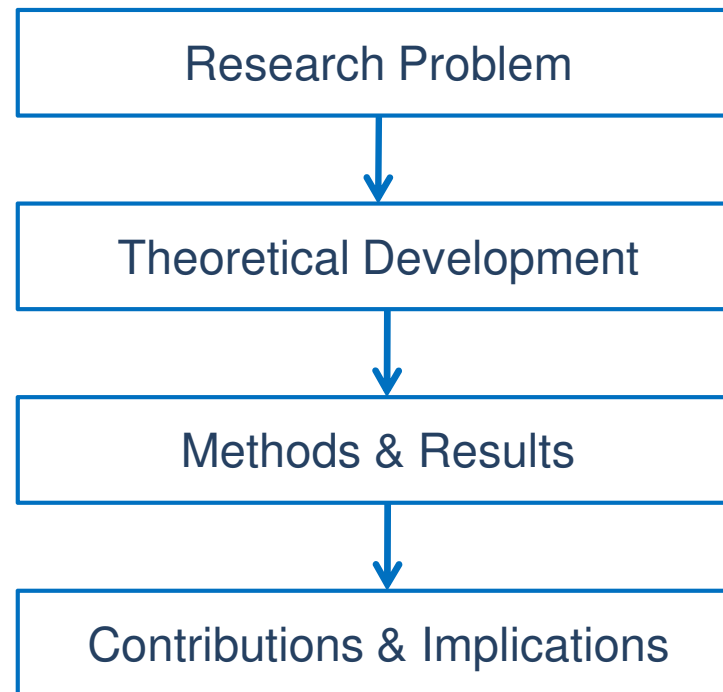
# Complementarities between Organizational IT Architecture and IT Governance Structure

Amrit Tiwana and Benn Konsynski

*Iowa State University*

*Emory University*


# Agenda



# IT Alignment: A Slippery Slope

- #1 driver of IT business value
- ~~Static~~ dynamic process
  - Correction of emergent misfits
    - New competitive pressures
    - New opportunities
    - Business process changes
- Inflexible IT can be a paralyzing bottleneck
  - Business processes deeply embedded in IT
    - IT apps must rapidly adapt
  - IT agility - critical, underappreciated role in sustaining alignment

# IT Alignment

Old priorities  New priorities



1990  
Cost



2005  
Quality



2001  
\$6 “Yuppie Lattes”



2008  
\$2 “regulars”

IT apps must support  
*different objectives*



**MY STARBUCKS IDEA** | **SHARE YOUR IDEAS**



# Two Lenses Used in Isolation

IT Architecture



Structure, properties of relns b/w apps in IT portfolio

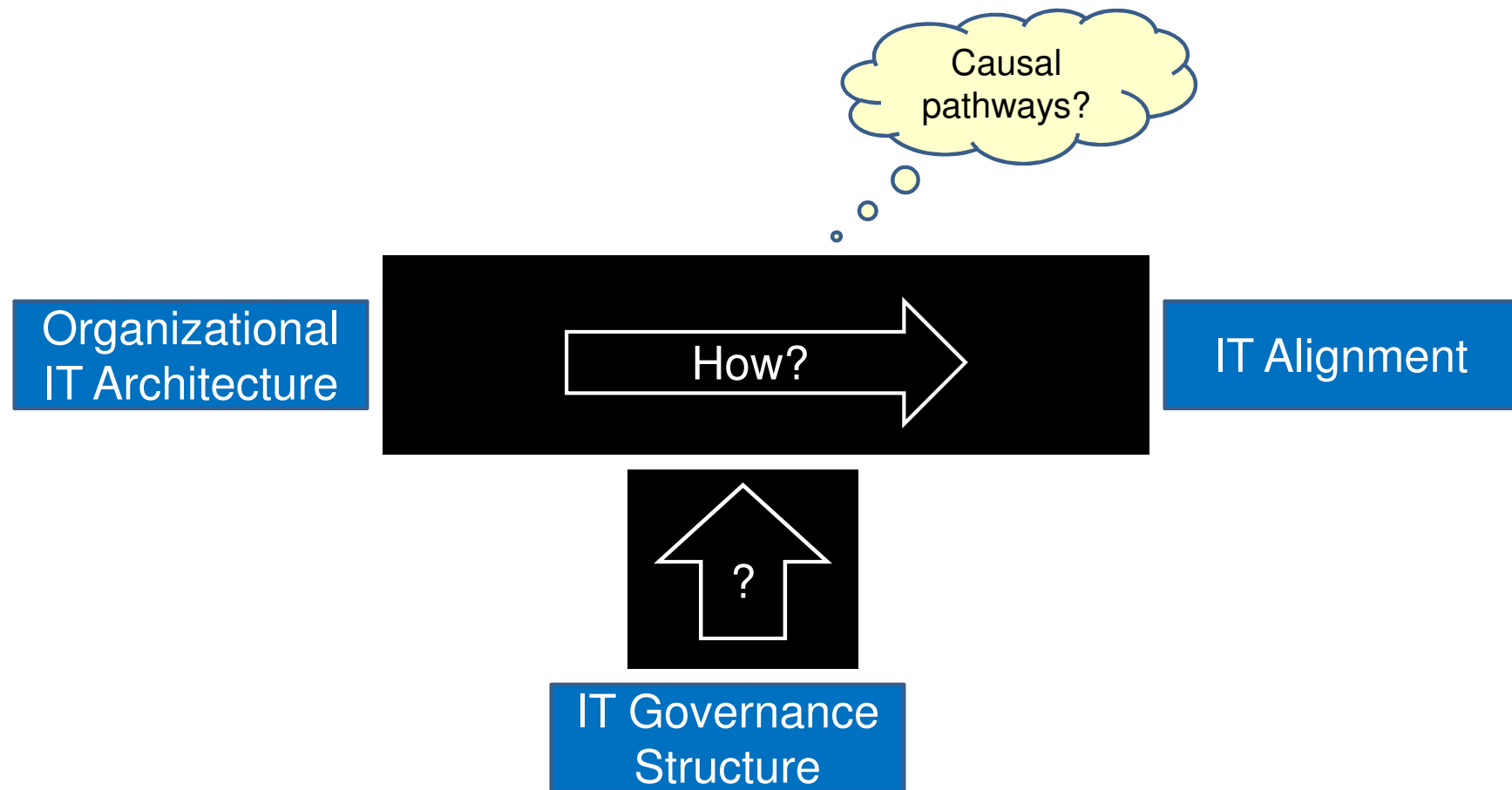
?

