Outsourcing Product Development in the New Economy: A Benchmarking Study of Challenges and Best Practices

Edward G. Anderson
University of Texas
Austin

Alison Davis-Blake
University of Minnesota
Minneapolis

Geoffrey Parker
Tulane University
New Orleans

11-October-2006

Research sponsored by National Science Foundation Grant SES-0323227

October Sponsor

C.H. ROBINSON WORLDWIDE, INC.

Parker Background

Oxford, Ohio

Princeton 1982-1986

- BS, Electrical engineering & computer science
- Minor, Economics

General Electric 1985-1990

- Electrical engineer (Research Triangle Park)
- Financial management training program (FMP)
- Finance jobs, Service Engineering, Business Development

MIT 1990-1998

- MS, Electrical Engineering (Technology and Policy)
- Ph.D., Operations Management and Statistics

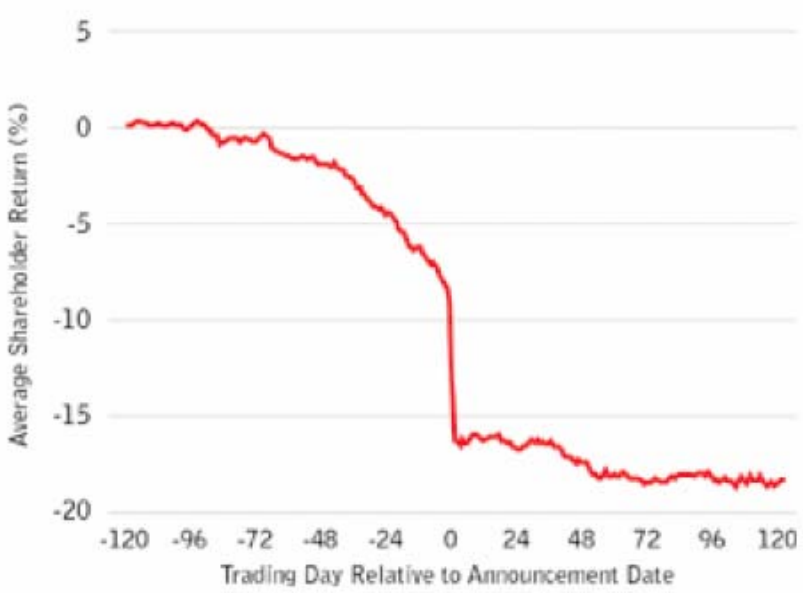
Tulane 1998-present

- Information and Operations Management
- Entergy Tulane Energy Institute

Increasing Exposure: Supply Glitches Affect Value

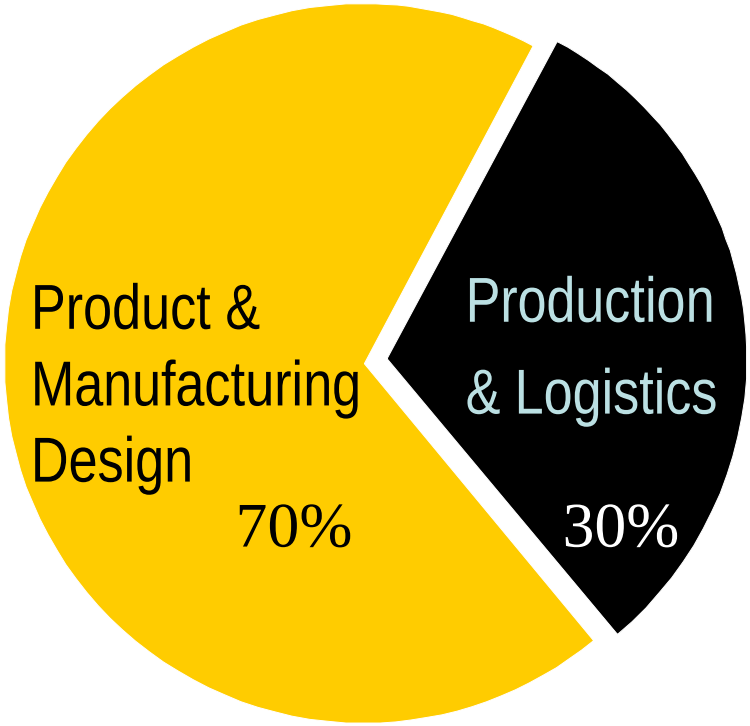
EXHIBIT 7

EXHIBIT 8



Source: V. Singhal and K. Hendricks, "How Supply Chain Glitches Torpedo Shareholder Value," Supply Chain Management Review, 2002.

Role of Design in the Supply Chain



Point in time when total Lifecyle cost is determined

- 70% of total product lifecycle cost is determined during design and development (including process design) (Nevins & Whitney 1989)
- Overwhelming majority of supply chain programs concentrate on post-development activities (Closs & Stank 1999)

NSF Study Background

Large vertically integrated firms are disintegrating in favor of supply chains of specialists

- Widespread cost and quality disappointments (anecdotal)

Studies on how to manage these networks are still immature, particularly w.r.t. engineering/technical projects

Case study at Hewlett-Packard, published in *Production and Operations Management* in 2002

National Science Foundation-sponsored study begun in 2004

- Completed firms: Applied Materials, Blade Logic, Heraeus, Innovative Emergency Mgmt., Motorola (Freescale), Cardinal Health, Frito-Lay, Fujitsu-Siemens, GMC, IBM, Lockheed Martin 1, Lockheed Martin 2, Sensortran, Sigmatel, Stork-Fokker, and Zombie Studios