IT Governance



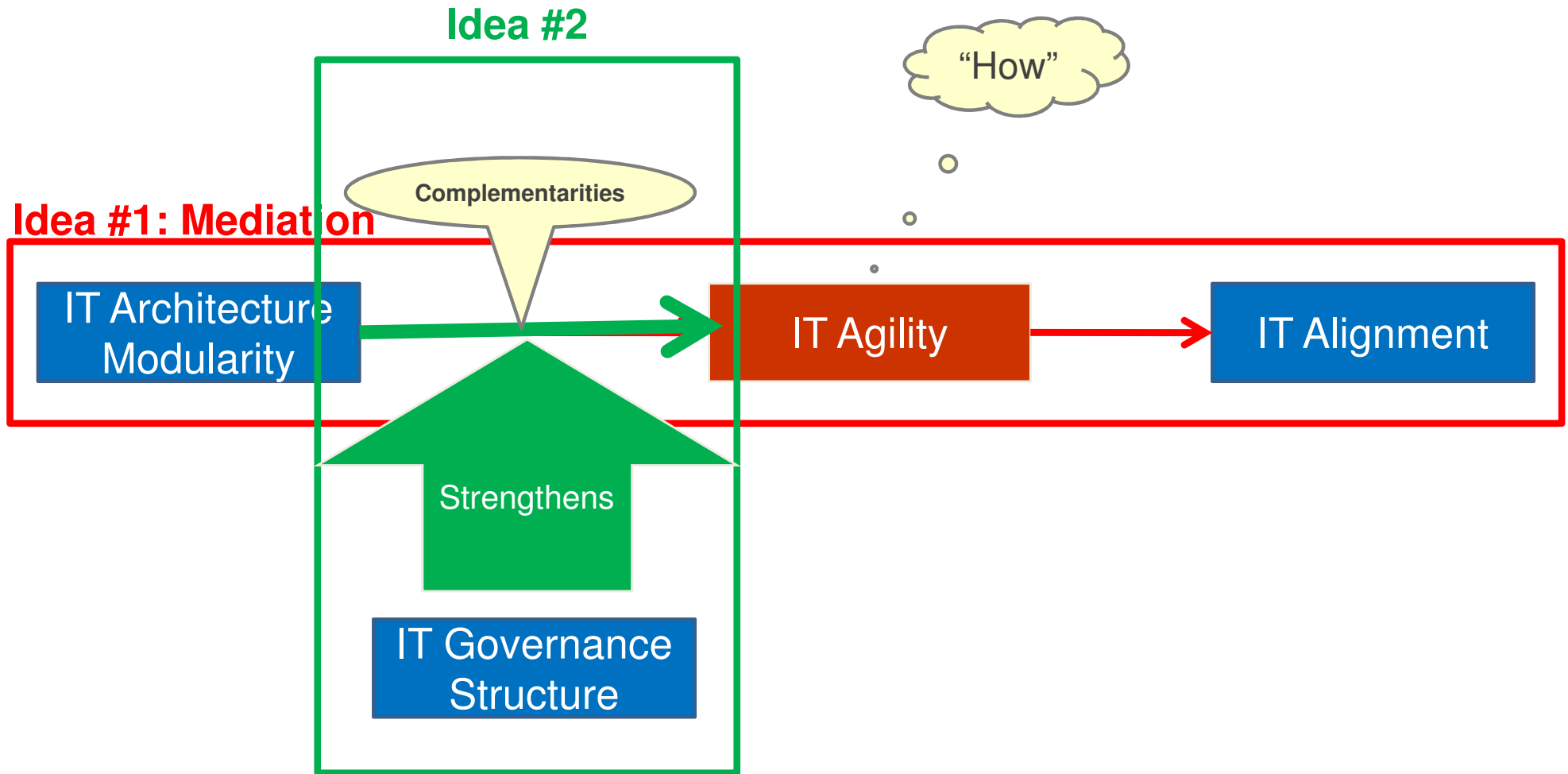
Getting IT decision rights “right”

# Two Research Gaps

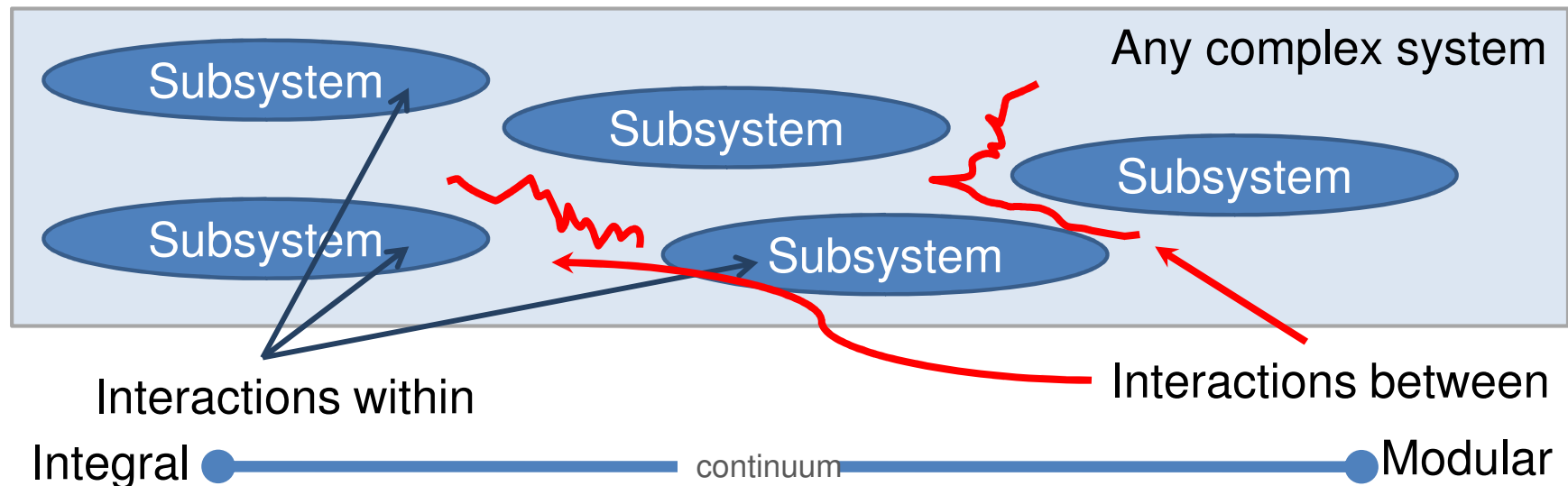


**RQ:** How do IT architecture and IT governance structure *jointly* influence IT alignment?

# Two Ideas Developed



# Modular Systems Theory



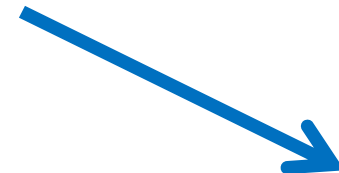
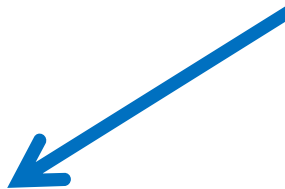
- **Modularity** ~ design principle for complex systems
  - Any system = **interacting subsystems** independent and interdependent
    - intentionally ↑ independence between subsystems
      - modular = interaction within subsystems > among subsystems
- **Continuum** rather than integral-modular dichotomy
- Two forms ~ Technical and organizational property

Org IT architecture

IT governance structure

# IT Architecture Modularity

Org IT portfolio loosely-coupled linked via standardized interfaces



? Internal changes in one app  
don't disrupt others

Org-wide standards & policies prespecify how apps

- connect
- interoperate



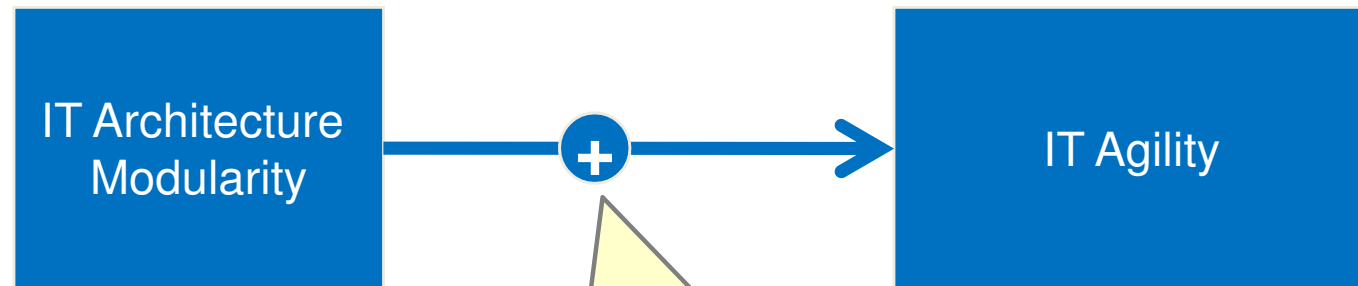
E.g., SOA, Web services, CORBA

APIs, WSDL, SOAP



Don't necessarily covary

# IT Architecture Modularity → IT Agility



- Constraint = **cross-application dependencies**
  - Changes in one application might require **parallel changes** in others
- ↑ Modularity “encapsulates”
  - Isolates cross-application perturbances
  - **Standards**: Prespecify how apps interact & interoperate
  - **LC**: Lowers need for overt coordination of changes