Growing Opportunities in Integration

"... the other side of the coin of value chain modularity and the increasingly specialized division of labor is the emergence of systems integration as a key factor in the organization of production. The work of systems integration … implementing new combinations of technologies; integrating skills, knowledge, and components from other firms … becomes increasingly important as value chains grow more complex and disaggregated."

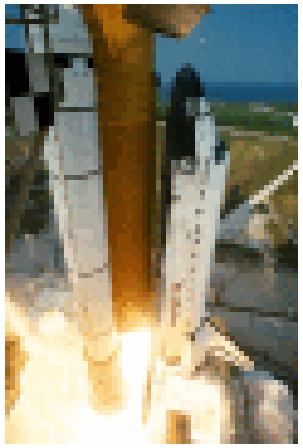
Source: Richard Lester, "China, America, and the Global Competition for Industry," MIT Industrial Performance Center, October 16, 2003.

NSF Study: Research Questions

1. What special challenges do firms face with outsourced development?
   - Product development, embedded software development, contract manufacturing
2. What are best practices for coping with these challenges (Benchmarking)?
3. What skills help project managers in managing outsourced development projects?

Note: "Outsourcing" for our purposes includes all supplier-lead development projects, not just those that were once done in-house

World trade MAGAZINE
Supply Chain Management Online University
2006 Webinar Series
In Partnership With
nasstrac
AST&L
THE NATIONAL INDUSTRIAL TRANSPORTATION LEAGUE
October Sponsor
C.H. ROBINSON WORLDWIDE, INC.



Methodology

Survey & interview managers of identified projects at each participant firm

Project managers answer questions like:

- What issues were encountered (language, geography, industrial differences, differing goals, etc.)?
- What methods were used to coordinate the project?
  - E.g. co-location, project mgt. tools like PERT, modular design, structured design tools like QFD etc.
- Frequency and types of communications with the supplier
- Education, background, and training (such as systems engineering, costing, or negotiations skills)

Their supervisors rate the success of each project vs. initial expectations on quality, performance/functionality, cost, timing, and overall working relationship