# IT Agility → IT Alignment

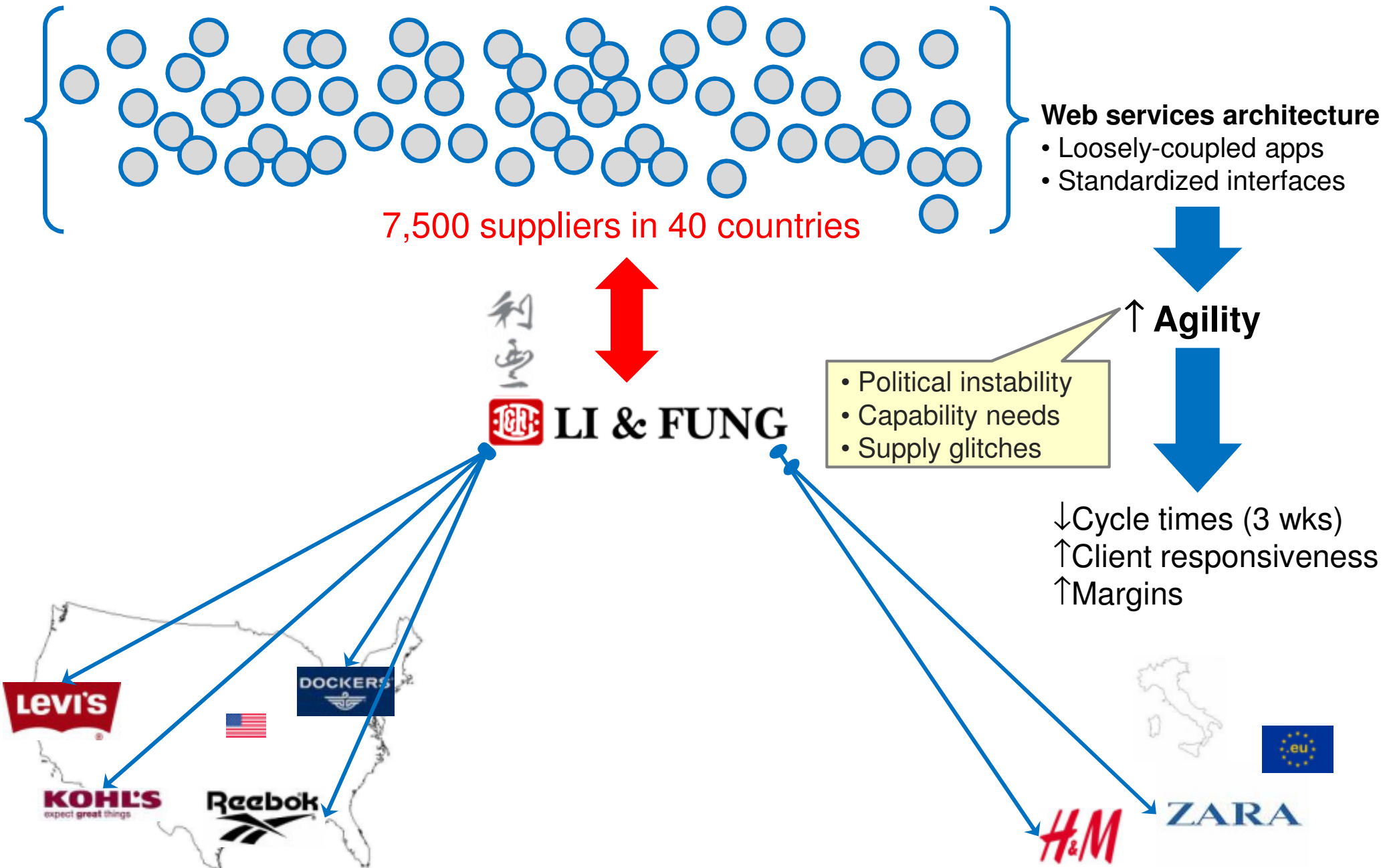
IT Agility



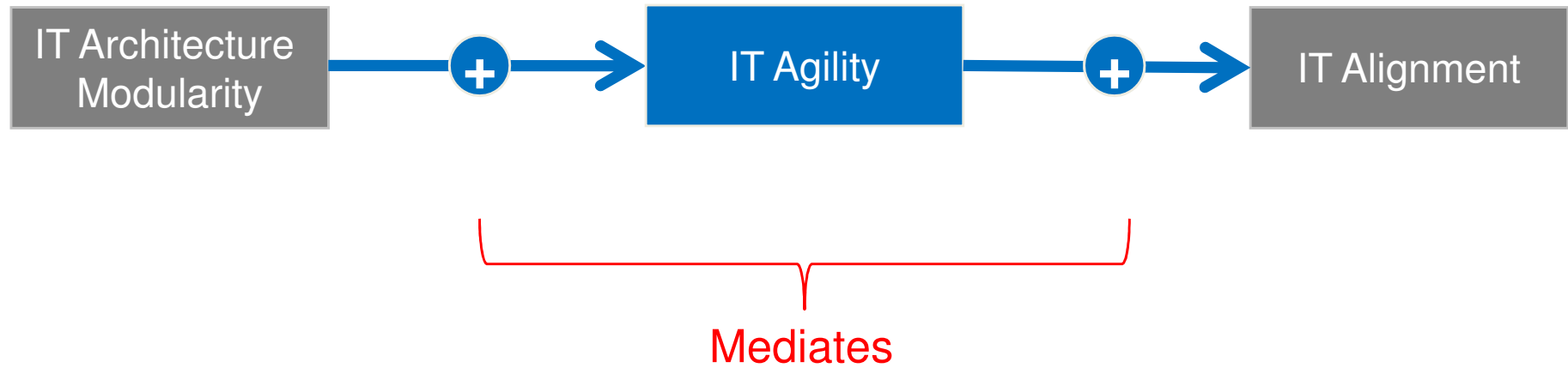
IT Alignment

- Responsiveness to line function demands
- Rapid correction of emergent misalignments

# Example: Li & Fung (Hong Kong)



# Hypothesis 1



# IT Governance Decentralization

“Who decides what”

2 Classes of IT decision rights

IT specification DRs

“What”

Decisions about...

- what biz processes
- priorities
- constraints (time, \$)
- performance metrics
- service levels

IT Implementation DRs

“How”