Study Respondents

Bachelor's Degree	Frequency
Electrical Engineering	26.1%
Mechanical Engineering	17.4%
General/Other Engineering	13.0%
Industrial Engineering	8.7%
Other bachelor's degree	8.7%
Finance	4.3%
Operations Management	4.3%
None	17.4%

N = 23 Project Engineers/Administrators

September 2006: N=40

Master's Degree	Frequency
MBA	17.4%
General/Other Engineering	8.7%
Aerospace Engineering	4.3%
Mechanical Engineering	4.3%
None	69.6%

N = 23 Project Engineers/Administrators
1 PE had 2 Master's degrees

October Sponsor

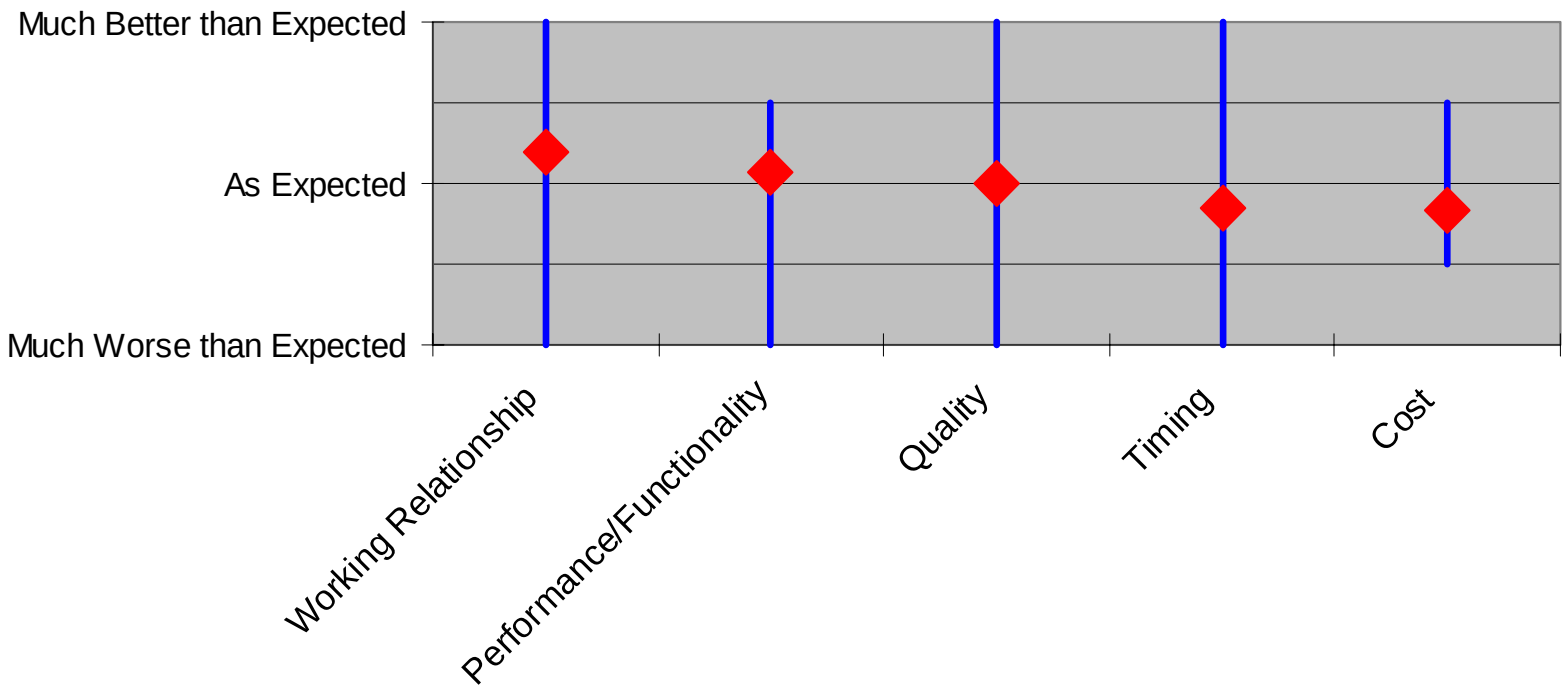
C.H. ROBINSON WORLDWIDE, INC.