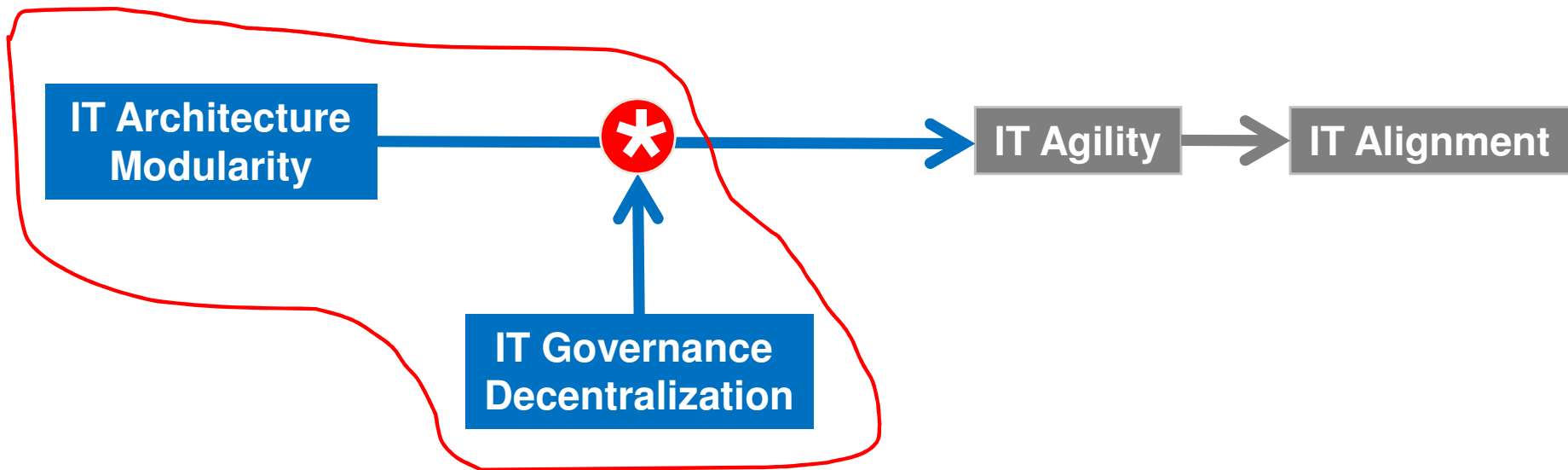
Decisions about...

- methods
- programming languages
- platform choices
- definition of IT standards/ policies
- IT sourcing

Don't necessarily covary

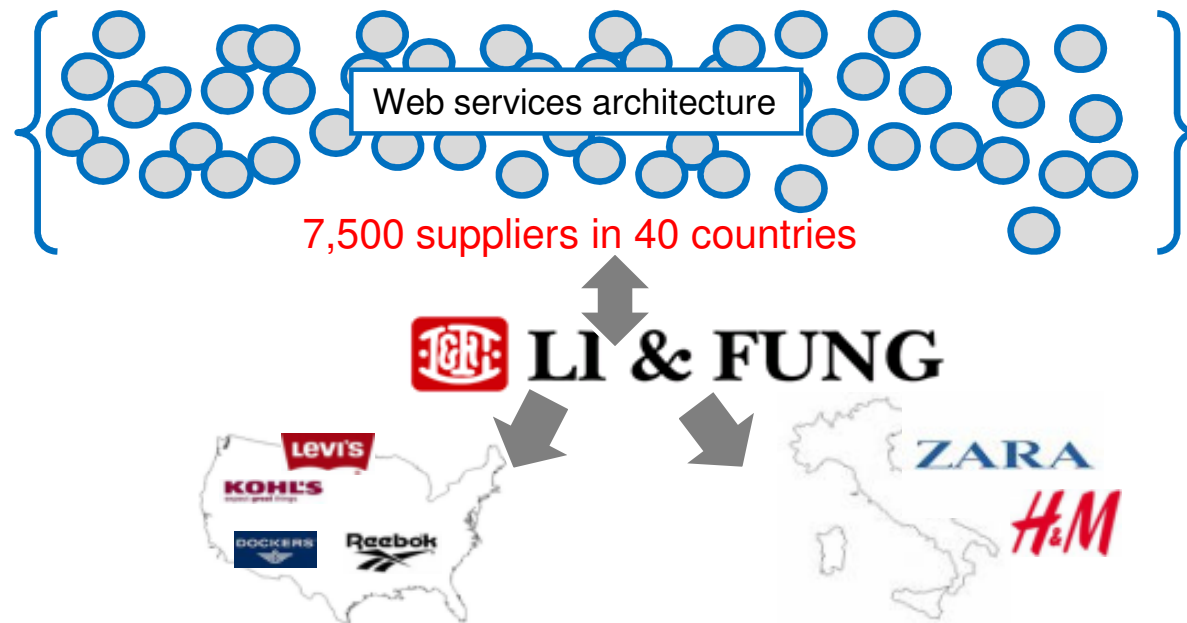
Greater decentralization (line) ~ Greater alertness

# Complementarities



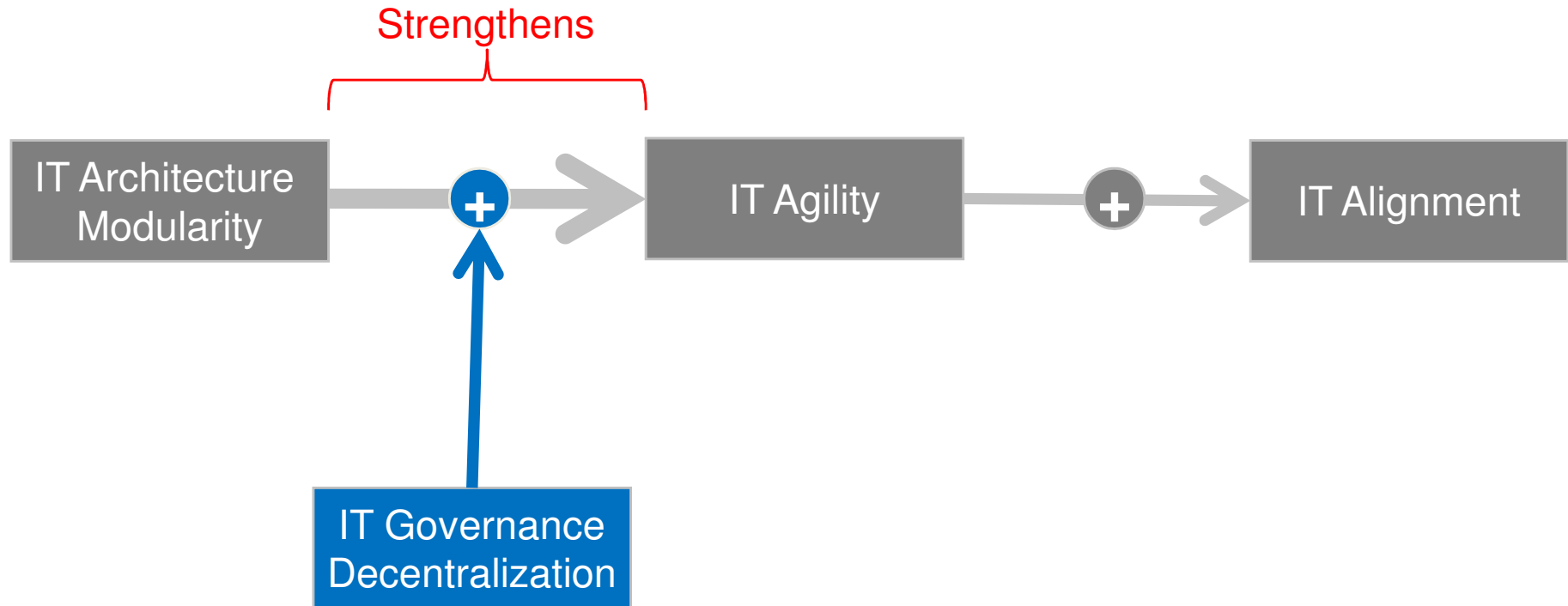
- Alertness matters less if constrained by IT architecture
  - ▣ Lowers need for overt coordination among departments
  - ▣ IT arch modularity provides flexibility to benefit from alertness
- Alertness + flexibility → IT agility
  - IT governance decentralization
  - IT architecture modularity