Preliminary Results

Outcomes, Coordination Tools,
Organization, and Skills

Benchmarking: Outcomes

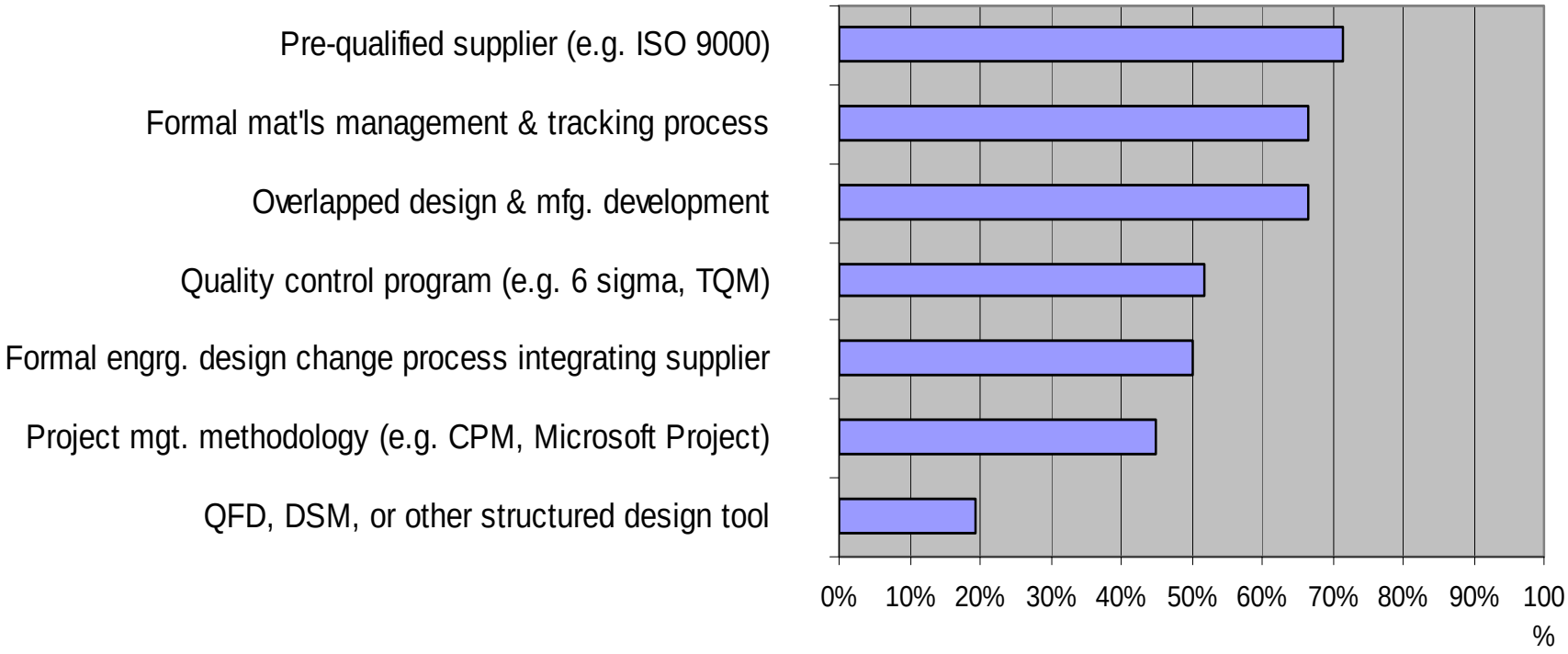
Outcomes (Mean & Range) vs. Expectations



- Projects show a wide variety of success levels
- Most conflicts in timing/schedule and costs

Benchmarking: Tools

Coordination Tools vs. Frequency of Usage



Study Results: Tools

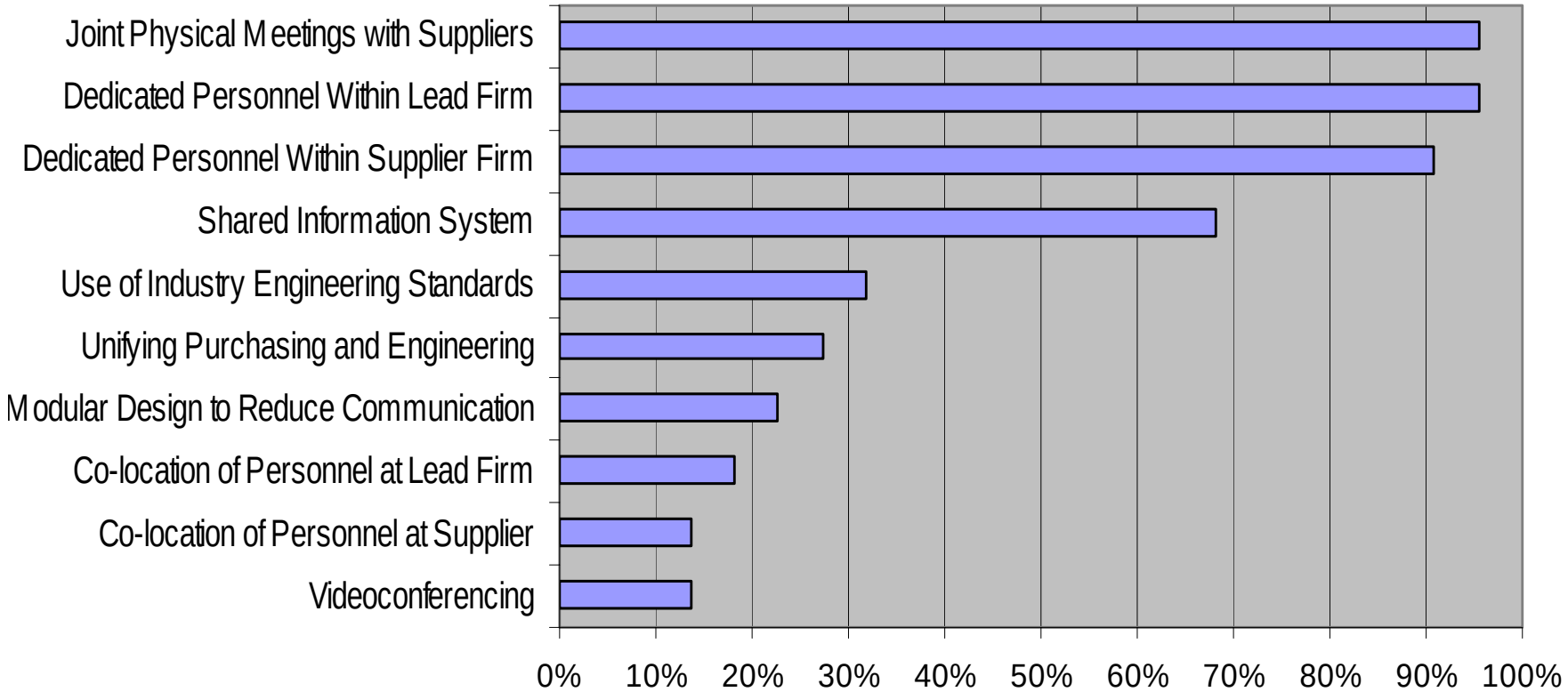
- Pre-qualification for suppliers and formal material management processes are broadly beneficial
  - Except for cost
- Formal processes to translate customer wants into design specs (e.g. QFD and DSM) are broadly beneficial
  - Except for performance/functionality
  - *not highly used*

Study Results: Tools (cont.)