# Example: Li & Fung, Again



- Supplier **autonomy** over: (1) IT apps & (2) IT decisions
  - ▣ within framework of interconnection standards (WDSL)
- Flexibility to rapidly **add/ delete suppliers**
- Seamless **interoperability** (compliance with WSDL standards)

# Hypothesis 2



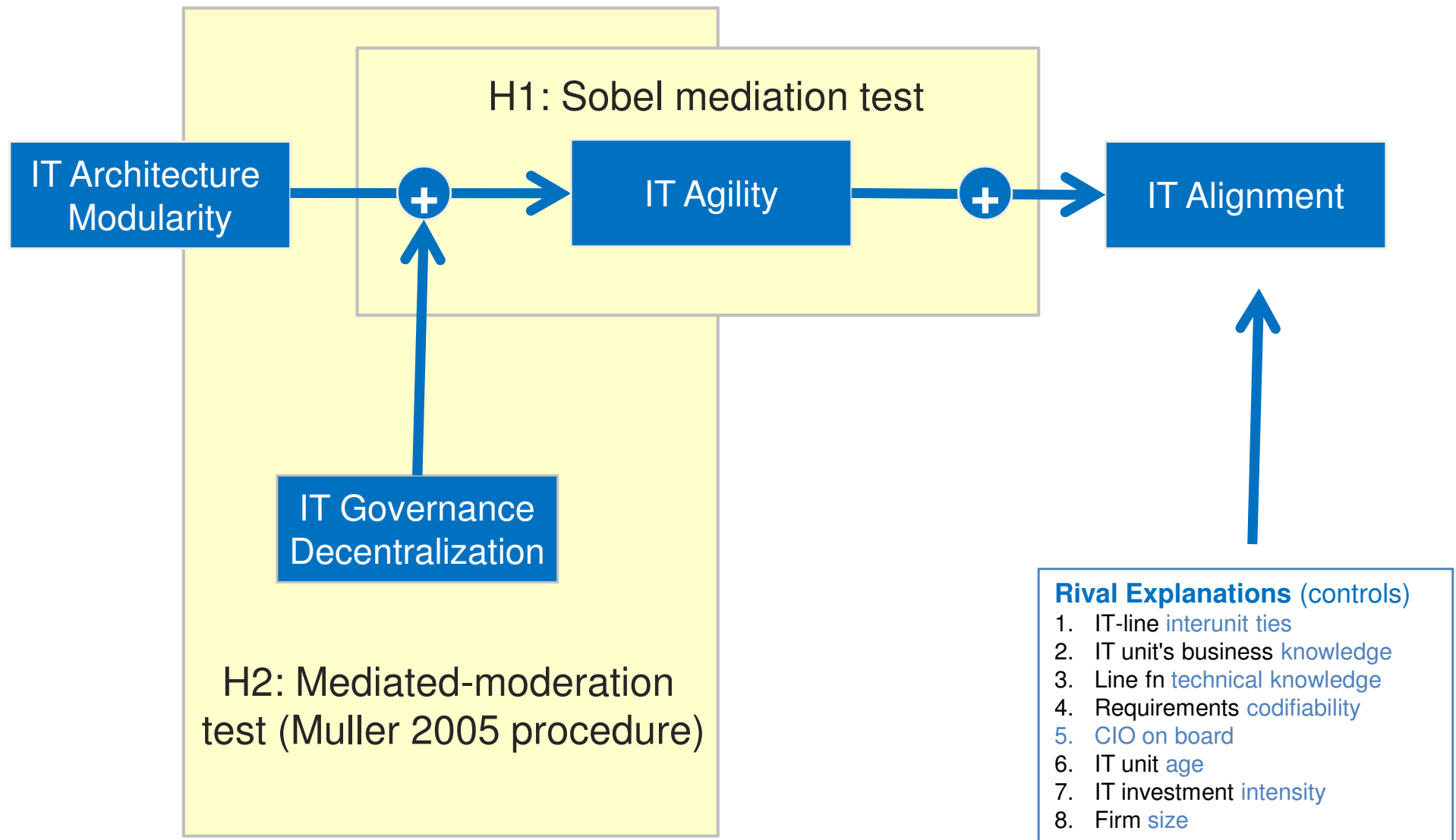
# Methodology

## Survey of 223 firms (24.6% response rate)

- ▣ MIS directors (N = 223) + line managers (N = 90)
- ▣ Experienced (16+ years)
- ▣ Variety of industries (e.g., manufacturing, services, technology)
- ▣ New measures for IT modularity, IT governance decentralization; rest adapted