- Project management & quality programs seem to benefit quality
- Formal engineering change processes and concurrent engineering have no discernable statistical effects
- Most tools seem to help, but their effect is not uniform across outcomes
  - Need a combination of tools

Benchmarking: Organization

Organizational Structures vs. Frequency of Usage



Study Results: Organization

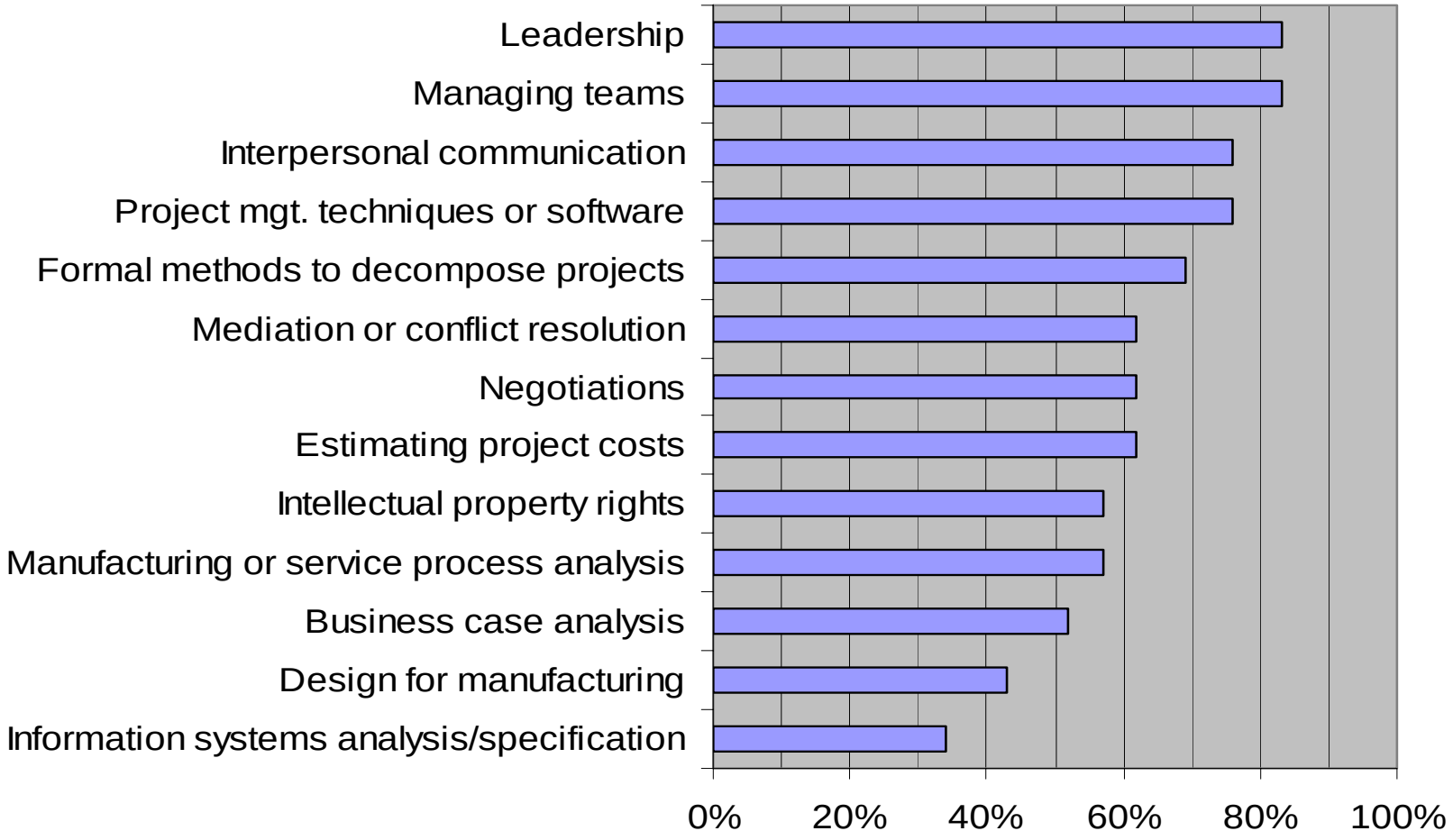
- More people needed for outsourced projects
  - Dedicated personnel on both sides
  - Steep learning curve for organization and individuals
  - Heavy reliance on joint meetings; creates difficulties across large distances
  - Virtual integration vulnerable to personnel turnover
- Co-location seems to be a last ditch measure when projects are performing poorly
  - But once established, it tends to be permanent
  - Staggers communication barriers … “Ugly American with an Asian face…”

Study Results: Organization (cont.)

- There are no high-tech “silver bullets” for outsourcing
  - Traditional videoconferencing doesn’t seem to help
    - Webex seems to be growing in popularity
  - Information systems are usually just e-mail & Excel
    - Although shared computer-aided design (CAD) probably helps
    - Fax still used for complex data interchange
- Modular design seems to help quality but does not meet expectations w.r.t. performance/functionality
- Using industry standards (such as USB) does not meet expectations w.r.t. working relationship, quality, and timeliness
  - Example: PC air intakes blocked by rack

Benchmarking—Skills/Training

Project Engineers with Formal Training in:



Study Results: Skills

- Most training is either sponsored by company or is “on-the-job”
- Broad and deep experience in the industry is vital
- Soft skills (persuasion, leadership, team-building skills) seem key according to most participants:
  - “It’s about getting people on the other side of the line...to like you and to sympathize with you, to do favors for you. I have a guy who’s really good at this. He’s about eight-tenths con-man. He’s got a lot of likeability and is just great at making you feel you have a friendship with him. ”
  - “Some of our managers are on the banned list. They are not allowed to visit suppliers.”
  - Numerous complaints about courses in soft skills being too cursory

Study Results: Skills

- Clarity of communication
  - "Managing by remote-control," particularly with offshoring and via e-mail
  - Clear & complete specifications
  - Detecting when you're misunderstood
  - "Monkey-proofing" … really
- Training in project management is helpful
  - "I think schools do a horrible job at systems engineering. Product design is pretty good. Integration skills are almost completely lacking. The ability to integrate systems weeds out people who can be promoted versus those who cannot."
  - Decomposing tasks
  - Risk management
- Training in "Design for Manufacturing" is quite beneficial overall, but relatively rare

Next Steps

We need more participants!

- To improve robustness of results and detect weaker relationships
- To refine statistical and qualitative findings
  - e.g. Does project management training help more when there is a language barrier?

Academic Applications

- Core OM courses at BU, Georgia Tech, University of Texas at Austin, Tulane heavily influenced
- Opportunities for specialized courses
  - Designing and Managing Global Design
  - Entrepreneurial supply chain and product/process design

October Sponsor

C.H. ROBINSON WORLDWIDE, INC.

Industrial Applications

- Entry level recruiting
- Management training
- Career progression
- Technology investments
- Outsourcing strategy

Summary

- Outsourcing design, development, and manufacturing often has hidden challenges & costs
- Successful outsourcing requires a number of organization structures, tools, and skills beyond what's needed in house.
  - Different coordination mechanisms and tools help in different ways. There are no silver bullets.
- People, and relating to people, are the glue that holds your virtual organization together
  - The promise of high-tech fixes is mostly as yet unfulfilled

Questions?

More information can be found at:

pdoutsourcing.org
EdAnderson.org
ggparker.net

Keiretsus vs. Alliance Outsourcing

- Why Keiretsus are different?
- Shared equity between buyer and supplier
- Suppliers often managed by former executives from buyer firm
- Decades-long relationships