# Hypothesis Testing Strategy



Bootstrap of 1,000, 500, and 200 model reestimates in PLS model

# Results

H1 supported

Loose coupling

.5\*\*

IT Architecture Modularity

0.40\*\*\*

IT Agility

0.38\*\*\*

0.13\*

IT Alignment

R<sup>2</sup> = 57%

IT standardization

\* Interaction term \*

0.17\*\*

Sobel T = 2.1\*

R<sup>2</sup> = 31%

IT specification DRs

.4\*

IT Governance Decentralization

-0.33\*\*\*

H2 supported

Control Variables

IT-line **interunit ties** 0.29\*\*\*(4.14)  
 IT unit's **business knowledge** 0.13\*(2.03)  
 Line function's **technical knowledge** 0.02(0.31)  
 Requirements **codifiability** 0.05(0.98)  
 CIO on board -0.04(-0.67)  
 IT unit **age** -0.02(-0.61)  
 IT investment **intensity** -0.03(-0.71)  
 Firm **size** 0.002(0.01)

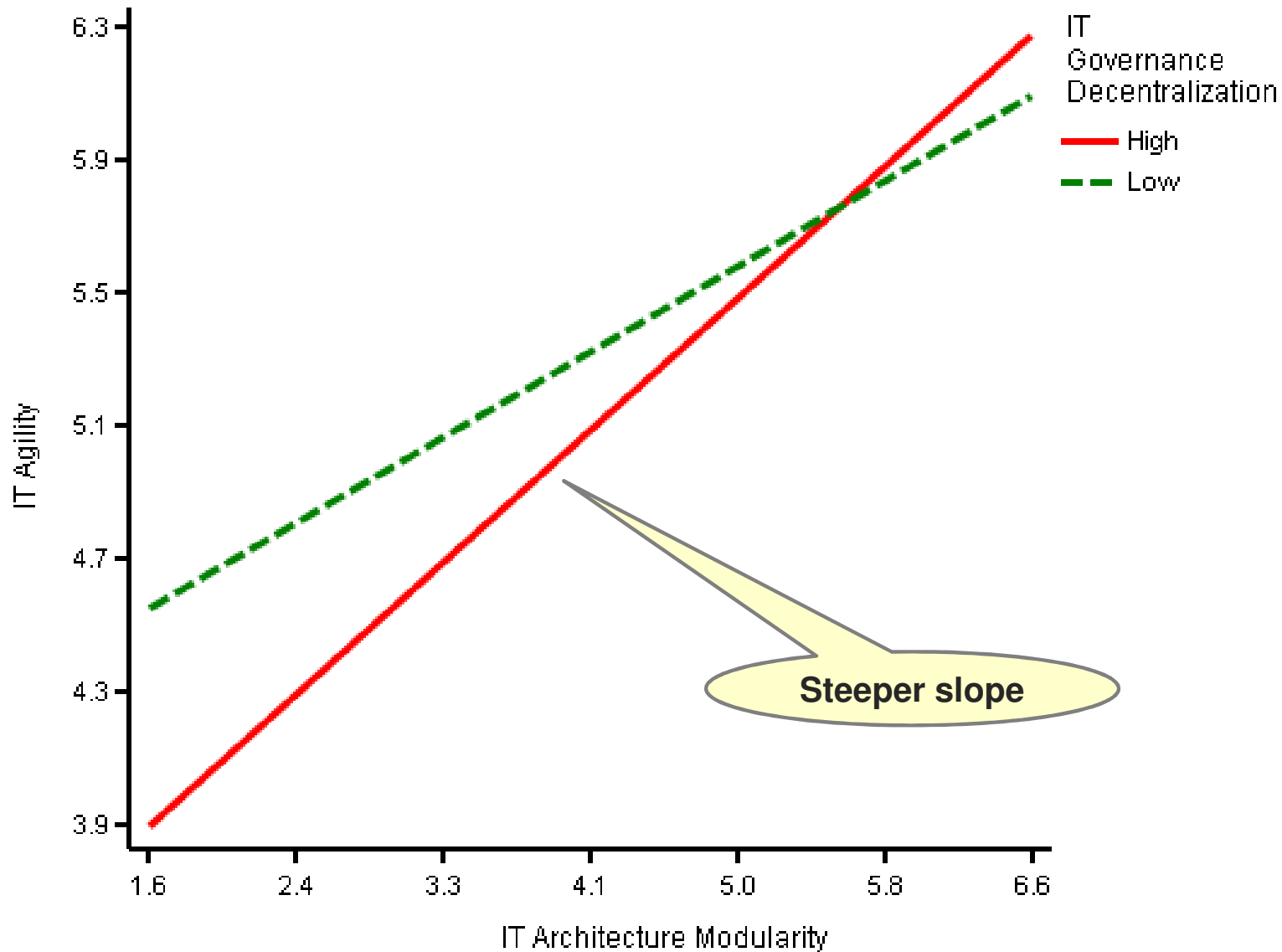
.9\*\*\*

IT implementation DRs

→ Significant  
 → Non-significant

N = 223 firms

# Decentralized Governance Amplifies Modularity's Benefits



# Contribution #1: “How”

## How IT architecture modularity enhances IT alignment

- IT agility ~ important intervening **explanatory mechanism**

## Implications

- **Rigidity** (in enforcing IT architecture) increases IT agility
  - Flexibility @ higher level requires discipline @ lower
    - Modularity **implied but never measured** in IS research
- Evidence for untested modularity’s adaptation arguments

# Contribution #2: Complementarities

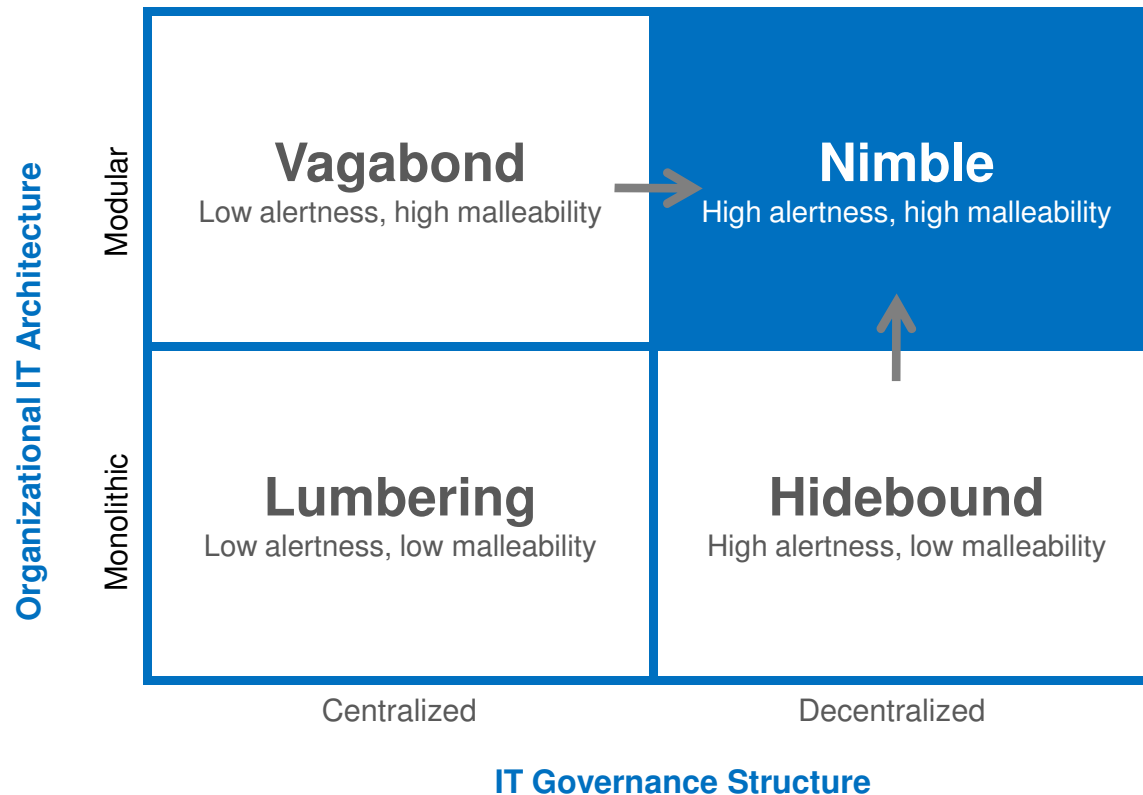
How IT architecture\*IT governance complementarities translate into stronger IT alignment

- ▣ via IT agility

## Implications

- ▣ The two **must work in tandem** ~ mutual “fit”
  - ▣ Highlights underappreciated interactions b/w architecture and governance
- ▣ “**Do modular tech architectures require modular org structures?**”
  - ▣ Both asserted challenged in modularity literature
  - ▣ Results **reconcile** disagreements

# Implications for Practice



1. Alignment ~ ongoing **dynamic process** of fixing IT-business misfits
2. IT architecture + IT governance = **system of interdependent choices**
  - Neglecting one erodes the others' benefits

## Questions

Full paper @ [www.bus.iastate.edu/tiwana](http://www.bus.iastate.edu/tiwana)



# Appendices

# Appendix: Muller's Mediated-Moderation Test

Must show four things to demonstrate mediated moderation:

1. a significant relationship between the mediator and DV
2. that the relationship between the IV and mediator is moderated by governance decentralization
3. the interaction term's effect on the DV is mediated by agility
4. the direct effect of the moderator on mediator decreases in magnitude in the presence of the interaction term

D. Muller, C.M. Judd, and V. Yzerbyt, "When Moderation Is Mediated and Mediation Is Moderated," *Journal of Personality and Social Psychology*, 89 (6), 2005, 852-863.

# Future Work

1. Causal ordering ~ longitudinal data
2. Role of “peripheral knowledge” in IT-client departments?
3. Over- versus under-modularization (Ethiraj-Levinthal 2007)

# Limitations

1. Cross-sectional data
2. Smaller firms might limit generalizability
  - Post hoc tests show no systematic bias
3. Industry not controlled for
  - Brown (*Org. Sci* 1997) Industry poor predictor of IT org structure

# Appendix: 4x Common Methods Bias Tests

Test	Bias?
Harman's one factor test	X
Lindell-Whitney marker variable test	X
IT-line inter-rater triangulation (N=90)	X
Model retest with matched pair data subset	X

# Variants of the Two Types of Decision Rights

Type of decision right		Disciplinary home
What IT should accomplish	How IT should accomplish it	
Specification DRs	Implementation DRs	IS
Strategic DRs	Execution DRs	IS
Specification DRs	Production DRs	NPD
Strategic DRs	Operational DRs	Operations
Decision control rights	Decision management rights	Management and IS

# Measures

# Summary of Construct Measures

Construct	Definition	# items
IT architecture modularity	The degree of decomposition of an organization's IT portfolio into loosely-coupled subsystems that communicate through standardized interfaces.	9
IT governance decentralization	The degree to which IT specification and IT implementation decisions are made by the line functions vis-à-vis the IT department. IT specification decisions pertain to what business processes in the line functions IT must support, the associated constraints (schedule, budget, quality), objectives, priorities, and performance expectations (e.g., service levels). IT implementation decisions pertain to the methods, programming languages, platforms, definition of IT standards and policies, and IT sourcing.	10
IT Agility	The capacity of the IT function to rapidly adapt to changing line function demands and opportunities.	6
IT Alignment	The degree to which the IT function supports the goals and priorities of an organization's line functions.	6